

Relevant Authority: Prospective bidders must familiarize themselves thoroughly with the Commission's Rules relating to the Location and Monitoring Service, contained in Title 47, Part 90 of the Code of Federal Regulations, and those relating to application and auction procedures, contained in Title 47, Part 1 of the Code of Federal Regulations.

Prospective bidders must also be thoroughly familiar with the procedures, terms and conditions contained in the *LMS Report and Order, Memorandum Opinion and Order and Further Notice of Proposed Rule Making, LMS Second Report and Order*, Part 90, Subpart M of the Commission's Rules concerning Transportation Infrastructure Radio Service, Subpart X of the Commission's Rules concerning Competitive Bidding Procedures, and Part 1, Subpart Q of the Commission's Rules concerning Competitive Bidding Proceedings.

The terms contained in the Commission's Rules, relevant orders, public notices and bidder information package are not negotiable. The Commission may amend or supplement the information contained in our public notices or the bidder information package at any time, and will issue public notices to convey any new or supplemental information to bidders. It is the responsibility of all prospective bidders to remain current with all Commission Rules and with all public notices pertaining to this auction. Copies of most Commission documents, including public notices, can be retrieved from the FCC Internet node via anonymous ftp @ftp.fcc.gov or the FCC World Wide Web site at <http://www.fcc.gov/wtb/auctions>. Additionally, documents may be obtained for a fee by calling the Commission's copy contractor, International Transcription Service, Inc. (ITS), at (202) 857-3800. When ordering documents from ITS, please provide the appropriate FCC number (*e.g.*, FCC 97-305 for the *Memorandum Opinion and Order and Further Notice of Proposed Rule Making* and FCC 98-157 for the *LMS Second Report and Order*).



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Report No. WT 98-20

WIRELESS TELECOMMUNICATIONS ACTION

July 14, 1998

FCC ADOPTS AUCTION RULES FOR LMS SERVICES

(PR Docket No. 93-61)

The Commission has adopted rules and procedures for the future auction of Location and Monitoring Service (LMS) licenses. LMS refers to advanced radio technologies designed to support the nation's transportation infrastructure and facilitate growth of Intelligent Transportation Systems. These systems are intended to improve the efficiency and safety of the highways of the United States.

LMS systems can be used, for example, by trucking companies to track individual vehicles, by municipalities to pinpoint the location of their buses, or even by private entrepreneurs developing subscriber-based services for recovery of stolen vehicles.

The Commission has taken various steps in developing procedures to license LMS. In its *LMS Report and Order*, the Commission adopted rules governing the licensing of LMS in the 902-928 MHz frequency band and also created a new section in Part 90 of its Rules for Transportation Infrastructure Radio Services, which include LMS and similar services. In the decision released today, the Commission adopts many of the proposals set forth in the *LMS Further Notice of Proposed Rulemaking*. Specifically, the Commission took the following steps to implement competitive bidding for LMS systems:

- Adopted the general competitive bidding rules and procedures included in Part 1 of the Commission Rules for the LMS auction.
- Noted in the *Part 1 Third Report and Order*, delegated authority to the Wireless Telecommunications Bureau to determine the appropriate auction design and auction procedures.
- Adopted bidding credits for eligible small businesses. "Small businesses" with average annual gross revenues not to exceed \$15 million are eligible for a 25 percent bidding credit, and "very small businesses" with average annual gross revenues not to exceed \$3 million are eligible for a 35 percent bidding credit.

- **Determined that LMS licensees will be allowed to partition their geographic licenses and disaggregate portions of their spectrum, provided that a qualified small business that applies to partition or disaggregate its license to a non-small business entity will be required to repay any benefits it received from special small business provisions as a condition of approval.**

By Public Notice, the Wireless Telecommunications Bureau will schedule an auction of LMS licenses to begin on a date approximately five months after release of these rules.

Action by the Commission, July 9, 1998, by Second Report and Order (FCC 98-157). Chairman Kennard, Commissioners Ness, Furchtgott-Roth, Powell and Tristani.

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Before the FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
) Amendment of Part 90 of the)
PR Docket No. 93-61)
Commission's Rules to Adopt)
Regulations for Automatic Vehicle)
Monitoring Systems)
)
)
)
)
)

SECOND REPORT AND ORDER

Adopted: July 9, 1998

Released: July 14, 1998

By the Commission:

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I. INTRODUCTION

1. In this *Second Report and Order*, we adopt rules and procedures governing competitive bidding for multilateration Location and Monitoring Service (LMS) frequencies. As proposed in the *LMS Further Notice*,¹ we conclude that the LMS auction should be

¹ Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Memorandum Opinion and Order and Further Notice of Proposed Rule Making*, PR Docket No. 93-61, 12 FCC Rcd 13942 (1997) ("*LMS Further Notice*").

conducted pursuant to the recently adopted Part 1 general competitive bidding rules.² In addition, we establish small business definitions for multilateration LMS.

II. EXECUTIVE SUMMARY

2. In our decision today, we take a number of steps to simplify and streamline competitive bidding for LMS systems. What follows is a synopsis of the major aspects of our decision.

- We adopt the general competitive bidding rules and procedures of Part 1 for the LMS auction.
- As noted in the *Part 1 Third Report and Order*, the Wireless Telecommunications Bureau has delegated authority to determine the appropriate auction design and auction procedures.
- We adopt bidding credits for eligible small businesses. "Small businesses" with revenues not to exceed \$15 million are eligible for a 25 percent bidding credit, and "very small businesses" with average annual gross revenues not to exceed \$3 million are eligible for a 35 percent bidding credit.
- LMS licensees will be allowed to partition their geographic licenses and disaggregate portions of their spectrum.
- A qualified small business that applies to partition or disaggregate its license to a non-small business entity will be required to repay any benefits it received from special small business provisions as a condition of approval.

III. BACKGROUND

3. In the *LMS Report and Order*, we established rules governing the licensing of the LMS in the 902-928 MHz frequency band.³ LMS refers to advanced radio technologies

² See generally Amendment of Part 1 of the Commission's Rules -- Competitive Bidding Procedures, WT Docket No. 97-82, Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use, ET Docket No. 94-32, *Third Report and Order and Second Further Notice of Proposed Rule Making*, 13 FCC Rcd 374 (1997) (modified by Erratum, DA 98-419 (rel. March 2, 1998)) ("*Part 1 Third Report and Order*").

³ Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Report and Order*, PR Docket No. 93-61, 10 FCC Rcd 4695 (1995) ("*LMS Report and Order*").

designed to support the nation's transportation infrastructure and to facilitate the growth of Intelligent Transportation Systems.⁴ We created a new Subpart M in Part 90 of the Commission's Rules for Transportation Infrastructure Radio Services, which included LMS and like services.

4. The Commission defined two types of LMS systems -- multilateration and non-multilateration. Multilateration LMS systems are designed to locate vehicles or other objects by measuring the difference in time of arrival, or difference in phase, of signals transmitted from a unit to a number of fixed points, or from a number of fixed points to the unit to be located. Such systems generally use spread-spectrum technology to locate vehicles throughout a wide geographic area. Multilateration technology is used, for example, by trucking companies to track individual vehicles, by municipalities to pinpoint the location of their buses, and by private entrepreneurs developing subscriber-based services for recovery of stolen vehicles.⁵ The Commission defined non-multilateration systems as LMS systems that employ any technology other than multilateration technology. The Commission noted that unlike a multilateration system, which determines the location of a vehicle or object over a wide area, a typical non-multilateration system uses narrowband technology whereby an electronic device placed in a vehicle transfers information to and from that vehicle when the vehicle passes near one of the system's stations. Examples of non-multilateration LMS systems include automated toll collection devices and systems used by railway companies to monitor the location of railroad cars.⁶

5. LMS operates in the 902-928 MHz frequency band.⁷ The band is allocated for primary use by Federal Government radiolocation systems. Next in order of priority are Industrial, Scientific and Medical devices. Federal Government fixed and mobile and LMS systems are secondary to both of these uses. The remaining uses of the 902-928 MHz band include licensed amateur radio operations and unlicensed Part 15 equipment, both of which are secondary to all other uses of the band. Part 15 low power devices include, but are not limited to, those used for automatic meter reading, inventory control, package tracking and shipping control, alarm services, local area networks, internet access and cordless telephones. The amateur radio service is used by technically inclined private citizens to engage in self-training, information exchange and radio experimentation. In the *LMS Report and Order*, the

⁴ The term "Intelligent Transportation System," or "Intelligent Vehicle Highway System," refers to the collection of advanced radio technologies that, among other things, is intended to improve the efficiency and safety of our nation's highways. *LMS Report and Order* at 4698, ¶ 5 n.9.

⁵ *LMS Report and Order*, 10 FCC Rcd at 4697-98, 4703, ¶ 14.

⁶ *Id.*

⁷ The definition of LMS also includes existing Automatic Vehicle Monitoring operations below 512 MHz. Unlike other LMS operations, LMS systems below 512 MHz may neither offer service to the public nor provide service on a commercial basis. See *LMS Report and Order*, 10 FCC Rcd at 4738, ¶ 86.

Commission recognized the important contribution to the public provided by Part 15 technologies and amateur radio operators and sought to develop a band plan that would maximize the ability of these services to coexist with LMS systems.⁸

6. The Commission adopted the *LMS Report and Order* with an eye toward minimizing potential interference within and among the various users of the 902-928 MHz band. The Commission's band plan accordingly permits secondary operations across the entire band by users of unlicensed Part 15 devices and amateur licensees. At the same time, the band plan separates non-multilateration from multilateration LMS systems in all but one subband so as to avert interference. The *LMS Report and Order* also established limitations on LMS systems' interconnection with the public switched network and set forth a number of technical requirements intended to ensure successful coexistence of all the services authorized to operate in the band. We have also resolved issues raised by petitioners on reconsideration.⁹

7. Background. In the *LMS Further Notice*, the Commission sought comment on, *inter alia*, the appropriate competitive bidding methodology and procedures for LMS, establishment of small business definitions, whether the gross revenues of all controlling interests and affiliates should be attributed to the small business, sufficiency of small business provisions to promote participation, whether licensees should be allowed to partition their licenses and disaggregate portions of their spectrum, and the appropriate form of unjust enrichment provisions. Comments and reply comments were filed by two commenters: Teletrac, Inc. ("Teletrac") and Comtrak.

IV. COMPETITIVE BIDDING FOR MULTILATERATION LMS LICENSES SECOND REPORT AND ORDER

A. Auctionability of the LMS Frequency Bands

8. Background. In the *LMS Report and Order*, the Commission decided to use competitive bidding to select from among mutually exclusive applications for multilateration

⁸ *LMS Report and Order*, 10 FCC Rcd at 4714, ¶ 34.

⁹ See Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Order on Reconsideration*, PR Docket No. 93-61, 11 FCC Rcd 16905 (1996) ("*Order on Reconsideration*"); see also *LMS Further Notice*, 12 FCC Rcd at 13942. Specifically, the *Order on Reconsideration* resolved issues regarding incumbent LMS licensees that were afforded grandfathered status. These issues involved interference testing, accommodation of secondary uses in the 902-928 MHz band, emission masks, frequency tolerance, type acceptance and site relocation with respect to grandfathered licenses, as well as extension of the construction deadline applicable to grandfathered licensees. The *LMS Further Notice* clarified issues such as interconnection limitations, operational parameters for nonmultilateration systems, treatment of other users of the 902-928 MHz band, the structure of the spectrum allocation plan, geographic service areas, and the licensing of wideband forward links.

LMS licenses.¹⁰ The Commission reached this decision based on its conclusion that the statutory criteria for use of competitive bidding, set forth in Section 309(j) of the Communications Act, were satisfied.¹¹ More specifically, the Commission found that (1) its decision to offer multilateration LMS licenses on an exclusive basis makes it likely that mutually exclusive applications for such licenses will be filed; (2) multilateration LMS licenses will be used principally to offer for-profit, subscriber-based services; and (3) the use of competitive bidding for these licenses will promote the public interest objectives set forth in Section 309(j)(3).¹²

9. Discussion. Since release of the *LMS Report and Order*, Congress enacted the Balanced Budget Act of 1997 which extended and expanded the Commission's auction authority.¹³ Section 309(j)(2) of the Communications Act formerly stated that mutually exclusive applications for initial licenses or construction permits were auctionable if the principal use of the spectrum was for subscription-based services and competitive bidding would promote the expressed objectives. As amended by the Budget Act, Section 309(j) of the Communications Act provides that, "If . . . mutually exclusive applications are accepted for any initial license or construction permit, then, except as provided in paragraph (2) the Commission *shall* grant the license or permit to a qualified applicant through a system of competitive bidding that meets the requirements of this subsection."¹⁴ Therefore, as noted, the Budget Act provides that all licenses and construction permits for which mutually exclusive applications are accepted, with certain exceptions not relevant here, shall be granted by means of competitive bidding.¹⁵ We therefore believe that we lack discretion to resolve mutually exclusive LMS license applications by any means other than competitive bidding. Accordingly, we find that the Budget Act's amendments to Section 309(j) of the Act direct us to assign licenses for multilateration LMS by competitive bidding.

10. In the *LMS Further Notice*, we reaffirmed our spectrum plan comprising three blocks of spectrum allocated for multilateration LMS systems: (1) 904.000-909.750 MHz and 927.750-928.000 MHz; (2) 919.750-921.750 MHz and 927.500-927.750 MHz; and (3)

¹⁰ *LMS Report and Order*, 10 FCC Rcd at 4725-26, ¶¶ 54-57.

¹¹ *Id.*

¹² *Id.*

¹³ See Balanced Budget Act of 1997, P.L. 105-33, § 3002, 111 Stat. 251 (1997) ("Budget Act") (amending 47 U.S.C. § 309(j)).

¹⁴ 47 U.S.C. § 309(j)(1) (as amended by the Budget Act, § 3002) (emphasis added).

¹⁵ See 47 U.S.C. §§ 309(j)(1), 309(j)(2) (as amended by Balanced Budget Act, § 3002).

921.750-927.250 MHz and 927.250-927.500 MHz.¹⁶ One license will be awarded for each of these spectrum blocks in each of 176 Economic Areas (EAs). Thus, there are a total of 528 multilateration LMS licenses to be auctioned.

B. Competitive Bidding Design and Procedures

1. Applicability of the Part 1 Competitive Bidding Rules

11. Background. In the *LMS Further Notice*, the Commission tentatively concluded that the LMS auction will follow the general competitive bidding procedures of Part 1, Subpart Q.¹⁷

12. Discussion. We will adopt our proposal to follow the competitive bidding procedures contained in Subpart Q of Part 1 of the Commission's Rules, as amended by the Part 1 proceedings, unless specifically indicated otherwise. Commenters support the use of these rules for the LMS spectrum auction.¹⁸

13. Recently, we adopted the *Part 1 Third Report and Order*, which streamlines and simplifies our uniform competitive bidding provisions based on our experience in 16 prior auctions and allows us to conduct future auctions in a more consistent, efficient, and effective manner.¹⁹ As proposed in the *LMS Further Notice*, the general competitive bidding rules found in Subpart Q of Part 1 of the Commission's rules, including provisions adopted in the *Part 1 Third Report and Order*, will serve as the auction rules for LMS. Consistent with this, matters such as the appropriate competitive bidding design for the auction of LMS stations, as well as minimum opening bids and reserve prices, will be determined by the Wireless Telecommunications Bureau ("Bureau") pursuant to its delegated authority.²⁰ In this *Order*, we adopt service-specific provisions applicable to designated entities bidding in the LMS auction (see Section IV.C.1, *infra*).

¹⁶ *LMS Further Notice*, 12 FCC Rcd at 13969, ¶ 73.

¹⁷ *Id.* at 13970, ¶ 74.

¹⁸ Comtrak Comments at 2; Teletrak Comments at 15.

¹⁹ See Amendment of Part 1 of the Commission's Rules -- Competitive Bidding Procedures, WT Docket No. 97-82, Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use, 4660-4685 MHz, ET Docket No. 94-32, *Third Report and Order and Second Further Notice of Proposed Rule Making*, 13 FCC Rcd 374, 63 Fed Reg 2315 (1997) ("*Part 1 Third Report and Order*").

²⁰ See, e.g., *Part 1 Third Report and Order*, 13 FCC Rcd at 448-49, 454, ¶¶ 125, 139; see also, 47 C.F.R. §§ 0.131(c), 0.331, and 0.332.

2. Reserve Price or Minimum Opening Bids

14. Discussion. Commenters argue that the public interest will not be served if the Commission establishes reserve prices in the LMS auction.²¹ Commenters argue it will be difficult, if not impossible, for the Commission to establish a reserve price level that will accurately reflect the market's initial valuation of LMS spectrum.²² However, as we noted in the *Part 1 Third Report and Order*, the Budget Act establishes a presumption in favor of a required minimum opening bid or reserve price.²³ In addition, in the Part 1 proceeding, we gave authority to the Bureau to establish a minimum opening bid and/or reserve price in future auctions.²⁴ Accordingly, the Bureau will establish a minimum opening bid and/or reserve price for the LMS auction, unless, after comment is sought, it is determined that a minimum opening bid or reserve price would not be in the public interest.²⁵

3. Competitive Bidding Design

15. Background. In the *LMS Further Notice*, we proposed to adopt for the LMS auction the simultaneous multiple round competitive bidding design used in the Personal Communications Service (PCS) auctions.²⁶ We noted that multiple round bidding should provide more information to bidders during the auction about the values of the licenses than single round bidding.²⁷ However, we have also held open the possibility of using other competitive bidding designs based on other factors.²⁸

²¹ Teletrac Comments at 4-10; Comtrak Reply Comments at 2-3.

²² Teletrac Comments at 6; Comtrak Reply Comments at 2.

²³ *Part 1 Third Report and Order*, 13 FCC Rcd at 454, ¶ 139. Section 3002(a)(1)(C)(iii) of the Budget Act provides that the Commission must "prescribe methods by which a reasonable reserve price will be required, or a minimum opening bid will be established, to obtain any license or permit being assigned . . . unless . . . such a reserve price or minimum opening bid is not in the public interest." Budget Act, § 3002(a)(1)(C)(iii).

²⁴ See *Part 1 Third Report and Order*, 13 FCC Rcd at 454-56, ¶¶ 138-41.

²⁵ *Id.*

²⁶ *LMS Further Notice*, 12 FCC Rcd at 13970, ¶ 74.

²⁷ *Id.*

²⁸ See Implementation of Section 309(j) of the Communications Act - Competitive Bidding, PP Docket No. 93-253, *Second Report and Order*, 9 FCC Rcd 2348, 2360, ¶¶ 68-69 (1994) ("*Competitive Bidding Second Report and Order*"), *on recon.*, *Second Memorandum Opinion and Order*, 9 FCC Rcd 7245 (1994) ("*Competitive Bidding Second Memorandum Opinion and Order*").

16. Discussion. Commenters support the use of simultaneous, multiple-round competitive bidding.²⁹ Comtrak believes that simultaneous, multiple-round competitive bidding is cost-efficient and agrees with the Commission that such a bidding design will provide auction participants with information that will help them value the available spectrum and shape their bidding strategy accordingly.³⁰ Both commenters also believe that the LMS auction is not the appropriate setting to experiment with combinatorial bidding.³¹ We agree with commenters that a simultaneous multiple round auction design generally provides more information to bidders than single round bidding during the auction about the values of the licenses.³² Consistent with our approach in the *Part 1 Third Report and Order*, we leave to the Bureau to determine the appropriate auction design and make such an announcement by Public Notice. Moreover, although the Commission is preparing to design and test a combinatorial bidding system in accordance with the Budget Act,³³ the Commission does not have sufficient information at this time to determine how this relatively new bidding methodology can improve its spectrum auction program.³⁴ The Commission has announced it will seek comment on a number of issues relating to combinatorial bidding and address this issue once the record is complete.³⁵ While we believe the simultaneous multiple-round auction is an effective methodology for auctioning LMS licenses, the Bureau has the discretion to select other auction designs, based on its experience, if other designs are warranted (e.g., for auction or reauction).³⁶

C. Treatment of Designated Entities

1. Eligibility for Small Business Provisions

²⁹ Teletrac Comments at 3; Comtrak Comments at 3.

³⁰ Comtrak Comments at 3.

³¹ Teletrac Comments at 3-4; Comtrak Reply Comments at 2.

³² *LMS Further Notice*, 12 FCC Rcd at 13970, ¶ 74.

³³ See Budget Act, P.L. 105-33, 111 Stat. 251 (1997); 47 U.S.C. § 309(j)(3)(i).

³⁴ *Part 1 Third Report and Order*, 13 FCC Rcd at 453-44, ¶ 137.

³⁵ *Id.*

³⁶ See *Amendment of Part 1 of the Commissions Rules -- Competitive Bidding Proceeding, Order, Memorandum Opinion and Order and Notice of Proposed Rule Making*, WT Docket 97-82, 12 FCC Rcd 5686, 5697, ¶ 16 (1997) ("*Part 1 Notice*").

17. In authorizing the Commission to use competitive bidding, Congress mandated that the Commission "ensure that small businesses, rural telephone companies, and businesses owned by members of minority groups and women are given the opportunity to participate in the provision of spectrum-based services."³⁷ The statute requires the Commission to "consider the use of tax certificates, bidding preferences, and other procedures" in order to achieve this Congressional goal.³⁸ In addition, Section 309(j)(3)(B) provides that in establishing eligibility criteria and bidding methodologies the Commission shall promote "economic opportunity and competition . . . by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women."³⁹ In the *LMS Further Notice*, we acknowledged that we have consistently established "small business" definitions on a service-by-service basis, and proposed to establish a similar definition for the multilateration LMS.⁴⁰ We also sought comment on the sufficiency of small business provisions to encourage participation by minority- and women-owned businesses and rural telephone companies (see Section IV.C.2, *infra*).

a. *Small Business Size Standards*

18. Background. In the *LMS Further Notice*, we sought comment on what small business provisions should be offered to multilateration LMS small business entities to "remove entry barriers so as to ensure the participation of small businesses in the auction and in the provision of service."⁴¹ We also proposed that, if small business provisions are adopted, the unjust enrichment provisions set forth in Part 1, Subpart Q should apply.⁴²

³⁷ 47 U.S.C. § 309(j)(4)(D).

³⁸ *Id.* Under the tax certificate program, the Commission issued tax certificates pursuant to the Internal Revenue Code, 26 U.S.C. § 1071 to: (1) initial non-controlling investors in minority- and women-owned applicants upon the sale of their interests; and (2) licensees who assigned or transferred control of their licenses to minority- and/or women-owned entities. The certificates enabled the investors and licensees meeting the criteria to defer the gain realized upon the sale. In early 1995, Congress repealed 26 U.S.C. § 1071. See Pub. L. No. 104-7, § 2, 109 Stat. 93, 93-94 (1995).

³⁹ 47 U.S.C. § 309(j)(3)(B).

⁴⁰ *LMS Further Notice*, 12 FCC Rcd at 13970, ¶ 75; see also *Part 1 Third Report and Order*, 13 FCC Rcd at 387, ¶ 16.

⁴¹ *LMS Further Notice*, 12 FCC Rcd at 13970, ¶ 75.

⁴² *Id.*

19. Discussion. Commenters favor establishing a small business definition for the multilateration LMS.⁴³ Comtrak recommends that the Commission adopt two small business categories in the LMS auction: (1) a "small business" category, for businesses with average gross revenues of not to exceed \$10 million; and (2) a "very small business" category, for businesses with average gross revenues of not to exceed \$3 million.⁴⁴ Comtrak suggests that the Commission base these categories on the average gross revenues of the business for the three years preceding the filing of the entity's application.⁴⁵ Comtrak recommends bidding credits of 25 percent for small businesses and 35 percent for very small businesses.⁴⁶

20. We will define a small business as an entity with average annual gross revenues for the preceding three years not to exceed \$15 million. We will also define an additional category of small businesses -- very small businesses. A very small business is an entity with average annual gross revenues for the preceding three years not to exceed \$3 million. These definitions match those adopted for the 800 MHz Specialized Mobile Radio, 900 MHz Specialized Mobile Radio and Phase II 220 MHz services, which have been approved by the Small Business Administration.⁴⁷ We will adopt tiered bidding credits for these small business definitions, consistent with levels adopted in the Part 1 proceeding. As we stated in the Part 1 proceeding, we believe that bidding credits alone will enable small businesses to successfully compete in future auctions.⁴⁸ Accordingly, small businesses will receive a 25 percent bidding credit. Very small businesses will receive a 35 percent bidding credit. Bidding credits for small businesses are not cumulative. As noted in the Part 1 proceeding, we believe that this approach will provide adequate opportunities for small businesses of varying sizes to participate in spectrum auctions.⁴⁹ We believe that the tiered bidding credits we adopt for

⁴³ Teletrac Comments at 15; Comtrak Comments at 5.

⁴⁴ Comtrak Comments at 4.

⁴⁵ *Id.*

⁴⁶ *Id.* at 6.

⁴⁷ See, e.g., Letter to Daniel B. Phythyon, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, re: Approval of Small Business Size Standards -- Competitive Bidding Rules for 800 MHz Specialized Mobile Radio Services (October 27, 1997). See also Letter to Daniel B. Phythyon, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration (January 6, 1998) (Approval of Small Business Size Standards for the Phase II 220 MHz Services; Letter to Michele C. Farquhar, Acting Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration (July 24, 1996) (Approval of Small Business Size Standards for the 900 MHz Specialized Mobile Radio Services).

⁴⁸ *Id.* The use of tiered bidding credits was successful in enabling small businesses to participate in the 800 MHz Specialized Mobile Radio auction that ended on December 8, 1997 and the Local Multipoint Distribution Service auction that ended on March 25, 1998.

⁴⁹ See *Part 1 Third Report and Order*, 13 FCC Rcd at 403-04, ¶ 47.

LMS are reasonable in light of our decision to suspend installment payments for services auctioned in the immediate future, and expect that they will enable small businesses to obtain spectrum licenses through our auction program.

b. *Attribution of Gross Revenues*

21. Background. In the *LMS Further Notice*, we tentatively concluded that for LMS we would attribute the gross revenues of all controlling principals in the small business applicant as well as its affiliates.⁵⁰ In the *Part 1 Third Report and Order*, the Commission proposed to adopt a "controlling interest" standard, similar to the standard adopted for the Local Multipoint Distribution Service (LMDS),⁵¹ as the general attribution rule for all future auctions.⁵² Under this standard, eligibility for small business provisions would be determined by attributing the gross revenues of controlling interests in the applicant which are defined to include those that exercise "*de jure*" and "*de facto*" control and their affiliates.

22. Discussion. Comtrak argues that the Commission should rely solely on gross revenues, and not the number of employees, to determine an entity's eligibility for small incentives.⁵³ Comtrak generally supports the idea that a third party's gross revenues may be attributed to a small business applicant when the party exercises *de jure* or *de facto* control over the applicant.⁵⁴ Comtrak advocates a standard of control that reflects the fact that small businesses must raise capital from a variety of investors, some of which do not necessarily exercise control over the small business applicant.⁵⁵

23. We will adopt, with a slight modification, our tentative conclusion to attribute the gross revenues of the applicant, its controlling principals and their affiliates. Specifically, we refer to "controlling interests" rather than "controlling principals." In addition, we provide a

⁵⁰ *LMS Further Notice*, 12 FCC Rcd at 13970-71, ¶ 76.

⁵¹ See, e.g., In the Matter of Implementation of Section 309(j) of the Communications Act - Competitive Bidding, PP Docket No. 93-253, *Tenth Report and Order* (rel. November 21, 1996); Rule Making To Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, To Reallocate the 29.5-30.0 GHz Frequency Band, To Establish Rules and Policies for Local Multipoint Distribution Service And for Fixed Satellite Services -- Petitions for Reconsideration of the Denial of Applications for Waiver of the Commission's Common Carrier Point-to-Point Microwave Radio Service Rules, Suite 12 Group Petition for Pioneer Preference, CC Docket No. 92-297, *Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rule Making*, ¶ 352 (rel. March 13, 1997) ("*LMDS Second Report and Order*").

⁵² *Part 1 Third Report and Order*, 13 FCC Rcd at 477-78, ¶ 185-86.

⁵³ Comtrak Comments at 5.

⁵⁴ *Id.* at 7.

⁵⁵ *Id.*

definition of "controlling interest" to clarify the application of the attribution rule in determining whether an entity qualifies to bid as a small business. In calculating gross revenues for purposes of small business eligibility, applicants will be required to count the gross revenues of the controlling interests of the applicant and their affiliates. This approach is consistent with our proposal in the *Part 1 Second Further Notice*,⁵⁶ and is similar to the attribution rules we have employed for the recent LMDS and 800 MHz Specialized Mobile Radio auction proceedings.⁵⁷

24. A "controlling interest" includes individuals or entities with *de jure* and *de facto* control of the applicant. *De jure* control is 50.1% of the voting stock of a corporation or, in the case of a partnership, the general partners. *De facto* control is determined on a case-by-case basis, and includes the criteria set forth in *Ellis Thompson*.⁵⁸ We recently sought comment in the *Part 1 Second Further Notice* on whether we should impose a minimum equity requirement (e.g., fifteen percent) on any person or entity identified as a controlling interest.⁵⁹ The "controlling interest" definition also provides specific guidance on calculation of various types of ownership interests. For purposes of calculating equity held in an applicant, the definition provides for full dilution of certain stock interests, warrants, and convertible debentures.⁶⁰ In addition, the definition provides for attribution of partnership and other ownership interests, including stock interests held in trust, non-voting stock, and indirect ownership through intervening corporations. Once principals or entities with a controlling interest are determined under the definition, only the revenues of those principals or entities and their affiliates will be counted for small business eligibility.

25. When an applicant cannot identify controlling interests under the definition, the revenues of all interest holders in the applicant and their affiliates will be counted. For

⁵⁶ See *Part 1 Third Report and Order*, 13 FCC Rcd at 477-78, ¶¶ 185-87.

⁵⁷ See Amendment of Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, *Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rulemaking*, CC Docket No. 92-297, 12 FCC Rcd 12545, 12692-93 (1997); Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, FCC 97-223, *Second Report and Order*, PR Docket No. 93-144, 12 FCC Rcd 19079, 19169 (1997).

⁵⁸ See *Ellis Thompson Corp.*, 76 Rad. Reg. 2d (P & F) 1125, 1127-28 (1994) ("*Ellis Thompson*"), in which the Commission identified the following factors used to determine control of a business: (1) use of facilities and equipment; (2) control of day-to-day operations; (3) control of policy decisions; (4) personnel responsibilities; (5) control of financial obligations; and (6) receipt of monies and profits. See also *Intermountain Microwave*, 24 Rad. Reg. (P & F) 983 (1963); Stephen F. Sewell, *Assignments and Transfers of Control of FCC Authorizations Under Section 309(d) of the Communications Act of 1934*, 43 FED. COMM. L.J. 277 (1991).

⁵⁹ See *Part 1 Third Report and Order*, 13 FCC Rcd at 478, ¶ 186.

⁶⁰ See 47 C.F.R. § 1.2110(b)(4)(v); cf. 47 C.F.R. § 24.709(b)(7).

example, if a company is owned by four entities, each of which has twenty-five percent voting equity and no shareholders' agreement or voting trust gives any one of them control of the company, the revenues of all four entities must be counted. Treating such a corporation in this way is similar to our treatment of a general partnership—all general partners are considered to have a controlling interest. This rule, we believe, looks to substance over form in assessing eligibility for small business status.

26. We note that our intent here is to provide flexibility that will enable legitimate small businesses to attract passive financing in a highly competitive and evolving telecommunications marketplace.⁶¹ We believe that this controlling interest threshold will function effectively to ensure that only those entities truly meriting small business status are eligible for small business provisions. In particular, we believe that the *de jure* and *de facto* concepts of control used to determine controlling interest in an applicant and the application of our affiliation rules will effectively prevent larger firms from illegitimately seeking status as a small business. Moreover, as we discussed in the *Part 1 Third Report and Order*, we believe that requiring detailed ownership information will ensure that applicants claiming small business status qualify for such status, and ensure compliance by all applicants with spectrum cap limits.⁶² Therefore, we emphasize that bidders will be subject to the ownership disclosure requirements set forth in Section 1.2112 of our rules.⁶³

27. Comtrak argues that the Commission's definition of "affiliate" does not provide clear guidance on whether an institutional investor and its affiliates should be considered affiliates of the small business for purposes of attributing gross revenues.⁶⁴ Comtrak suggests providing a clear definition of what constitutes control, including examples of the kinds of financial investments that will cause an investor or its affiliates to become affiliates of the small business applicant.⁶⁵ Teletrac supports greater clarity in the rules but believes that further definitional pronouncements will not provide sufficient clarity.⁶⁶ Teletrac instead suggests administrative procedures in order to provide preliminary determinations of affiliation

⁶¹ We note, however, that in seeking comment regarding the auction of initial licenses for certain broadcast stations, the Commission has proposed stricter attribution standards and eligibility requirements for applicants seeking to qualify for minority-based provisions. See Implementation of Section 309(j) of the Communications Act -- Competitive Bidding for Commercial Broadcast and Instructional Television Fixed Service Licenses, *Notice of Proposed Rulemaking*, MM Docket No. 97-234, 12 FCC Rcd 22363, 22399-401 (1997).

⁶² *Part 1 Third Report and Order*, 13 FCC Rcd at 417-18, ¶ 73.

⁶³ See 47 C.F.R. § 1.2112.

⁶⁴ *Id.* at 8.

⁶⁵ *Id.*

⁶⁶ Teletrac Reply Comments at 2.

status before the auction begins.⁶⁷ In the Part 1 proceeding, we examined our affiliation rules and adopted a uniform definition of the term "affiliate" for all future auctions.⁶⁸ We have found that this definition, which also contains detailed discussion and examples of relevant terms such as "control" and "identity of interest," has proven workable and is broad enough to address a wide variety of business structures.⁶⁹ In particular, this definition has helped to ensure that businesses seeking small business status are truly small.⁷⁰ This definition also allows entities themselves to make an appropriate preliminary determination of affiliation status without the assistance of administrative procedures. Therefore, we believe that the definition adequately addresses the concerns of the commenters. As a result, any change to the definition is not warranted.

2. *Sufficiency of Designated Entity Provisions*

28. Background. In the *LMS Further Notice*, the Commission solicited comments on whether small business provisions should be offered to multilateration LMS small business entities to further the Commission's goal of ensuring the participation of small businesses in the LMS auction and in the provision of multilateration LMS service.⁷¹

29. Discussion. Comtrak asserts that to facilitate the participation of small businesses, the Commission should modify its build-out deadlines to allow all LMS licensees to satisfy their construction requirements by providing coverage to one-third of the EA's population within five years of initial license grant and two-thirds of the population within ten years.⁷² In the alternative, Comtrak requests that small business LMS licensees be granted the proposed extended build-out period.⁷³ Comtrak states that construction requirements have a direct impact on the level of competition in the industry.⁷⁴ Unless an auction winner were an incumbent LMS provider, Comtrak asserts, it would be almost impossible for the auction winner to meet the one year deadline for more than a few EAs without raising a prohibitive

⁶⁷ Teletrac Comments at 15; *see also* Teletrac Reply Comments at 2-3.

⁶⁸ *See Part 1 Third Report and Order*, 13 FCC Rcd at 392, ¶¶ 26-27.

⁶⁹ *Id.* at ¶ 27.

⁷⁰ *Id.*

⁷¹ *LMS Further Notice*, 12 FCC Rcd at 13970, ¶ 75.

⁷² Comtrak Reply Comments at 6.

⁷³ *Id.*

⁷⁴ *Id.* at 7.

amount of initial capital.⁷⁵ Thus, Comtrak claims that the current construction rules favor incumbents and reduce potential competition from new entrants.⁷⁶ On the other hand, Teletrac indicates support for strict enforcement of the one-year construction deadline.⁷⁷ Teletrac asserts that forcing EA licensees to either construct or return licensed spectrum within one year would deter speculation, and would limit delays before LMS service is made available to the public.⁷⁸

30. We believe that it is appropriate to extend the amount of time for LMS auction winners to satisfy their construction requirements. The one-year requirement adopted in the *LMS Report and Order* and then retained in the *LMS Further Notice* was based on our rules for site-licensed systems. We are not persuaded that a one-year requirement is necessary to deter speculators. We agree with Comtrak that a one year build-out period is too short for all multilateration LMS licensees, not just for small businesses. In addition, although LMS auction winners will have the exclusive right to provide multilateration LMS service within their licensed EA, the frequency spectrum will still be shared with other services. In fact, the 902-928 MHz band is already heavily used by other licensed and unlicensed services for a wide variety of purposes. Consequently, even if a multilateration LMS licensee fails to build-out its system, the possibility that the spectrum will go under-utilized is negligible. Further, location services are being developed using alternative technologies, such as Global Positioning Satellite (GPS) systems, suggesting that service to the public will not be greatly delayed by allowing LMS licensees the option of constructing over a longer period. Thus, we modify our construction requirements for all multilateration LMS licensees. We will require that multilateration LMS EA-licensees construct and place in operation a sufficient number of base stations that utilize multilateration technology to provide multilateration location service to one-third of the EA's population within five years of initial license grant, and two thirds of the population within ten years. In demonstrating compliance with the construction and coverage requirements, we will allow licensees to individually determine an appropriate field strength for reliable service, taking into account the technologies employed in their system design and other relevant technical factors. At the five- and ten-year benchmarks, licensees will be required to file with the Commission a map and other supporting documentation showing compliance with the coverage requirements.

31. We received no comments on whether small business provisions are sufficient to ensure the opportunity for businesses owned by minorities and women and rural telephone

⁷⁵ *Id.*

⁷⁶ *Id.*

⁷⁷ Teletrac Comments at 10-13.

⁷⁸ *Id.*

companies to participate in the provision of spectrum-based services. We remain committed to meeting the statutory objectives of promoting economic opportunity and competition, avoiding excessive concentration of licenses, and ensuring access to new and innovative technologies by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women. Commenters submitted no suggestions, evidence, or data to support race- or gender-based auction provisions. Therefore, we conclude that we do not have a sufficient record to support such special provisions at this time under the current standard of judicial review. We believe the bidding credits for small businesses, as detailed above, will provide small businesses with a meaningful opportunity to obtain LMS licenses. Moreover, many minority- and women-owned entities are small businesses and will therefore qualify for special provisions. As noted in the *Part 1 Third Report and Order*, we have commenced a series of studies to examine barriers encountered by minorities and women in the auctions process and have planned other studies to examine the experiences of small, minority- and women-owned businesses in the auctions process.⁷⁹ We also believe that our standardization, through the *Part 1 Third Report and Order*, of the rules regarding eligible entities, unjust enrichment, and bidding credits will assist small, minority- and women-owned businesses because the resulting predictability will facilitate the business planning and capital fundraising process.⁸⁰

D. Partitioning and Disaggregation and Unjust Enrichment Provisions

32. Background. Partitioning and disaggregation are methods of subdividing the operating authority for a market area. Licensees that partition create a geographic subdivision of their market area, whereas licensees that disaggregate subdivide spectrum over their entire market area. The Commission has previously adopted or proposed to adopt partitioning and disaggregation rules for many of the Commercial Mobile Radio Services (CMRS). For example, we initially authorized licensees in the broadband Personal Communications Service (PCS), the Wireless Communications Service (WCS), and the 800 MHz and 900 MHz Specialized Mobile Radio (SMR) services to partition their license areas or disaggregate their spectrum.⁸¹ We extended our partitioning provisions to include winners of our upcoming

⁷⁹ *Part 1 Third Report and Order*, 13 FCC Rcd at 386, ¶ 15 and n. 36, citing, e.g., *Section 257 Proceeding to Identify and Eliminate Market Entry Barriers for Small Business (Report)*, FCC 97-164 (rel. May 8, 1997).

⁸⁰ See *Part 1 Third Report and Order*, 13 FCC Rcd at 386, ¶ 14.

⁸¹ See Geographic Partitioning and Spectrum Disaggregation by Commercial Mobile Radio Services Licensees, WT Docket No. 96-148, *Report and Order*, 11 FCC Rcd 21831, 21843 and 21847-48, ¶¶ 13 and 24 (1996) ("*Partitioning and Disaggregation Report and Order*"); Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service, *Report and Order*, 12 FCC Rcd 10785, 10834-39 (1997) ("*Wireless Communications Service Report and Order*"); and Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, *Second Report and Order*, 12 FCC Rcd 19079, 19134, 19137 and 19139, ¶¶ 156, 165 and 174 (1997) ("*800 MHz SMR Second Report and Order*").

auction of geographic area paging licenses and sought comment on allowing disaggregation for paging licensees.⁸² We have also proposed the adoption of partitioning and disaggregation authority for licensees in the Cellular Radiotelephone Service, the General Wireless Communications Service (GWCS), the narrowband PCS service,⁸³ and the 220-222 MHz service.⁸⁴

33. Consistent with these actions, in the *LMS Further Notice* we proposed to allow multilateration LMS licensees to partition their geographic license area and disaggregate portions of their spectrum.⁸⁵ Further, we tentatively concluded that a qualified small business that applies to partition or disaggregate its license to a non-small business entity should be required to repay any benefits it received from special small business provisions.⁸⁶ We sought comment on the type of unjust enrichment requirements that should be placed as a condition for approval of an application to partition or disaggregate a license, and on how such unjust enrichment amounts should be calculated.⁸⁷ Finally, we tentatively concluded that if a small business licensee partitions or disaggregates to another qualified small business that would not qualify for the same level of bidding credit, the transferring licensee should be required to repay a portion of the benefit it received.⁸⁸

34. Discussion. We adopt our proposal to allow multilateration LMS licensees to partition their geographic license areas and disaggregate portions of their spectrum in the same

⁸² Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems, WT Docket No. 96-18, *Second Report and Order and Further Notice of Proposed Rulemaking*, 12 FCC Rcd 2732, 2817 and 2824, ¶¶ 192 and 212 (1997).

⁸³ See Geographic Partitioning and Spectrum Disaggregation by Commercial Mobile Radio Service Licensees, WT Docket No. 96-148, *Report and Order and Further Notice of Proposed Rulemaking*, 11 FCC Rcd 21831 (1996); Amendment of the Commission's Rules to Establish New Personal Communications Services, Narrowband PCS, *Report and Order and Further Notice of Proposed Rulemaking*, 12 FCC Rcd 12972, 13014-18 (1997).

⁸⁴ See Amendment of Part 90 of the Commission's Rules to Provide for the Use of the 220-222 MHz Band by the Private Land Mobile Radio Service, Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory Treatment of Mobile Services, Implementation of Section 309(j) of the Communications Act--Competitive Bidding, *Third Report and Order; Fifth Notice of Proposed Rulemaking*, 12 FCC Rcd 10943, 11074, ¶ 308 (1997). In the 220-222 MHz service, we decided to allow partitioning of 220 MHz Phase II geographic licenses and sought comment on rules to implement that authority. 12 FCC Rcd at 11074, 11080, ¶ 308, ¶ 322. We also sought comment on whether partitioning of 220 MHz Phase I nationwide licenses should be permitted in a manner similar to the rules for partitioning we have adopted for broadband PCS licensees. Finally, we sought comment on whether all Phase I and Phase II 220 MHz licensees should be permitted to disaggregate their license spectrum. 12 FCC Rcd at 11080, ¶ 322.

⁸⁵ *LMS Further Notice*, 12 FCC Rcd at 13971, ¶ 77.

⁸⁶ *LMS Further Notice*, 12 FCC Rcd at 13971, ¶ 78.

⁸⁷ *Id.*

⁸⁸ *Id.*

general manner as for licensees in other CMRS services where we have adopted partitioning and disaggregation. We will permit multilateration LMS licensees to partition or disaggregate to any party eligible to be a multilateration LMS licensee. Further, we will permit partitioning along any service area defined by the parties. We conclude that these decisions will permit marketplace forces to determine the most suitable service areas, and will further the goal of regulatory parity among CMRS services.

35. Comtrak, the only party that commented on these issues, supports our proposal to allow partitioning and disaggregation.⁸⁹ Comtrak states that partitioning and disaggregation will allow small business auction winners to customize their LMS systems in a manner that will best address their business plans.⁹⁰ We agree that this will allow auction winners to customize their LMS systems and will help remove entry barriers for small businesses.⁹¹

36. To ensure that partitioning and disaggregation do not result in circumvention of our LMS construction requirements, we adopt the dual construction requirements for partitioning and the construction certification procedure for disaggregation used in the broadband PCS service.⁹² Under the first option for partitioning, we will require that the partitionee certify that it will meet the same coverage requirements as the original licensee for its partitioned market. If the partitionee fails to meet its coverage requirement, the license for the partitioned area will automatically cancel without further Commission action. Under the second option, the original licensee certifies that it has already met or will meet its coverage requirement. Further, we will require parties seeking Commission approval of an LMS disaggregation agreement to include a certification as to which party will be responsible for meeting the construction requirements.

37. As discussed above, we will permit partitioning along any service area defined by the parties. To this end, the Commission requires sufficient information to maintain our licensing records. Therefore, consistent with our treatment of the WCS and 800 MHz and 900 MHz SMR services, partitioning applicants will be required to submit, as separate attachments to the partial assignment application, a description of the partitioned service area and a calculation of the population of the partitioned service area and licensed market. The partitioned service area must be defined by coordinate points at every three degrees along the partitioned service area agreed to by both parties, unless county lines are followed. These

⁸⁹ See Comtrak Comments at 6-7.

⁹⁰ Comtrak Comments at 6.

⁹¹ See *Partitioning and Disaggregation Report and Order*, 11 FCC Rcd at 21831 (1996); *Wireless Communications Service Report and Order*, 12 FCC Rcd at 10834-39 (1997); and *800 MHz SMR Second Report and Order*, 12 FCC Rcd 19079, 19127-53 (1997).

⁹² See *Partitioning and Disaggregation Report and Order*, 11 FCC Rcd at 21857, 21865, ¶¶ 42 and 63 (1996).

geographical coordinates must be specified in degrees, minutes and seconds to the nearest second of latitude and longitude, and must be based upon the 1927 North American Datum (NAD27). Applicants also may supply geographical coordinates based on 1983 North American Datum (NAD83) in addition to those required based on NAD27. This coordinate data should be supplied as an attachment to the partial assignment application, and maps need not be supplied. In cases where county lines are being utilized, applicants need only list the specific counties that make up the newly partitioned area.⁹³

38. We find that it is unnecessary to require a party that wishes to disaggregate to retain a minimum amount of spectrum. Consistent with our treatment of the broadband PCS, WCS and 800 MHz and 900 MHz SMR services, we will allow disaggregating parties to negotiate channelization plans among themselves as a part of their disaggregation agreements.⁹⁴ Likewise, we find that it is unnecessary to adopt a limit on the maximum amount of spectrum that licensees may disaggregate. It is more appropriate for the marketplace to determine the amount of spectrum that should be disaggregated. LMS licensees shall be permitted to disaggregate spectrum without limitation on the overall size of the disaggregation as long as such disaggregation is otherwise consistent with our rules.

39. Consistent with our treatment of the broadband PCS, WCS and 800 MHz and 900 MHz SMR services, we will permit combined partitioning and disaggregation.⁹⁵ This will allow LMS licensees the flexibility to design the types of agreements they desire, and will advance the goals of providing competitive service offerings, encouraging new market entrants and ensuring quality service to the public. In the event that there is a conflict in the application of the partitioning and disaggregation rules, the partitioning rules should prevail.

40. Regarding possible unjust enrichment through partitioning or disaggregation, we adopt our tentative conclusion that when a small business entity applies to partition its license or disaggregate spectrum, unjust enrichment rules must exist in order to ensure that non-small business entities cannot take indirect advantage of our small business incentives. Comtrak

⁹³ See *Wireless Communications Service Report and Order*, 12 FCC Rcd at 10837, ¶ 98 (1997); and *800 MHz SMR Second Report and Order*, 12 FCC Rcd at 19137, ¶ 166 (1997).

⁹⁴ See *Partitioning and Disaggregation Report and Order*, 11 FCC Rcd at 21860, ¶ 49 (1996); *Wireless Communications Service Report and Order*, 12 FCC Rcd at 10837, ¶ 99 (1997); and *800 MHz SMR Second Report and Order*, 12 FCC Rcd at 19141-42, ¶ 183 (1997).

⁹⁵ See *Partitioning and Disaggregation Report and Order*, 11 FCC Rcd at 21866, ¶ 66 (1996); *Wireless Communications Service Report and Order*, 12 FCC Rcd at 10839, ¶ 102 (1997); and *800 MHz SMR Second Report and Order*, 12 FCC Rcd at 19150, ¶ 217 (1997).

agrees with this principal and suggests that we adopt unjust enrichment rules patterned on those adopted for the 800 MHz SMR auction.⁹⁶

41. We no longer need to establish a separate unjust enrichment requirement for approving partitioning and disaggregation in LMS because we have adopted a uniform requirement in Part 1, Subpart Q of our rules for all services.⁹⁷ Accordingly, we will use the Part 1 unjust enrichment provisions for LMS.⁹⁸ These rules are similar to unjust enrichment rules adopted for the 800 MHz Specialized Mobile Radio auction for determining the actual proportion of bidding credit to be refunded and, consistent with Comtrak's suggestions, reduce the amount of unjust enrichment payments due on transfer based upon the amount of time the initial license has been held. In addition, when a combination of partitioning and disaggregation is proposed, we will use both the population of the partitioned area and the amount of spectrum disaggregated to make these *pro rata* calculations.⁹⁹

V. CONCLUSION

42. The actions we take in this *Second Report and Order* will ensure that competitive bidding for LMS licenses is conducted under the recently streamlined procedures adopted in Part 1, Subpart Q, and consistent with our procedures for all auctionable services. In addition, we establish small business definitions, adopt bidding credits, and approve partitioning and disaggregation provisions for multilateration LMS. We believe that these steps will facilitate the rapid deployment of LMS and will ensure the participation of small businesses in the auction process.

VI. PROCEDURAL MATTERS

A. Regulatory Flexibility Act

43. The Final Regulatory Flexibility analysis, pursuant to the Regulatory Flexibility Act, see 5 U.S.C. Section 604, is contained in Appendix B.

⁹⁶ Comtrak Comments at 7.

⁹⁷ See *Part 1 Third Report and Order*, 13 FCC Rcd at 405-06, ¶ 50.

⁹⁸ See C.F.R. §§ 1.2111(e)(1)-(2).

⁹⁹ For example, if an LMS licensee that availed itself of a bidding credit and a non-qualifying partitionee/disaggregatee were to agree on a 20 percent disaggregation of spectrum over 30 percent of the population of the licensed service area, an unjust enrichment payment of six percent (.20 x .30) of the bidding credit would be required.

B. Initial Paperwork Reduction Act of 1995 Analysis

44. This *Second Report and Order* contains either a proposed or modified information collection. As part of its continuing effort to reduce paperwork burdens, we invite the general public and other Federal Agencies to take this opportunity to comment on the information collections contained in this *Second Report and Order*, as required by the Paperwork Reduction Act of 1995, Pub. L. No. 104-13. Public and agency comments are due 60 days after publication of the *Second Report and Order* in the Federal Register. Comments should address: (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology.

45. In addition to filing comments on the information collections contained in this *Second Report and Order* with the Secretary, a copy of any comments on the information collections should be submitted to Judy Boley, Federal Communications Commission, Room 234, 1919 M Street, N.W., Washington, DC 20554, or via the Internet to jboley@fcc.gov.

C. Ordering Clauses

46. Accordingly, IT IS ORDERED that Part 90 of the Commission's Rules IS AMENDED as specified in Appendix C, effective 60 days after publication in the Federal Register. IT IS FURTHER ORDERED that Section 90.365(d) of the Commission's Rules IS AMENDED as specified in Appendix C, effective 170 days after publication in the Federal Register.

47. Authority for issuance of this *Second Report and Order* is contained in Sections 4(i), 257, 303(r), and 309(j) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 257, 303(r), and 309(j).

48. IT IS FURTHER ORDERED that the Commission's Office of Public Affairs, Reference Operations Division, SHALL SEND a copy of this *Second Report and Order*, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

D. Contacts for Further Information

49. For further information concerning this *Second Report and Order*, contact Kenneth Burnley at (202) 418-0660 (Auctions and Industry Analysis Division, Wireless Telecommunications Bureau). For additional information concerning the information collections contained in this *Second Report and Order* contact Judy Boley at 202-418-0214, or via the Internet at jboley@fcc.gov.

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas
Secretary

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of
Amendment of Part 90 of the
Commission's Rules to Adopt
Regulations for Automatic Vehicle
Monitoring Systems
PR Docket No. 93-61

MEMORANDUM OPINION AND ORDER
AND FURTHER NOTICE OF PROPOSED RULE MAKING

Adopted: August 28, 1997 Released: September 16, 1997
Comments Due: November 5, 1997
Reply Comments Due: November 20, 1997
By the Commission:

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I. INTRODUCTION

1. In this *Memorandum Opinion and Order and Further Notice of Proposed Rule Making*, we address the remaining issues raised by petitioners for reconsideration of our *Report and Order* in PR Docket No. 93-61, which established rules governing the licensing of the Location and Monitoring Service (LMS) in the 902-928 MHz band.¹ We resolved other issues raised by petitioners in an *Order on Reconsideration* in this docket.² This item clarifies interconnection limitations for multilateration LMS, as well as other issues raised on reconsideration, such as operational parameters for non-multilateration systems, treatment of other users of the 902-928 MHz band, the structure of the spectrum allocation plan, the geographic service area for licensing multilateration LMS, and the licensing of wideband forward links.³

2. As we have discussed previously in this Docket, LMS refers to advanced radio technologies designed to support the nation's transportation infrastructure and to facilitate the growth of Intelligent Transportation Systems.⁴ In the *LMS Report and Order*, we created a new Subpart M in Part 90 of the Commission's Rules for Transportation Infrastructure Radio Services (TIRS). LMS, which encompasses the 20-year-old Automatic Vehicle Monitoring Service as well as developing transportation-related services, was deemed to be the first service included within the TIRS category. In this regard, the Intelligent Transportation Society of America filed a petition for reconsideration of the *LMS Report and Order* requesting that we

¹Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Report and Order*, PR Docket No. 93-61, 10 FCC Rcd 4695 (1995) (*LMS Report and Order*).

²See Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Order on Reconsideration*, PR Docket No. 93-61, 11 FCC Rcd 16905 (1996) (*LMS Order on Reconsideration*). Specifically, the *Order on Reconsideration* resolved issues regarding incumbent LMS licensees that were being afforded grandfathered status. These issues involved interference testing, accommodation of secondary uses in the 902-928 MHz band, emission masks, frequency tolerance, type acceptance and site relocation with respect to grandfathered licensees, as well as extension of the construction deadline applicable to grandfathered licensees.

³A list of parties filing Petitions for Reconsideration and associated pleadings in this proceeding is attached as Appendix A.

⁴The term "Intelligent Transportation System," or "Intelligent Vehicle Highway System," refers to the collection of advanced radio technologies that, among other things, is intended to improve the efficiency and safety of our nation's highways. *LMS Report and Order* at 4698 n.9.

redesignate TIRS as ITSRS, or "Intelligent Transportation Systems Radio Service." This request was supported by the American Association of State Highway and Transportation Officials and by the Land Mobile Communications Council. These parties contend that the term "Intelligent Transportation System" has become widely accepted by other government agencies and in the private sector, and would be more descriptive of the types of services contemplated for Subpart M of Part 90. We are persuaded that it would be appropriate to refer to LMS and like services as Intelligent Transportation Systems Radio Services, and we will change our rules accordingly.

3. In the *LMS Report and Order*, the Commission defined two types of LMS systems -- multilateration and non-multilateration. Multilateration LMS systems are designed to locate vehicles or other objects by measuring the difference of time of arrival, or difference in phase, of signals transmitted from a unit to a number of fixed points, or from a number of fixed points to the unit to be located. Such systems generally use spread-spectrum technology to locate vehicles throughout a wide geographic area. Multilateration technology is used, for example, by trucking companies to track individual vehicles, by municipalities to pinpoint the location of their buses, and by private entrepreneurs developing subscriber-based services for recovery of stolen vehicles.⁵ The Commission defined non-multilateration systems as LMS systems that employ any technology other than multilateration technology. The Commission noted that unlike a multilateration system, which determines the location of a vehicle or object over a wide area, a typical non-multilateration system uses narrowband technology whereby an electronic device placed in a vehicle transfers information to and/or from that vehicle when the vehicle passes near one of the system's stations. Examples of non-multilateration LMS systems include automated toll collection devices and systems used by railway companies to monitor the location of railroad cars.⁶

4. LMS operates in the 902-928 MHz frequency band.⁷ The band is allocated for primary use by Federal Government radiolocation systems. Next in order of priority are Industrial, Scientific and Medical (ISM) devices. Federal Government fixed and mobile and LMS systems are secondary to both of these uses. The remaining uses of the 902-928 MHz band include licensed amateur radio operations and unlicensed Part 15 equipment, both of which are secondary to all other uses of the band. Part 15 low power devices include, but are not limited to, those used for automatic meter reading, inventory control, package tracking and shipping control, alarm services, local area networks, internet access and cordless telephones. The amateur radio service is used by technically inclined private citizens to engage in self-training, information exchange and radio experimentation. In the *LMS Report and Order*, the Commission recognized the important contribution to the public provided by Part 15 technologies and amateur radio operators and sought to develop a band plan that would maximize the ability of these services to coexist with LMS systems.⁸

5. The Commission adopted the *LMS Report and Order* with an eye toward minimizing potential interference within and among the various users of the 902-928 MHz band. The Commission's band plan accordingly permits secondary operations across the entire band by users of unlicensed Part 15 devices and

⁵*LMS Report and Order* at 4697-98, 4703.

⁶*Id.*

⁷The definition of LMS also includes existing Automatic Vehicle Monitoring operations below 512 MHz. Unlike other LMS operations, LMS systems below 512 MHz may neither offer service to the public nor provide service on a commercial basis. See *LMS Report and Order* at 4738.

⁸See *LMS Report and Order* at 4714.

amateur licensees. At the same time, the band plan separates non-multilateration from multilateration LMS systems in all but one subband so as to avert interference. The *LMS Report and Order* also established limitations on LMS systems' interconnection with the public switched network and set forth a number of technical requirements intended to ensure successful coexistence of all the services authorized to operate in the band.

6. This *Memorandum Opinion and Order* for the most part affirms decisions made by the Commission in the *LMS Report and Order* as an appropriate balancing of the interests of the different uses authorized in the band. Where appropriate, we clarify particular aspects of those decisions. First, we review petitioners' objections to our interconnection restrictions and clarify that the regulatory classification of LMS operators will be determined on a case-by-case basis. Next, we address petitioners' concerns regarding the definition and scope of the non-multilateration LMS service. We then discuss issues raised by petitioners regarding the "safe harbor" within which Part 15 devices and amateur operators will be deemed not to cause interference to multilateration LMS providers. We next address petitioners' suggested changes to the band plan adopted in the *LMS Report and Order*, as well as our decision to license multilateration LMS systems on a major trading area (MTA) basis. We further consider the propriety of allowing multilateration wideband forward links to operate in the 902-928 MHz band. Finally, in a *Further Notice of Proposed Rule Making* included as part of this item, we propose rules and procedures governing competitive bidding for multilateration LMS frequencies.

II. ELIGIBILITY AND PERMISSIBLE USES

7. *Background.* In the *LMS Report and Order*, we recognized that multilateration systems may have some need for interconnection with the public switched telephone network (PSTN). At the same time, however, we recognized that unlimited interconnection by multilateration operators would be incompatible with the unique technical environment created by different types of services sharing the 902-928 MHz band. We were concerned that such activity would not only increase the potential for harmful interference to other users of the band, but also detract from the location and monitoring purposes of the LMS allocation. Accordingly, we adopted operational restrictions on multilateration LMS operators to minimize interference to all users of the spectrum. These restrictions include limitations on messaging services and interconnection with the PSTN, and a prohibition against message and data transmissions to fixed units and units for which location and monitoring is not being provided.⁹

8. *Pleadings.* Of the restrictions listed above, the most discussed by petitioners are the Commission's limitations on interconnection. Specifically, the Commission in the *LMS Report and Order* permitted "store and forward" interconnection where either (1) transmissions from a vehicle or object being monitored are stored by the multilateration LMS provider for later transmission over the PSTN, or (2) transmissions received by the multilateration LMS provider from the PSTN are stored for later transmission to the vehicle or object being monitored. The rules adopted in the *LMS Report and Order* do not permit "real-time" interconnection between vehicles and the PSTN except for emergency communications related to a vehicle or a passenger in a vehicle.¹⁰

⁹*LMS Report and Order* at 4708.

¹⁰*LMS Report and Order* at 4710.

9. MobileVision is the only petitioner that supports unrestricted interconnection. It believes that interconnection with the PSTN must be provided on an unrestricted basis if multilateration LMS systems are to be viable and the goals of the Intelligent Vehicle Highway System are to be attained. In the alternative, MobileVision proposes that multilateration systems' interconnection capabilities only be restricted by requiring store and forward interconnection to the mobile unit from the PSTN, but permit unrestricted (*i.e.*, real time) communication to the PSTN from the mobile unit. MobileVision submits that this is the minimum degree of interconnection necessary to serve the needs of the public and the Intelligent Vehicle Highway System and to provide the necessary foundation for a successful spectrum auction.¹¹

10. Unlike MobileVision, the majority of parties addressing the issue support at least some restriction on LMS interconnection. For example, Pinpoint submits that allowing unlimited voice communications would be inappropriate because such traffic would increase interference levels throughout the band and would complicate sharing in the band. Pinpoint thus supports limiting interconnection to data store and forward messages.¹² Similarly, Metricom/SCE, CellNet and the Part 15 Coalition argue that voice messaging is not an important component of LMS and that permitting it will eliminate the possibility of Part 15 devices coexisting with LMS operators in the 902-928 MHz band.¹³ Ad Hoc Gas and the Part 15 Coalition oppose use of LMS for interconnected voice messaging, even on a limited, store-and-forward basis.¹⁴ The Part 15 Coalition suggests that if the Commission nevertheless decides to retain this exception, a minimum time delay of transmission should be imposed such that a two-way, person-to-person conversation would be impossible (*e.g.*, one minute).¹⁵

11. Further, some petitioners that oppose permitting any multilateration LMS interconnection to the PSTN submit that the restrictions adopted by the Commission present substantial enforcement

¹¹MobileVision Petition at 5-6.

¹²Pinpoint Opposition at 21-22.

¹³Metricom/SCE Opposition at 3; CellNet Opposition at 9; Part 15 Coalition Petition at 7-8. AT&T, UTC and the Connectivity for Learning Coalition also oppose interconnection for voice communications. AT&T Reply at 3; UTC Petition at 2; Connectivity for Learning Coalition Petition at 11-12.

¹⁴Ad Hoc Gas Petition at 16; Part 15 Coalition Petition at 7.

¹⁵Part 15 Coalition Petition at 12, *contra* AirTouch/Teletrac Opposition at 15.

problems.¹⁶ They argue that by limiting transmission of messages to emergency communications related to the location and monitoring functions of the system, the Commission will place multilateration LMS operators in the position of having to become substantially involved with the content of their customers' communications. Further, UTC contends that carrier enforcement of this restriction could violate Section 705 of the Communications Act, which prohibits carriers from divulging the contents of their customers' communications.¹⁷ UTC additionally argues that a rule requiring multilateration LMS providers to monitor, disclose and/or prevent customers from transmitting certain types of communications could be construed as a form of censorship in violation of Section 326 of the Communications Act.¹⁸ Similarly, Ad Hoc Gas submits that allowing interconnection for only limited purposes could be considered a content-based speech restriction in violation of the First Amendment.¹⁹

12. Nonetheless, some parties, even those that generally oppose interconnection, recognize that some interconnected service is needed in the event of an emergency. For example, CellNet contends that the use of any interconnected services should be limited to those of an emergency nature, whether it is a real-time or a store and forward communication.²⁰ AirTouch/Teletrac and SBMS believe that it would be in the public interest to allow voice communications for emergency situations.²¹ On the other hand, Symbol Technologies would prohibit all interconnected voice messaging, even for emergency purposes, due to questions regarding the legality of monitoring message content.²² The Part 15 Coalition contends that there is no justification for emergency voice communications to be interconnected to the PSTN because other technologies are available

¹⁶See, e.g., Ad Hoc Gas Petition at 15-16; Metricom/SCE Petition at 14-15; Connectivity for Learning Coalition Petition at 13; UTC Petition at 9; Symbol Technologies Comments at 11.

¹⁷UTC Petition at 7. Section 705 of the Communications Act reads, in pertinent part, as follows:

Except as authorized by chapter 119, title 18 . . . no person receiving, assisting in receiving, transmitting, or assisting in transmitting, any interstate or foreign communication by wire or radio shall divulge or publish the existence, contents, substance, purport, effect, or meaning thereof, except through authorized channels of transmission or reception, (1) to any person other than the addressee, his agent, or attorney, (2) to a person employed or authorized to forward such communication to its destination, (3) to proper accounting or distributing officers of the various communicating centers over which the communication may be passed, (4) to the master of a ship under whom he is serving, (5) in response to a subpoena issued by a court of competent jurisdiction, or (6) on demand of other lawful authority

47 U.S.C. § 705(a).

¹⁸UTC Petition at 8. Section 326 of the Communications Act reads as follows:

Nothing in this chapter shall be understood or construed to give the Commission the power of censorship over the radio communications or signals transmitted by any radio station, and no regulation or condition shall be promulgated or fixed by the Commission which shall interfere with the right of free speech by means of radio communications.

47 U.S.C. § 326.

¹⁹Ad Hoc Gas Petition at 16-17.

²⁰CellNet Petition at 12.

²¹AirTouch/Teletrac Opposition at 13-14; SBMS Opposition at 16. TIA also supports permitting interconnection for emergency purposes. TIA Comments at 11.

²²Symbol Technologies Comments at 11.

for emergencies, such as emergency radio beacons.²³ AirTouch/Teletrac responds that voice messages may be necessary to explain certain complex situations and could be time and life saving.²⁴ In any event, a number of petitioners request that the definitions of store and forward messaging and emergency voice communications be clarified.²⁵

13. *Discussion.* As noted above, the *LMS Report and Order* specifically permitted "store and forward" interconnection, where either (1) transmissions from a vehicle or object being monitored are stored by the LMS provider for later transmission over the PSTN, or (2) transmissions received by the LMS provider from the PSTN are stored for later transmission to the vehicle or object being monitored.²⁶ Real-time interconnection between vehicles or objects being monitored and the PSTN was limited to emergency communications related to a vehicle or passenger in a vehicle. The *LMS Report and Order* also stated that emergency communications may include information about a medical condition that requires immediate attention or the mechanical breakdown or failure of an automobile.²⁷

14. After revisiting this issue and considering petitioners' concerns, we continue to believe that our decision regarding limitations on multilateration LMS interconnection reflects a necessary balancing of the interests of LMS providers and other users of the 902-928 MHz band. Relaxing restrictions on interconnection could increase the potential for interference in the band by allowing for additional message traffic. We believe that requiring messages to be sent on a store-and-forward basis will reduce message traffic in the band by making it difficult to conduct a real-time conversation using LMS spectrum. We therefore reject MobileVision's recommendation that multilateration LMS users be permitted unrestricted interconnection to the PSTN. We note that other services, such as personal communications services (PCS) and cellular telephone, are available for that type of use. At the same time, however, we conclude that real-time interconnection is necessary and appropriate in emergency situations. We therefore also reject the arguments of commenters asking that we forbid real-time interconnection in emergency situations. We believe that to do otherwise could impede the development of LMS, to the detriment of Intelligent Transportation Systems and, more importantly, would raise significant public safety concerns.

15. We clarify that "store and forward" communications as described in the *LMS Report and Order* refers to a storage of voice or data messages for subsequent delivery to the recipient. We decline to adopt a specific minimum delay, as requested by some petitioners. As a guideline, however, we adopt a "safe harbor" approach whereby a particular message will be considered an acceptable store-and-forward message pursuant to our rules if the LMS service provider incorporates at least a thirty-second delay between the time a message is stored and the time that message is forwarded. This is not to say that a delay of less than 30 seconds will be unacceptable in all cases, but use of a 30-second delay will ensure that the communication will be deemed to fit within the definition of a store and forward message with respect to LMS. While we considered using a one-minute delay, as suggested by the Part 15 Coalition, we believe that a thirty-second

²³Part 15 Coalition Petition at 9.

²⁴Teletrac Reply at 6.

²⁵See, e.g., CellNet Petition at 12; Connectivity for Learning Petition at 13; Part 15 Coalition Petition at 8-12.

²⁶*LMS Report and Order* at 4710.

²⁷*Id.* at n.61.

delay is sufficient to ensure that two-way conversation is impractical and will thereby discourage use of multilateration LMS for general messaging. We also clarify that emergency communications, for which real-time interconnection may be utilized, is equivalent to a 911 or 311 call. Such communication must have a direct relation to the immediate safety of life or for communications to render assistance to a motorist.²⁸ If no immediate action is necessary, it is not an emergency. All other communications should use "store and forward" technology.

16. We recognize petitioners' concerns that limiting interconnection based on the character of the message would be difficult to enforce and therefore raises the possibility of abuse. We believe, however, that setting forth specific examples of what is or is not an emergency would serve no useful purpose. While it may be desirable to have a fully descriptive definition of an emergency communication in the rules, such a rule could be unduly restrictive. The Commission does not intend to monitor the content of messages but expects that multilateration operators will be able to demonstrate compliance with the interconnection limitations if requested. Compliance may be accomplished by equipment that will permit voice calls in real time only to 311, 911, and an automobile road service provider. Of course, compliance might also be accomplished by multilateration LMS operators monitoring transmissions over their facilities and providing information regarding their transmissions to the Commission if requested. We believe that this type of monitoring will not violate Section 705 of the Communications Act as alleged by UTC, because it fits within the exception for providing information regarding a transmission "on demand of other lawful authority." We also note that the Commission will, on a case-by-case basis, consider requests for confidential treatment of such information. Moreover, the interconnection limitations are not tantamount to a restriction on free speech, as alleged by UTC and Ad Hoc Gas. Rather, the interconnection limitations are necessary to define the parameters of multilateration LMS service pursuant to the Commission's authority under the Communications Act to prescribe the type of service to be offered by a particular class of radio stations.²⁹

17. The interconnection issues raised by petitioners lead to the question of whether multilateration LMS is a Commercial Mobile Radio Service (CMRS). Pursuant to Section 332(d) of the Communications Act, a service is classified as CMRS if it is (1) provided for profit, (2) interconnected with the PSTN, and (3) available to the public or effectively available to a substantial portion of the public. In the *CMRS Second Report and Order*, we classified LMS as a Private Mobile Radio Service (PMRS). We indicated, however, that should LMS systems offer interconnected service in the future, they would be subject to reclassification as a presumptively Commercial Mobile Radio Service (CMRS).³⁰ At this juncture, it is unclear to what extent multilateration LMS providers will offer any interconnected service, notwithstanding their ability to offer some limited interconnection capabilities as discussed above. To accommodate the specific service offerings anticipated by each multilateration LMS provider, we will use a case-by-case approach in determining whether a particular service offering is CMRS or PMRS.

²⁸A similar definition of "emergency communications" is used in the context of citizens band radio (CB) service. See In the Matter of Amendment of Section 95.41(d) of the Commission's Rules to Reserve a Citizen's Radio Frequency for Emergency Communications, Docket No. 18705, 22 FCC 2d 635 (1970).

²⁹See 47 U.S.C. § 303(b).

³⁰ See Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory Treatment of Mobile Services, *Second Report and Order*, GN Docket No. 93-252, 9 FCC Rcd 1411, 1453 (1994) (*CMRS Second Report and Order*).

III. OTHER ISSUES RAISED ON RECONSIDERATION

A. Definition and Licensing of Non-Multilateration Systems

1. Antenna Height and Power Limitations

18. *Background.* In the *LMS Report and Order*, we limited the peak effective radiated power (ERP) of non-multilateration systems to 30 watts over the licensee's authorized bandwidth. The Commission also limited the antenna height above ground of these systems to 15 meters.³¹

19. *Pleadings.* The Part 15 Coalition proposes that the Commission make the height and power restrictions more strict, while Amtech suggests that they be relaxed in certain circumstances. The Part 15 Coalition contends that the Commission's definition of non-multilateration systems includes virtually any vehicular communications technology, including cellular and PCS. Further, it asserts that true "tag-reader" technologies require at most a few watts of power. The Part 15 Coalition submits that such high-power operations might not pose a significant threat of interference to Part 15 technologies if confined to highway toll plazas and railroad sidings, but that high-power systems with no geographic limits will overwhelm Part 15 operations in their vicinity. The Part 15 Coalition therefore requests that the Commission either (1) reduce the applicable power limitation for non-multilateration LMS systems to one watt, or (2) require that all such systems be operated within 50 meters of a highway toll plaza or rail siding.³²

20. Most parties addressing the issue believe that the Part 15 Coalition's proposal would unduly restrict non-multilateration operators.³³ For example, Pinpoint and Texas Instruments argue that granting the Part 15 Coalition's proposal would foreclose operation of non-multilateration systems that are not tag readers, such as might be used in parking facilities to monitor permissible incoming and outgoing vehicles.³⁴ Hughes submits that the Part 15 Coalition's modification would limit non-multilateration operators' ability to maintain current services and develop and implement new ones.³⁵

21. Unlike the Part 15 Coalition, Amtech contends that the height and power limits adopted in the *LMS Report and Order* are too restrictive. For example, with respect to the height restriction, Amtech submits that readers used by airport authorities to monitor taxis and ground commercial transportation services sometimes are placed at locations less than 15 meters above the applicable arrival or departure ramp, but more than 15 meters above the ground. With respect to the power limitation, Amtech asserts that a railway company would need unconventional antennas in order to monitor rail cars in high speed multiple track situations.³⁶ Amtech therefore suggests that antenna heights greater than 15 meters should be permitted

³¹*LMS Report and Order* at 4742.

³²Part 15 Coalition Petition at 17-18.

³³*See, e.g.*, AAR Opposition at 4; Hughes Opposition at 5-7; Pinpoint Opposition at 4-6; SBMS Opposition at 22-23; TI Opposition at 3-5.

³⁴Pinpoint Opposition at 2-4; TI Opposition at 4.

³⁵Hughes Opposition at 5-7.

³⁶Amtech Petition at 9-11.

if the ERP is limited to 30 watts, and if the energy radiated toward the horizon is reduced such that the resultant radiated electric field is no more than 90 dBuV/m at a distance of one mile from the site at a height of six feet. Amtech also suggests that a system be permitted to exceed 30 watts ERP if the resultant radiated electric field is no more than 90 dBuV/m at a distance of one mile from the site and at a height of six feet (or 96 dBuV/m at one kilometer and a receive height of two meters).³⁷

22. A number of parties oppose Amtech's suggestion. They contend that allowing non-multilateration operators to exceed the height or power restrictions could significantly increase the potential for interference to Part 15 users.³⁸ The Ad Hoc Gas Distribution Utilities Coalition agrees with Amtech that allowing non-multilateration systems flexibility to exceed the height limitations may be acceptable with appropriate safeguards, but would not permit non-multilateration systems to exceed the power limits. Indeed, Ad Hoc Gas believes that 30 watts is too high a power limitation for a band designed to be shared and suggests that emissions from LMS base station and mobile transmitters operating from 903-927.25 MHz be limited to 10 watts ERP, except where highly directional antenna are employed.³⁹

23. *Discussion.* The *LMS Report and Order* concluded that the power and antenna height restrictions will allow non-multilateration systems to share spectrum more easily with other non-multilateration systems and with Part 15 users. It also concluded that the power and antenna height limitations will permit greater frequency reuse.⁴⁰ We continue to believe that the definition and technical specifications of non-multilateration LMS systems adopted in the *LMS Report and Order* reflect a reasoned balancing of the interests of the various users of the 902-928 MHz band, and no new information has been introduced into the record of this proceeding to persuade us otherwise. The restrictions advocated by the Part 15 Coalition and others would unduly limit non-multilateration operations, jeopardizing future technological developments that could be crucial to the advancement of Intelligent Transportation Systems. On the other hand, the higher limitations suggested by Amtech could increase the potential for interference within the band. We believe that our requirements are most conducive to continued sharing of this band, and thus we decline to modify the power and antenna height restrictions we adopted in the *LMS Report and Order*. We believe that the antenna height and transmitting power limits in the current rule accommodate most of the common non-multilateration applications that would be appropriate for operation in this shared spectrum. However, in the event that unique practical considerations of a particular installation necessitate a higher antenna mounting height, such as the airport example cited by Amtech, we would consider waiving the rule on a case-by-case basis to allow the higher antenna height (but not higher power), provided that other comparable technical trade-offs, such as reduced power or confined antenna radiation patterns, are employed to limit the interference potential.

2. Licensing Issues

24. *Background.* In the *LMS Report and Order*, we decided to license non-multilateration LMS

³⁷*Id.* at 11-13.

³⁸*See, e.g.*, Itron Opposition at 2; Metricom/SCE Opposition at 17-18; SBMS Opposition at 22; TIA Comments at 13; UTC Comments at 12.

³⁹Ad Hoc Gas Petition at 7-8; Ad Hoc Gas Comments at 6-7.

⁴⁰*LMS Report and Order* at 4742.

systems on a shared basis because these systems generally cover relatively short distances, and because of our belief that licensing based on a fixed mileage separation would limit re-use of spectrum and thereby limit the potential uses of non-multilateration systems. The Commission declined to adopt a blanket licensing scheme for non-multilateration systems whereby, for example, a licensee would be permitted to locate transmitter sites anywhere within a given geographic area. The Commission instead decided to require non-multilateration systems to acquire licenses for each site, concluding that a blanket licensing approach would make it difficult for the Commission and the public to ascertain the exact location of LMS transmitters.⁴¹

25. The Interagency Group reiterates its request that the Commission devise a blanket authorization procedure for non-multilateration systems used in large scale public service projects (*i.e.*, publicly-funded public service non-multilateration systems with multiple sites and multiple readers at individual sites). It notes that the *LMS Report and Order* declined to do this, reasoning that applicants and co-users need to know exactly where systems are located in order to avoid interference. The Interagency Group submits that it does not advocate blanket licensing for all non-multilateration systems, but only those used in large-scale public service projects. Moreover, the Interagency Group argues, it is not seeking to obtain licensing for unidentified sites but seeks a streamlined, single application procedure for obtaining all licenses required to operate all necessary sites on a system-wide basis after such sites have been identified. In other words, instead of separately considering the applications of each member of the Interagency Group, which consists of eight different public transportation authorities, the Commission would receive and consider joint applications for purposes of deploying a single, region-wide toll collection system. The Interagency Group submits that this would facilitate planning, promote administrative efficiency and ensure that necessary frequencies will be available during a lengthy build-out period.⁴² Amtech and Hughes support the Interagency Group's suggestion.⁴³

26. In addition, Ad Hoc Gas urges the Commission to revise its rules to make clear that non-multilateration systems are to limit their transmissions to a confined area and will not be licensed to provide communications over an extended area.⁴⁴ In opposition, Texas Instruments (TI) submits that not all non-multilateration systems operate over a limited contiguous area, and argues that the future of the intelligent highway system requires that vehicles be able to interact with transponders that do not emit over one contiguous area. For example, TI posits that a commuter of the future on a typical trip home at the end of a workday may, via non-multilateration LMS technology, enter his or her car without keys, exit a parking garage without stopping at the gate, pass through toll plazas uninterrupted and refuel without stopping to pay. TI asserts that this is only possible because the commuter's vehicle has interacted at various times with different transponders that do not emit over one contiguous area.⁴⁵

27. *Discussion.* We are persuaded by the Interagency Group that it would be administratively expedient to establish a mechanism by which public agencies and other entities can file joint applications for

⁴¹*LMS Report and Order* at 4730-31.

⁴²Interagency Group Petition at 2-3.

⁴³Amtech Opposition at 22-23; Hughes Reply at 5.

⁴⁴Ad Hoc Gas Petition at 8 n.11.

⁴⁵TI Opposition at 5-7.

non-multilateration systems for purposes of deploying a single, region-wide system with multiple sites and multiple readers at individual sites. While we anticipate that this mechanism will be used primarily by municipalities and government agencies, we also believe that other entities seeking to establish multiple-site systems should also be able to use a streamlined application procedure. We will thus permit applicants to file a single application for a non-multilateration license covering multiple sites within a given U.S. Department of Commerce Bureau of Economic Analysis Economic Area (EA). Such an application may also be filed jointly by multiple users of a single system. In order to avoid uncertainty for other users of the band, the application must identify all planned sites and, after receiving the license, the licensee must notify the Commission if sites are deleted or if new sites are added before those sites become operational. We will revise our rules accordingly. We decline, however, to revise our rules as requested by Ad Hoc Gas to specify that the transmissions of non-multilateration systems are limited to a confined area. We believe that this could unnecessarily limit such systems' flexibility to configure their facilities for particular uses.

B. Accommodation of Secondary Users in the 902-928 MHz Band

28. *Background.* To accommodate the concerns of Part 15 interests regarding their secondary status *vis-a-vis* LMS, the *LMS Report and Order* adopted a "safe harbor" within which Part 15 devices may operate without fear of being deemed to cause interference to LMS operators. Specifically, a Part 15 device will, by definition, not be considered to be causing interference to a multilateration LMS system if it is otherwise operating in accordance with the provisions of Part 15 and meets at least one of the following conditions:

(a) it is a Part 15 field disturbance sensor operating in compliance with Section 15.245 of the rules and it is not operating in the 904-909.750 or 919.750-928.000 MHz sub-bands; or

(b) it does not employ an outdoor antenna; or,

(c) if it does employ an outdoor antenna, then if

(1) the directional gain of the antenna does not exceed 6 dBi, or if the directional gain of the antenna exceeds 6 dBi, it reduces its transmitter output power below 1 watt by the proportional amount that the directional gain of the antenna exceeds 6 dBi; and,

(2) either

(A) the antenna is 5 meters or less in height above ground; or,

(B) the antenna is more than 5 meters in height above ground but less than or equal to 15 meters in height above ground and either:

(i) adjusts its transmitter output power below 1 watt by $20 \log(h/5)$ dB, where h is the height above ground of the antenna in meters; or,

(ii) is providing the final link for communications of entities

eligible under Subparts B or C of Part 90 of the rules.⁴⁶

29. In its *Order on Reconsideration* in this proceeding, the Commission denied requests by petitioners that the Part 15 safe harbor instead be treated as a rebuttable presumption, *i.e.*, that LMS licensees be permitted to file complaints of interference regarding Part 15 devices operating within the safe harbor if the LMS licensees believe those Part 15 devices are causing harmful interference. The Commission concluded that the safe harbor approach represented an appropriate balancing of the interests of the various parties sharing the 902-928 MHz band.⁴⁷ In this *Memorandum Opinion and Order*, we address petitioners' other contentions regarding the safe harbor. Specifically, petitioners also challenged the technical parameters of the safe harbor and argued that the Commission acted in violation of the Administrative Procedure Act (APA), 5 U.S.C. § 551, *et seq.* In addition, some petitioners ask that the safe harbor apply to non-multilateration LMS operators as well as multilateration operators.

1. Parameters of Safe Harbor

30. *Pleadings.* A number of parties who support the concept of a safe harbor oppose the height and power restrictions adopted by the Commission. Some of them contend that the height limit should be eliminated, or at least raised to accommodate schools, libraries and other users that might locate their antennas on top of buildings or street light poles.⁴⁸ If the Commission does not eliminate or relax the height/power requirements, some parties suggest that it add educational users to the exemption of Section 90.361(c)(2)(ii)(B), which now permits public safety and special emergency users to employ full power with antennas up to 15 meters.⁴⁹ Similarly, UTC suggests revising the rule so that entities listed in Section 90.63 of the Commission's Rules (*i.e.*, Power Radio Service entities such as utilities) will not be subject to the height/power restriction.⁵⁰ Metricom submits that the safe harbor limits should not apply to mobile and portable Part 15 devices. It posits that a cordless phone being operated off a 50th floor balcony as part of a wireless network should not be subject to complaints of interference from LMS providers.⁵¹ In addition, some parties contend that the height and power restrictions are arbitrary in that they would not necessarily achieve their intended purpose of minimizing interference to LMS operators. For example, the Part 15 Coalition argues that an antenna operation five meters above ground on a mountaintop could cause more interference than an antenna 50 feet above ground located on average terrain.⁵²

⁴⁶*LMS Report and Order* at 4715-16.

⁴⁷Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Order on Reconsideration*, PR Docket No. 93-61, 11 FCC Rcd 16905 (1996) (*LMS Order on Reconsideration*).

⁴⁸*See, e.g.*, Council of Chief State School Officers Petition at 2,4; Connectivity for Learning Reply at 2; Metricom/SCE Petition at 2, 5-6; Metricom/SCE Opposition at 7; Part 15 Coalition Petition at 14; Part 15 Coalition Reply at 6; Symbol Technologies Comments at 11; UTC Petition at 14; UTC Comments at 10-12; Wireless Transactions Corp. Petition at 2.

⁴⁹Council of Chief State School Officers Petition at 3-4; Connectivity for Learning Reply at 4.

⁵⁰UTC Petition at 16-17; UTC Comments at 12.

⁵¹Metricom Petition at 6; Metricom Reply at 5-6.

⁵²Part 15 Coalition Petition at 13.

31. Other parties, most of whom oppose the idea of a Part 15 safe harbor, urge the Commission not to relax the height and power restrictions.⁵³ Indeed, some of these parties would tighten the parameters of the safe harbor. For example, Uniplex believes that the safe harbor should not include Part 15 devices that are within a given distance of LMS operations, and would apply that distance variable to indoor antennas.⁵⁴ Pinpoint would limit the application of the safe harbor to Part 15 operations with antenna heights of five meters or less. Pinpoint contends that the height/power attenuation rule has the undesirable effect of allowing more powerful systems at 15 meters antenna height than at 5 meters to be insulated from interference complaints.⁵⁵ Further, Pinpoint argues that any interference tolerance standard should be measured at the base station site (*i.e.*, the receiver of interference) and not based on height and power of Part 15 devices.⁵⁶ The American Radio Relay League contends that the safe harbor effectively places a power limit on amateur operators that does not exist in other bands and that the power limit is so severe that it precludes amateur operation in any segment of the 902-928 MHz band used for multilateration LMS. It further contends that the safe harbor was designed with Part 15 devices in mind rather than amateur radio operators.⁵⁷

32. *Discussion.* We believe that the safe harbor rule, which was adopted after careful study of the extensive record in this proceeding, appropriately balances the interests of the various parties operating in the 902-928 MHz band so as to limit the potential for harmful interference. In the *LMS Report and Order*, the Commission affirmed that unlicensed Part 15 devices in the band, as in any other band, may not cause harmful interference to and must accept interference from all other operations in the band.⁵⁸ It also reiterated that unlicensed Part 15 operations have no vested or recognizable right to continued use of any given frequency.⁵⁹ Nonetheless, the Commission recognized the concerns of Part 15 and amateur interests with respect to their secondary status. Accordingly, in order to alleviate such concerns and to provide all operators in the band with a greater degree of certainty in configuring their systems, thereby promoting competitive use of the band, the Commission adopted the safe harbor definition of non-interference.

33. The safe harbor rule is intended to identify Part 15 and amateur operations that will, in all cases, be deemed not to cause harmful interference to LMS operators. The Commission emphasized in the *LMS Report and Order* that Part 15 and amateur operations are not restricted from operating beyond the parameters of the safe harbor. Rather, the safe harbor specifications provide a threshold beyond which Part 15 and amateur operators will not be insulated from LMS operators' claims of harmful interference.⁶⁰ We therefore do not believe it necessary to add exemptions to the safe harbor as urged by some petitioners.

⁵³See, e.g., SBMS Opposition at 14-15; SBMS Reply at 4; Uniplex Opposition at 2.

⁵⁴Uniplex Petition at 8; *accord* Pinpoint Opposition at 13; *contra* EIA Reply at 3; ATA Opposition at 7-8.

⁵⁵Pinpoint Petition at 22-23; Pinpoint Opposition at 5-7, 11; *contra* TIA Comments at 3-5. MobileVision submits that TIA's response to Pinpoint misused the Hata model, an urban model, in a city environment. MobileVision Reply at 8.

⁵⁶Pinpoint Reply at 4.

⁵⁷American Radio Relay League Petition at 6-10.

⁵⁸*LMS Report and Order* at 4714 (citing 47 C.F.R. § 15.5(b)).

⁵⁹*Id.* (citing 47 C.F.R. § 15.5(a)).

⁶⁰*Id.* at 4716.

34. Moreover, the technical specifications of the rule were clearly explained in the *LMS Report and Order*. In general, amateur operators or Part 15 devices using outdoor antennas that are between five and 15 meters above the ground must reduce their output power concomitant with the height of their antennas in order to fit within the safe harbor. The Commission observed that an antenna less than five meters in height driven by a transmitter with one watt or less of output power (the general power limitation for Part 15 devices) will only affect LMS operations that are geographically close. A higher antenna, however, has the potential to affect a larger number of LMS operations. The Commission concluded that the power adjustment assures that between 5 and 15 meters, an outdoor antenna has the equivalent effect on multilateration LMS operations of an antenna five meters high using no more than 1 watt transmitter output power.⁶¹ We continue to believe that these specifications appropriately balance the interests of all the parties in minimizing interference.

35. We do not believe, as Metricom suggests, that the term "final link" in Section 90.361(c)(2)(ii)(B) of the Commission's rules requires clarification.⁶² Metricom asserts that the meaning of "final link" is open to interpretation because the Commission does not define the term. Metricom proposes that it be read as encompassing the entire complement of Part 15 devices that carries, or is available to carry, communications ultimately intended for entities eligible under Subparts B or C of Part 90 of the Rules. However, what Metricom proposes would in fact expand the definition of "final link" beyond its intended scope. The term "final link" is that link in a communications system which terminates with the Part 15 device used by or within the control of the Subpart B or C eligible entity. The term does not apply to other links in the system used to support such communications, e.g., intermediate links or links used by non-Subpart B or C entities. Therefore, we decline to expand the list of operations included under "final link" as proposed by Metricom.

36. We are persuaded by petitioners, however, that we should expand Section 90.361(c)(2)(ii)(B) of the Commission's Rules to include schools, libraries and rural health care providers within the safe harbor, permitting them to employ full power with antennas up to 15 meters. It is apparent from the record that many such institutions, particularly schools, may wish to use Part 15 devices that operate in this band, as well as similar devices that operate in the 5 GHz National Information Infrastructure (NII) band,⁶³ to connect to the Internet and other on-line resources. In addition to being invaluable research tools, such resources enhance the ability of students, teachers and parents to communicate with one another, as pointed out by the Connectivity for Higher Learning Coalition. We believe that inexpensive access to the national information infrastructure by our nation's educational institutions is of sufficiently significant benefit to the public to warrant special protection for this limited class of Part 15 devices. Further, the universal service provisions of Section 254 of the Communications Act, as amended by the Telecommunications Act of 1996, single out schools, libraries and public or nonprofit health care providers serving residents of rural areas as deserving of special attention so as to enable them to satisfy their communications needs.⁶⁴ Accordingly, we will include within the safe harbor elementary and secondary schools, libraries and health care providers for rural areas as

⁶¹*Id.*

⁶²Metricom Petition at 10-12.

⁶³Amendment of the Commission's Rules to Provide for Operation of Unlicensed NII Devices in the 5 GHz Frequency Range, *Report & Order*, ET Docket No. 96-102, 12 FCC Rcd 1576 (1997).

⁶⁴47 U.S.C. § 254. Rules implementing the new universal service provisions of the Act were adopted in Federal-State Joint Board on Universal Service, *Report and Order*, CC Docket No. 96-45, 62 Fed. Reg. 32,862 (1997).

defined by Section 254.

37. Further, we recognize that unlike Part 15 devices, the vast majority of which could operate within the safe harbor, amateur radio operations typically would not fit within the safe harbor provisions. Nevertheless, to the extent that amateur operators wish to employ the 902-928 MHz band and to operate within the safe harbor provisions, they should have the same protection as Part 15 devices. Further, we reiterate that failure to fit within the safe harbor provisions does not prevent operations; such operations may continue exactly as before, but are not protected from LMS operators' claims of interference.⁶⁵

38. In addition, AirTouch/Teletrac asks that the Commission clarify whether video links are included in the category of "unprotected" Part 15 devices for purposes of determining eligibility for the safe harbor.⁶⁶ They are not. The *LMS Report and Order* specifically provided that long-range video links will not be permitted to take advantage of the safe harbor. We stated that "because multilateration entities concur that most Part 15 interference to multilateration LMS systems is likely to be from field disturbance sensors and long range video links, we will not make any presumption of interference-free operations for these devices when they operate in the exclusive-use bands."⁶⁷

2. Extend Safe Harbor to Non-Multilateration

39. *Pleadings.* Metricom suggests that the safe harbor should apply with respect to non-multilateration operators as well as multilateration operators. It is concerned that non-multilateration operators will have the same problems sharing the band as multilateration operators, and argues that it is illogical to create a rule whereby Part 15 devices are protected from claims of interference by multilateration LMS systems but may be deemed to cause interference to non-multilateration LMS systems.⁶⁸ Other parties disagree, arguing that non-multilateration LMS systems and Part 15 devices do not have interference conflicts similar to those of multilateration LMS systems and Part 15 devices.⁶⁹

40. *Discussion.* The safe harbor was intended as a way to reduce interference conflicts between multilateration LMS operators and Part 15 devices and amateur operators in the 902-928 MHz band. Specifically, it was designed to provide parameters within which a Part 15 device or amateur operator could operate without being subject to a claim that it was interfering with the signal of a multilateration LMS operator. Because non-multilateration systems generally employ narrowband technology and operate at lower power levels, it is less likely that Part 15 devices and amateur operators will interfere with them, as compared with multilateration LMS systems, which use wider bandwidth emissions and operate at higher power levels. Because the range of non-multilateration devices is relatively small, there is less chance of Part 15 and amateur radio devices being located within their area of operation. Moreover, the record does not reveal actual or potential interference between non-multilateration and Part 15 devices. To the contrary, there

⁶⁵*LMS Report and Order* at 4717 (footnote omitted).

⁶⁶AirTouch/Teletrac Petition at 8.

⁶⁷*LMS Report and Order* at 4717 (footnote omitted).

⁶⁸Metricom Petition at 17-18.

⁶⁹Amtech Reply at 5; AAR Opposition at 5-7; Hughes Opposition at 2-5; TI Opposition at 10.

appears to be substantial evidence that there is little likelihood of interference. For these reasons, we do not believe that it is either necessary or appropriate to extend the definition of the safe harbor so as to insulate Part 15 and amateur operators from claims of interference by non-multilateration systems.

3. Administrative Procedure Act

41. *Pleadings.* Some petitioners contend that the Commission's adoption of a safe harbor was a violation of the Administrative Procedure Act (APA), because it was not proposed in the *Notice* in this proceeding and was therefore adopted without the required notice and opportunity for public comment.⁷⁰ Other parties disagree, contending that the safe harbor was a logical outgrowth of the issues raised in the *Notice*.⁷¹

42. *Discussion.* We do not agree that the safe harbor setting forth conditions that will not be considered harmful interference from amateurs and Part 15 devices violated the APA. The APA requires an agency to provide the public with "either the terms or the substance of a proposed rule or a description of the subject and issues involved."⁷² The APA, however, "does not require an agency to publish in advance every precise proposal which it may ultimately adopt as a rule."⁷³ Rather, the notice is sufficient if the final rule is a "logical outgrowth" of the underlying proposal.⁷⁴ We believe that the safe harbor was a logical outgrowth of the *Notice of Proposed Rule Making* in this proceeding, which sought comment on ways to accommodate the various users of the 902-928 MHz band and identified specifically the problems surrounding coexistence of Part 15 and licensed users of the band.⁷⁵ Moreover, the suggestion of a Part 15 safe harbor was discussed in publicly-filed *ex parte* submissions.⁷⁶

C. Spectrum Allocation Plan

43. *Background.* The *LMS Report and Order* allocated the entire 902-928 MHz frequency band for LMS systems, generally separating multilateration and non-multilateration operations, as follows:

⁷⁰See, e.g., MobileVision Petition at 2; Pinpoint Petition at 22-23; Pinpoint Reply at 7; AirTouch/Teletrac Reply at 4.

⁷¹Ad Hoc Gas Reply at 4-5; EIA Reply at 4; Symbol Technologies Comments at 3; UTC Comments at 8-9.

⁷²5 U.S.C. § 553(B)(3).

⁷³*California Citizens Band Association v. United States*, 375 F.2d 43, 48 (9th Cir.1967); see also *Spartan Radiocasting Co. v. FCC*, 619 F.2d 314 (4th Cir.1980).

⁷⁴*United Steelworkers v. Marshall*, 647 F.2d 1189, 1221 (D.C. Cir.1980).

⁷⁵Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Notice of Proposed Rule Making*, PR Docket No. 93-61, 8 FCC Rcd 2502, 2507 (1993).

⁷⁶See, e.g., Letter from Kathleen Q. Abernathy (AirTouch Communications), David E. Hilliard (Pinpoint Communications, Inc.), Max Bryan (Uniplex) and John J. McDonnell (MobileVision, L.P.) to Ralph Haller, Chief, Private Radio Bureau, FCC, dated June 23, 1994 (proposes that "[t]he FCC would adopt a threshold interference level below which wideband AVM systems cannot complain about 'harmful interference' from Part 15 devices"); Letter of Nancy Bukar (Wireless Information Networks Forum, Inc.) to William F. Caton, Acting Secretary, FCC, dated August 15, 1994 (summarizes safe harbor proposal that had been verbally presented to industry).

A:	902.000 - 904.000	Non-Multilateration
B:	904.000 - 909.750	Multilateration
C:	909.750 - 919.750	Non-Multilateration
D:	919.750 - 921.750	Multilateration and Non-Multilateration
E:	921.750 - 927.250	Multilateration
F:	927.250 - 927.500	Narrow band associated with sub-band E
G:	927.500 - 927.750	Narrow band associated with sub-band D
H:	927.750 - 928.000	Narrow band associated with sub-band B

Thus, we concluded that bands B and E will be assigned to multilateration systems. Bands A and C will be assigned to non-multilateration systems. Band D will be subject to both multilateration and non-multilateration use. Licensees of bands B, D and E will be assigned narrow bands H, G and F, respectively. Operators requiring additional spectrum will be permitted to aggregate bands to obtain up to eight MHz in a given region through the aggregation of bands D and G and bands E and F. We concluded that licensees may not otherwise be authorized to operate on more than one of the multilateration bands in a given geographic area.⁷⁷

44. *Pleadings*. SBMS contends that the designation of Band D for sharing between multilateration and non-multilateration systems is unworkable and will increase interference. It submits that the *Notice* in this proceeding proposed separate allocations for multilateration and non-multilateration systems and that designating Band D for sharing was in response to Amtech's argument that additional contiguous spectrum was necessary for its non-multilateration operations.⁷⁸ SBMS reiterates its call for an allocation plan that offers reverse link spectrum in discrete two MHz increments, grants auction winners free alienability of bandwidth, and allows participants to acquire multiple two MHz blocks in any particular market. It asserts that an allocation plan with these characteristics will deter warehousing, promote competition, reward providers that employ spectrum-saving technologies, and result in lower costs to consumers.⁷⁹ Further, SBMS posits that auctioning of smaller spectrum blocks would likely encourage participation by smaller entities.⁸⁰

45. Amtech urges the Commission to reject the SBMS approach.⁸¹ It also requests that the Commission modify its spectrum allocation plan to allow non-multilateration systems an additional 2 MHz of contiguous spectrum by permitting them to operate in subband E on a shared basis with multilateration systems.⁸² Amtech contends that the 12 MHz of contiguous spectrum available to non-multilateration operators under the band plan is the absolute minimum amount of spectrum required for new high-rate data applications. It submits that non-multilateration operators need more flexibility to facilitate resolution of

⁷⁷LMS Report and Order at 4722-23.

⁷⁸SBMS Petition at 4 & n.11; SBMS Opposition at 3.

⁷⁹SBMS Petition at 5-6.

⁸⁰SBMS Opposition at 8.

⁸¹Amtech Opposition at 5. AT&T and Texas Instruments also disagree with the SBMS plan. AT&T Comments at 3; TI Reply at 9.

⁸²Amtech Petition at 17-19; Amtech Opposition at 4.

interference.⁸³

46. In addition, Pinpoint and Uniplex propose that the Commission designate a sub-band for multilateration LMS systems that are willing to share spectrum that would not be subject to competitive bidding. Uniplex contends that this would preserve and encourage small entrepreneurial companies in this service and increase the value of the spectrum available for bidding. Pinpoint details its own time sharing experiment with Uniplex to illustrate that sharing among multilateration operators is feasible.⁸⁴ A number of parties disagree with the Pinpoint/Uniplex proposal.⁸⁵ For example, MobileVision contends that time sharing among multilateration LMS systems would not work because there is no common ground for arriving at a set of specifications, essential emergency voice communications would be rendered unusable, and an LMS system's reliability, capacity and integrity would be compromised.⁸⁶

47. Another change to the band plan supported by some parties is the reclassification of Part 15 devices as co-primary in parts of the band. These parties contend that this will eliminate their interference concerns and will promote the development of valuable Part 15 technology.⁸⁷ Similarly, Safetran is concerned that the adopted frequency allocation will result in congestion and interference that will render ineffective direct sequence modulation spread spectrum radio, which is a Part 15 type of radio service used by railway companies. It suggests that certain portions of the band be allocated for this type of low power emission.⁸⁸

48. *Discussion.* As we stated in the *LMS Report and Order*, we believe that both multilateration and non-multilateration LMS systems will play an important role in achieving a nationwide intelligent highway infrastructure.⁸⁹ We accordingly devised a band plan that, for the most part, creates separate allocations for the two types of LMS systems and takes into consideration the interference concerns of non-LMS users of the 902-928 MHz band. Upon review of parties' responses to our *Notice of Proposed Rule Making* in this proceeding, however, we decided to allocate the 2 MHz of subband D to be shared by multilateration and non-multilateration users so as to provide non-multilateration users with the possibility of obtaining additional contiguous spectrum.⁹⁰

⁸³Amtech Petition at 18.

⁸⁴Uniplex Petition at 9; Uniplex Opposition at 3; Pinpoint Petition at 7-10 & Appendix 1.

⁸⁵See, e.g., AirTouch/Teletrac Opposition at 18; AT&T Comments at 3; Metricom Opposition at 22-24; MobileVision Opposition at 6-7; SBMS Opposition at 5.

⁸⁶MobileVision Opposition at 7.

⁸⁷See, e.g., CellNet Petition at 3-4; EIA/CEG Comments at 8; *contra* SBMS Reply at 2; TI Reply at 7.

⁸⁸Safetran Petition at 4.

⁸⁹*LMS Report and Order* at 4721.

⁹⁰The band plan adopted in the *LMS Report and Order* permits non-multilateration operators a total of 14 MHz of spectrum. Twelve MHz is contiguous; the 10 MHz of subband C is available exclusively for non-multilateration operators and the 2 MHz of subband D is available on a shared basis with multilateration operators. An additional, non-contiguous 2 MHz of spectrum (subband A) is also available exclusively for non-multilateration operators.

49. We do not agree with SMBS that our band plan was illogical or that sharing between multilateration and non-multilateration operators is not feasible. Because we agree that it is preferable that multilateration and non-multilateration facilities do not operate in the same spectrum, we adopted a band plan that, for the most part, allocated separate blocks of spectrum for multilateration and non-multilateration systems. Our modification to the proposed band plan represented an effort to respond to the concern that some non-multilateration systems might need additional spectrum, without taking any spectrum away from multilateration users. We concluded that it would be appropriate to permit those few multilateration users the opportunity to obtain additional spectrum by permitting them to share the 2 MHz of subband D. We considered the SBMS band plan earlier in this proceeding and declined to adopt it. SMBS has raised no new issues or arguments that persuade us that their plan is superior to the plan we adopted in the *LMS Report and Order*.

50. In addition, we decline to adopt Amtech's suggestion that we allocate an additional 2 MHz of contiguous spectrum for non-multilateration providers. We believe that the band plan adopted in the *LMS Report and Order* appropriately balances the needs and interests of multilateration and non-multilateration operators, as well as Part 15 and amateur users of the band. For this reason, we also decline to adopt exclusive subbands for parties willing to time-share, or for Part 15 users. Doing so would upset the equilibrium among users of the band. Such an allocation would also ignore the secondary status of Part 15 providers in that it would afford unlicensed devices co-primary status *vis-a-vis* licensed operators.⁹¹

D. Geographic Areas for Exclusive Licenses

51. *Background.* Rand McNally organizes the 50 states and the District of Columbia into 47 Major Trading Areas (MTAs) and 487 Basic Trading Areas (BTAs). In the *LMS Report and Order*, the Commission concluded that MTAs and four additional MTA-like service areas provide a more suitable regulatory construct for multilateration licensing than the smaller BTAs. The Commission determined that use of MTAs, as defined in the Rand McNally Commercial Atlas and Marketing Guide, will give systems greater capacity to accommodate large number of prospective users which, in turn, will promote competition and encourage advancement of new technologies. The rules adopted in the *LMS Report and Order* provide for one exclusive multilateration system license in each MTA in each of the sub-bands identified for exclusive assignments (B and H, D and G, E and F).⁹²

52. *Pleadings:* Rand McNally submits that it is the copyright owner of the MTA/BTA Listings and the Commercial Atlas and Marketing Guide and that it has not licensed use of its MTA/BTA listings in connection with LMS. It asserts that the Commission should encourage prospective LMS licensees to contact Rand McNally to arrange licensing, and should explicitly acknowledge that the use of MTAs requires Rand McNally's consent, as it did in the 900 MHz SMR proceeding.⁹³

53. In addition, SBMS notes that the rules require construction of a substantial portion of at least one BTA per MTA within 12 months after initial authorization. SBMS is concerned that licensing on an

⁹¹We clarify, as requested by Amtech, that multilateration and non-multilateration systems operating in the shared subband will share in accordance Section 90.173(b) of the Commission's Rules. See Amtech Petition at 22.

⁹²*LMS Report and Order* at 4724.

⁹³Rand McNally Petition at 2-5.

MTA basis will encourage warehousing in light of this BTA-based build-out requirement. It contends that an LMS operator could meet this minimum standard by constructing and testing in a low-demand rural BTA, and could warehouse the rest of the MTA.⁹⁴

54. *Discussion.* After a thorough review of the record in this proceeding and upon further reflection regarding this issue, we conclude that the relevant geographic areas for multilateration LMS licenses should be based on U.S. Department of Commerce Bureau of Economic Analysis Economic Areas (EAs). There are 172 EAs covering the continental United States.

55. Because EAs have not been established for the five U.S. possessions (Guam, Northern Mariana Islands, Puerto Rico, U.S. Virgin Islands, American Samoa), we will create additional licensing regions for systems operating in these territories as well as for the Gulf of Mexico. Specifically, we will designate the following additional licensing regions: (1) Guam and the Northern Mariana Islands (to be licensed as a single area); (2) Puerto Rico and the U.S. Virgin Islands (to be licensed as a single area); and (3) American Samoa. In addition, Alaska will be licensed as a single area.⁹⁵ We believe that EAs are large enough to give systems sufficient capacity to accommodate large numbers of prospective users, which will promote competition, encourage new technologies and result in superior service to the public. At the same time, EAs are small enough to alleviate the BTA/MTA warehousing concerns posited by SMBS. Further, use of smaller geographic units could result in a more diverse group of prospective licensees because EA-based licenses may be more affordable for small and medium-sized businesses than would MTA-based licenses. We conclude that such an outcome not only is desirable but furthers the public interest and one of the goals enunciated in Section 309(j) of the Communications Act.⁹⁶ Moreover, EAs are better suited than MTAs to a service aimed at improving the nation's transportation infrastructure because EAs are based on urban, suburban and rural traffic patterns. Further, use of EAs solves the copyright problem raised by Rand McNally, because EAs are published by the U.S. Department of Commerce.

E. Multilateration System Operations -- Wideband Forward Links

56. *Background.* In the *LMS Report and Order* we allowed LMS multilateration systems to use wideband forward links. A forward link refers to the signal path from the LMS system's fixed base site to its mobile units. The Commission noted that unlike a narrowband forward link, a wideband forward link can operate over a multilateration system's entire authorized sub-band. This concerned Part 15 interests, who, the Commission pointed out, opposed authorization of wideband forward links because they believed that wideband forward links are likely to cause interference to Part 15 devices. The Commission emphasized that grant of multilateration licenses will be conditioned on the applicant's ability to demonstrate through field

⁹⁴SBMS Petition at 11-12.

⁹⁵The EA Listings and the EA map are available for public inspection at the Wireless Telecommunications Bureau's Public Reference Room, 2025 M Street, N.W., Room 5608, Washington, DC, 20554, and the Bureau's Office of Operations, Gettysburg Reference Room, 1270 Fairfield Road, Gettysburg, Pennsylvania, 17325-7245. EA maps are also available on the FCC's Internet website at <http://www.fcc.gov/wtb/auctions/maps/maps.html>.

⁹⁶47 U.S.C. § 309(j). We adopted EAs for licensing areas in both the Wireless Communications Service and 800 MHz SMR service for similar reasons. See Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service ("WCS"), *Report and Order*, GN Docket No. 96-228, FCC 97-50, ¶¶ 53-60, (released February 19, 1997); Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, *Second Report and Order*, PR Docket No. 93-144, FCC 97-223, ¶¶ 13-15, (released July 10, 1997).

testing that its system does not cause unacceptable levels of interference to Part 15 devices.⁹⁷ It also limited the maximum power of wideband forward links to 30 watts ERP.⁹⁸

57. *Pleadings.* A number of parties reiterate the concern that wideband forward links will cause harmful interference to Part 15 devices and should therefore not be authorized.⁹⁹ They submit that multilateration LMS providers have not shown a compelling need for the links sufficient to counterbalance the potentially severe detriment to Part 15 devices. In the alternative, the Part 15 Coalition calls for antenna height and duty cycle restrictions on such links.¹⁰⁰

58. Pinpoint and Uniplex, the original proponents of wideband forward links, continue to believe that authorization of such links is appropriate. Pinpoint submits that wideband forward links confer substantial cost and efficiency benefits for high capacity multilateration LMS systems and facilitate the sharing of spectrum by multilateration systems. It asserts, however, that the 30 watt ERP limit and the testing requirement will make the use of such links very difficult. It further contends that there is no evidence that wideband forward links cause the significant levels of interference claimed.¹⁰¹ Uniplex enumerates a number of advantages to use of wideband forward links rather than narrowband forward links. For example, it submits that a narrowband system attempting to track a person (e.g., a prisoner or an Alzheimer's Disease patient) would have to periodically transmit a fairly high-powered signal from that person, which would require battery capacity beyond that which could be worn by a person, as a practical matter. In contrast, it asserts, a wideband system would only transmit on request so that battery size is manageable.¹⁰²

59. Another difference highlighted by Uniplex is that narrowband forward links must constantly query mobiles and store their locations in a central database, while wideband systems allow for intelligence to be stored in the mobile itself. It asserts that this permits less use of airtime in some applications. For example, Uniplex posits a metropolitan transportation system with 500 buses that has a requirement that central dispatch be alerted if a bus is running two or more minutes off schedule. It submits that while a system with narrowband forward links would have to query all 500 buses every two minutes, wideband forward links would permit each bus to have its own on-board computer with its stored schedule and buses would only report back to dispatch when behind schedule.¹⁰³ For similar reasons, Uniplex submits that a wideband prisoner tracking system could accurately monitor the location of a prisoner, while narrowband

⁹⁷*LMS Report and Order* at 4734-35, 4736-37. In the *Order on Reconsideration*, the Commission described the testing requirement as a way to ensure "that LMS systems are not operated in such a manner as to degrade, obstruct or interrupt Part 15 devices to such an extent that Part 15 operations will be negatively affected." *Order on Reconsideration* at para. 15.

⁹⁸*Id.* at 4742.

⁹⁹*See, e.g.,* Ad Hoc Gas Petition at 14; CellNet Petition at 4; Metricom/SCE Petition at 7-8; Part 15 Coalition Petition at 3-7; Symbol Technologies Comments at 12; TIA Comments at 5-6; UTC Comments at 3; Wireless Transaction Corp. Petition at 2.

¹⁰⁰Part 15 Coalition Petition at 7.

¹⁰¹Pinpoint Opposition at 17-18; *contra* Ad Hoc Gas Comments at 10-11.

¹⁰²Uniplex Petition at 2-3.

¹⁰³*Id.* at 3-4.

links can only report when that prisoner has gone out of permissible range.¹⁰⁴

60. Uniplex asserts that by adopting a stricter power limitation than was proposed in the *Notice* in this proceeding, in combination with restrictions on grandfathered systems, the Commission has adopted a policy strongly favoring narrowband forward link technology. It argues that this will limit the potential for the emergence of diverse technologies in the band.¹⁰⁵ Accordingly, Uniplex requests that the Commission adopt a 300-watt power limitation with a duty cycle limitation in lieu of the 30-watt power limitation adopted in the *LMS Report and Order*.¹⁰⁶ It also urges the Commission to permit grandfathered systems to deploy additional sites within a 30-mile radius of the primary site; it contends that this would enable a grandfathered system using a wideband forward link to offer service in an area similar to that of a typical grandfathered narrowband forward link licensee, whose service area would be bound by the range of its outermost 300-watt narrowband forward link sites.¹⁰⁷

61. *Discussion.* We believe that elimination of wideband forward links would preclude certain LMS technology options from being developed, to the detriment of consumers. At the same time, we continue to believe that the power limitation of 30 watts ERP is necessary and appropriate to minimize interference to other operators sharing the 902-928 MHz band. As we noted in the *LMS Report and Order*, limiting base and mobile stations' power levels will lessen the potential for interference between co-channel multilateration systems and will reduce the likelihood of interference to other operations in the 902-928 MHz band.¹⁰⁸ Further, pre-authorization testing will be a condition on the license of multilateration LMS operators seeking to employ wideband forward links.¹⁰⁹ We do not agree with Uniplex that adoption of a duty cycle limitation would allow increased power for wideband forward links without increasing the interference potential. With wideband forward link technology, each vehicular unit to be located must be able to receive transmissions from at least four different forward link transmitters. These transmitters operate sequentially, passing a "token" packet. Consequently, although a duty cycle limitation could be applied to each individual forward link transmitter, considered collectively, there would almost always be at least one transmitter transmitting in an area at any given time. Taking into consideration the greater range of a base transmitter, as compared to a mobile transmitter, and the amount of spectrum occupied by the wideband forward link, we believe allowing higher power for wideband forward links would unacceptably increase band congestion.

62. Also, we decline to permit grandfathered systems to deploy additional transmitters on the basis of a 30-mile radius. Uniplex's reason for asking for this is essentially to allow comparable coverage for its

¹⁰⁴*Id.* at 4.

¹⁰⁵*Id.* at 1.

¹⁰⁶*Id.* at 6; *contra* Ad Hoc Gas Comments at 10.

¹⁰⁷Uniplex Petition at 5-6.

¹⁰⁸*LMS Report and Order* at 4742.

¹⁰⁹In addition, UTC requests that height and power limits be imposed on narrowband forward links operating in the 927.250-928.000 band in order to afford protection to multiple address systems operating in the adjacent 928-929 band. UTC Petition at 17-18. Multiple address systems are licensed systems and are fairly powerful. Given the nature of narrowband forward links, we do not believe that interference problems are likely and we accordingly deny UTC's request. In the event isolated interference problems do arise, voluntary coordination between these services may be necessary.

particular technology as compared to technologies using narrowband forward links. We have found that, in the 902-928 MHz band, it is necessary to have a common set of technical limits in order to facilitate co-occupancy among the various band users. Each different technology operating within these limits, however, will likely have advantages and disadvantages as compared to the others, including the matter of coverage. We do not have sufficient experience with operating LMS systems to craft a rule that would be appropriate for all potential LMS technologies. To the extent that grandfathered systems seek to add fill-in sites that do not increase their coverage footprint, we believe such requests should be handled on a case-by-case basis.

63. Some of the examples posed by Uniplex raise the issue of whether LMS technology may be used to track individuals as well as vehicles. CellNet requests us to clarify that only vehicles or inanimate objects, and not individuals, may be monitored and located via LMS. CellNet is concerned that without this restriction, the possibility increases that paging and messaging services will become the primary offerings on LMS channels. It also suggests that the Commission impose a limit on the number of receivers a company uses for non-vehicular monitoring, rather than defining vehicular location as a company's "primary" business.¹¹⁰

64. The rules adopted in the *LMS Report and Order* permit a multilateration LMS system to provide non-vehicular location services as long as the system's primary operations involve the provision of vehicle location services.¹¹¹ We do not share CellNet's concern that LMS will become a paging service. The rule clearly provides that such non-vehicular location functions may not be an LMS operation's primary function. To afford multilateration LMS operators maximum flexibility in designing their systems, we also decline to adopt a specific cap on non-vehicular location services. Non-multilateration LMS operators, on the other hand, are specifically prohibited from offering non-vehicular location services.¹¹² The Commission adopted this restriction because the spectrum occupied by non-multilateration LMS operators has a heavier concentration of amateur radio operators, Part 15 devices and federal government radiolocation operations than do other portions of the band.¹¹³ We continue to believe that this approach minimizes the potential for interference and we therefore decline to revise our rules.

F. Petitions for Reconsideration of Order on Reconsideration

65. On May 30, 1996, three parties filed petitions for reconsideration of the *Order on Reconsideration*, which, as noted above, had resolved certain issues regarding grandfathering of existing LMS systems that had been raised on reconsideration of the *LMS Report and Order*. Those petitioners, Amtech Corporation, Pinpoint Communication Networks, Inc., and Teletrac License, Inc., seek reconsideration of different aspects of the *Order on Reconsideration*.¹¹⁴ For the reasons detailed below, each

¹¹⁰CellNet Petition at 10-11.

¹¹¹47 C.F.R. § 90.353(a)(7).

¹¹²47 C.F.R. § 90.353(a)(8).

¹¹³*LMS Report and Order* at 4708-09.

¹¹⁴Oppositions to these petitions were filed on July 5, 1996 by the Consumer Electronic Manufacturers Association (opposes Pinpoint petition), Metricom (opposes Pinpoint and Teletrac petitions), the Part 15 Coalition (opposes all three petitions), SpectraLink Corporation (opposes Teletrac and Pinpoint petitions), and Symbol Technologies (opposes Pinpoint petition).

of these petitions is denied, except that we will make a technical correction to the rules requested by Amtech.

66. *Amtech Petition*. Amtech, a non-multilateration LMS provider, asserts that the Commission should revise the emission mask specifications of Section 90.209 as applied to transmitters with less than two watts output power. Specifically, Amtech proposes that the attenuation for out-of-band emissions produced by non-multilateration transmitters of two watts or less be specified as $43 + 10 \text{ Log}(P)$ rather than $55 + 10 \text{ Log}(P)$. Amtech contends that it has employed this limit for a number of years and that it is the same limit applied in other contexts for systems that can have greater height and power than non-multilateration systems. Amtech argues that use of the stricter $55 + 10 \text{ Log}(P)$ standard imposes significant costs and is not necessary due to the limited interference potential of non-multilateration systems.¹¹⁵ We are not persuaded that Amtech has presented sufficient evidence to support its contention that the standard adopted in the *LMS Report and Order* is overly restrictive. We continue to believe that that standard is the most appropriate given the disparate users of the 902-928 MHz band.

67. Amtech also urges the Commission to revise the relevant emission mask rule (formerly Section 90.209, now Section 90.210) to conform with the rule as originally adopted in the *LMS Report and Order*, wherein the attenuation applied at the edge of the licensee's LMS subband rather than at the edge of the "authorized bandwidth."¹¹⁶ We did not intend in the *Order on Reconsideration* to revise the emission mask for non-multilateration LMS licensees and we will make appropriate changes to Section 90.210 to make that clear.

68. *Pinpoint Petition*. Pinpoint, a multilateration LMS licensee, takes issue with the statement in the *Order on Reconsideration* that

[T]he Commission seeks to ensure not only that Part 15 operators refrain from causing harmful interference to LMS systems, but also that LMS systems are not operated in such a manner as to degrade, obstruct or interrupt Part 15 devices to such an extent that Part 15 operations will be negatively affected.¹¹⁷

Pinpoint contends that this language is inconsistent with Part 15 devices' secondary status in the LMS band and that it constitutes a "new standard" with respect to LMS operators' obligations *vis-a-vis* Part 15 devices.¹¹⁸ Pinpoint argues that this "new standard" conflicts with the statement in the *LMS Report and Order* that unlicensed Part 15 devices "may not cause harmful interference to and must accept interference from all other operations in the band."¹¹⁹

Amtech filed a Reply to the Part 15 Coalition Opposition on July 15, 1996. Pinpoint and Teletrac each filed a Reply to the relevant Oppositions on July 18, 1996.

¹¹⁵Amtech Petition for Reconsideration of *Order on Reconsideration* at 2-4.

¹¹⁶*Id.* at 4-6.

¹¹⁷Pinpoint Petition for Partial Reconsideration of *Order on Reconsideration* at 2 (quoting *Order on Reconsideration* at para. 15).

¹¹⁸*Id.* at 2.

¹¹⁹*Id.* at 3 (citing *LMS Report and Order*, 10 FCC Rcd at 4717).

69. The language in the Order on Reconsideration cited by Pinpoint does not mean that Part 15 devices are entitled to protection from interference. They are not. Rather, we were explaining our decision to place a testing condition on multilateration LMS licenses. The purpose of the testing condition is to insure that multilateration LMS licensees, when designing and constructing their systems, take into consideration a goal of minimizing interference to existing deployments or systems of Part 15 devices in their area, and to verify through cooperative testing that this goal has been served.

70. *Teletrac Petition*. Teletrac seeks reconsideration of the restriction in Section 90.363(a) of the Commission's Rules, originally adopted in the *LMS Report and Order* and affirmed in the *Order on Reconsideration*, that limits site relocation for grandfathered LMS licensees to within two kilometers of their authorized site. Teletrac submits that removing this restriction would be in the public interest because it would permit grandfathered multilateration LMS operators to improve the efficiency of their systems.¹²⁰ We are not persuaded that Teletrac has raised any new arguments to justify our further reconsideration of this rule. We note that we have granted Teletrac waivers of this rule with respect to three specific sites.¹²¹

71. Teletrac also urges the Commission to clarify that the Part 15 safe harbor only applies to Part 15 operations authorized pursuant to the Part 15 rules in effect at the time the safe harbor rule was adopted. Teletrac submits that the presumption of non-interference in the safe harbor rule assumes that the Part 15 rules as they existed when the safe harbor rule was adopted will remain in place. Teletrac notes that the Commission has proposed changes to the rules.¹²² Since the time Teletrac raised this point, the Commission has adopted changes to the Part 15 rules. We do not believe that the modified rules conflict with the safe harbor.¹²³ To the extent Teletrac continues to have concerns that the new rules are incompatible with the safe harbor, it should detail those concerns with the Commission.

IV. COMPETITIVE BIDDING FOR MULTILATERATION LMS LICENSEES FURTHER NOTICE OF PROPOSED RULE MAKING

72. In the *LMS Report and Order*, the Commission decided to use competitive bidding to select from mutually exclusive applications for multilateration LMS licenses.¹²⁴ The Commission reached this decision based on its conclusion that the statutory criteria for auctioning licenses, which are set forth in Section 309(j) of the Communications Act, 47 U.S.C. § 309(j), are satisfied. More specifically, the Commission found (1) that its decision to offer multilateration LMS licenses on an exclusive basis makes it likely that mutually exclusive applications for such licenses will be filed; (2) that multilateration LMS licenses will be used principally to offer for-profit, subscriber-based services; and, (3) that the use of

¹²⁰Teletrac Petition for Reconsideration of *Order on Reconsideration* at 1-11.

¹²¹See Teletrac License, Inc. Request for Waiver of Section 90.363(a) of the Commission's Rules, *Order*, 11 FCC Rcd 13184 (WTB 1996) (re Orlando, Florida and Sacramento, California); Teletrac License, Inc. Request for Waiver of Section 90.363(a) of the Commission's Rules, *Order*, 11 FCC Rcd 17499 (WTB 1996) (re New York, New York).

¹²²*Id.* at 11-12 (citing Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters, *Notice of Proposed Rule Making*, ET Docket No. 96-8, 11 FCC Rcd 3068 (1996)).

¹²³Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters, *Report and Order*, ET Docket 96-8, FCC 97-114 (released Apr. 10, 1997).

¹²⁴*LMS Report and Order* at 4725-26.

competitive bidding for these licenses will promote the public interest objectives set forth in Section 309(j)(3).¹²⁵

73. Under the spectrum plan we adopted in the *LMS Report and Order* and reaffirm here, three blocks of spectrum are allocated to multilateration LMS systems: (1) 904.000-909.750 MHz and 927.750-928.000 MHz; (2) 919.750-921.750 MHz and 927.500-927.750 MHz; and, (3) 921.750-927.250 MHz and 927.250-927.500 MHz. One license will be awarded for each of these spectrum blocks in each of 176 EAs. Thus, there are a total of 528 multilateration LMS licenses to be auctioned.

74. We anticipate conducting the auction for multilateration LMS frequencies in conformity with the general competitive bidding rules proposed to be included in Part 1, Subpart Q of the Commission's Rules, and substantially consistent with the auctions that have been employed in other wireless services.¹²⁶ We propose to adopt for the LMS auction the simultaneous multiple round competitive bidding design used in the PCS auctions. Multiple round bidding should provide more information to bidders than single round bidding during the auction about the values of the licenses. We seek comment on this proposal. We also tentatively conclude that the LMS auction will follow the general competitive bidding procedures of Part 1, Subpart Q. We seek comment on this tentative conclusion.¹²⁷

75. *Small Businesses.* Our auction rules for other services generally include special provisions -- such as bidding credits and installment payments -- designed to fulfill our statutory mandate to ensure that small businesses have the opportunity to participate in the provision of spectrum-based services.¹²⁸ In the *Second Memorandum Opinion and Order* in the competitive bidding docket, we indicated that we would establish definitions for "small business" on a service-by-service basis.¹²⁹ We therefore seek comment regarding the establishment of a small business definition for multilateration LMS. Commenters should discuss the level of capital commitment that is likely to be required to purchase a multilateration LMS license at auction and create a viable business. We also seek comment on what small business provisions should be offered to multilateration LMS small business entities. Our goal, should we adopt a special provision(s) for one or more categories of small businesses, will be to remove entry barriers so as to ensure the participation of small businesses in the auction and in the provision of service. If we adopt special provisions for small businesses, we propose that our unjust enrichment rules apply as set forth in Part 1, Subpart Q.¹³⁰

¹²⁵*Id.* As part of this determination, the Commission also decided that applications for non-multilateration LMS licenses would not be selected by competitive bidding because, unlike multilateration LMS licenses, non-multilateration LMS licenses will be offered on a shared basis -- a licensing scheme that does not allow for mutual exclusivity among applicants.

¹²⁶*See* Amendment of Part 1 of the Commission's Rules -- Competitive Bidding, *Order, Memorandum Opinion and Order and Notice of Proposed Rule Making*, WT Docket No. 97-82, 12 FCC Rcd 5686 (1997).

¹²⁷The Commission makes no representations or warranties about the use of this spectrum for particular services. Applicants should be aware that an FCC auction represents an opportunity to become an FCC licensee in this service, subject to certain conditions and regulations. An FCC auction does not constitute an endorsement by the FCC of any particular services, technologies or products, nor does an FCC license constitute a guarantee of business success. Applicants should perform their individual due diligence before proceeding as they would with any new business venture.

¹²⁸*See, e.g.*, 47 U.S.C. § 309(j)(4)(D).

¹²⁹*Second Memorandum Opinion and Order*, PP Docket No. 93-253, 9 FCC Rcd 7245, 7268-69 (1994).

¹³⁰47 C.F.R. § 1.2111.

76. In other services we also adopted attribution rules for purposes of determining small business status. We tentatively conclude that for LMS we should attribute the gross revenues of all controlling principals in the small business applicant as well as its affiliates. We seek comment on this tentative conclusion. We also seek comment on whether small business provisions are sufficient to promote participation by businesses owned by minorities, women, or rural telephone companies. To the extent that commenters propose additional provisions to ensure participation by minority-owned or women-owned businesses, we ask them to address how such provisions should be crafted to meet the relevant standards of judicial review.¹³¹

77. *Partitioning and Disaggregation.* We propose to allow multilateration LMS licensees to partition their geographic license area and disaggregate portions of their spectrum. We anticipate that this will, among other things, help to remove entry barriers for small businesses. We seek comment on this proposal.

78. If we determine that special provisions for small business are appropriate for LMS auctions, we tentatively conclude that a qualified small business that applies to partition or disaggregate its license to a non-small business entity should be required to repay any benefits it received from special small business provisions. We seek comment on the type of unjust enrichment requirements that should be placed as a condition for approval of an application to partition or disaggregate a license owned by a qualified small business licensee to a non-small business entity. This could include, for example, repayment of any bidding credit that we may adopt for small businesses, and would be applied on a proportional basis. Similarly, if a small business licensee partitions or disaggregates to another qualified small business that would not qualify for the same level of bidding credit, the transferring licensee should be required to repay a portion of the benefit it received. We seek comment on these tentative conclusions. Alternatively, we seek comment on whether we should restrict the partitioning or disaggregation of such licenses when the partitionee or disaggregatee is not within the definition of an entity eligible for such special provisions, or whether, at some point (*e.g.*, a term of years), such restriction on partitioning and disaggregation be removed and the unjust enrichment provisions would apply. We also seek comment on how such unjust enrichment amounts should be calculated, especially in light of the difficulty of devising a methodology or formula that will differentiate the relative market value of the opportunities to provide service to various partitioned areas or to use the amount of spectrum disaggregated.

V. CONCLUSION

79. In this *Memorandum Opinion and Order*, we have carefully considered petitioners' concerns and, for the most part, determined that our prior decisions in this proceeding remain appropriate. We believe that our LMS rules will facilitate the rapid deployment of LMS and will be instrumental in the development of "smart highway" technology. At the same time, we have endeavored to fairly balance the diverse interests of all parties operating in the 902-928 MHz band. We have paid particular attention to the positions of Part 15 and amateur operators and we believe we have created a band plan and accompanying regulatory structure that will enable them to coexist with LMS systems without significant disruption to their operations.

¹³¹See *Adarand Constructors, Inc. v. Peña*, 115 S. Ct. 2097 (1995); *United States v. Virginia*, 116 S. Ct. 2264 (1996).

VI. ADMINISTRATIVE MATTERS

80. *Ex Parte Rules -- Non-Restricted Proceeding.* This is a non-restricted notice and comment rulemaking proceeding. *Ex parte* presentations are permitted, except during the Sunshine Agenda period, provided they are disclosed as provided in Commission Rules. *See generally* 47 C.F.R. §§ 1.1202, 1.1203, 1.1206.

81. *Regulatory Flexibility.* The Initial and Final Regulatory Flexibility Analyses for this *Memorandum Opinion and Order*, as required by Sections 603 and 604, respectively, of the Regulatory Flexibility Act of 1980, 5 U.S.C. §§ 603-604, is set forth in Appendix B and Appendix C.

82. The Secretary shall send a copy of this *Memorandum Opinion and Order*, including the Final and Initial Regulatory Flexibility Analyses, to the Chief Counsel for Advocacy of the Small Business Administration in accordance with paragraph 603(a) of the Regulatory Flexibility Act (Pub. L. No. 96-354, 94 Stat. 1164, 4 U.S.C. § 601, *et seq.* (1981)).

83. *Comment Dates.* Pursuant to applicable procedures set forth in Sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415 and 1.419, interested parties may file comments on or before November 5, 1997, and reply comments on or before November 20, 1997. To file formally in this proceeding, you must file an original and four copies of all comments, reply comments, and supporting comments. If you want each Commissioner to receive a personal copy of your comments, you must file an original plus nine copies. You should send comments and reply comments to the Office of the Secretary, Federal Communications Commission, Washington, D.C. 20554. Comments and reply comments will be available for public inspection during regular business hours in the FCC Reference Center of the Federal Communications Commission, Room 239, 1919 M Street, N.W., Washington, D.C. 20554.

84. *Paperwork Reduction.* The *FNPRM* has been analyzed with respect to the Paperwork Reduction Act of 1995 and was found to impose no new or modified information collection requirement on the public. Implementation of any new or modified requirement will be subject to approval by the Office of Management and Budget, as prescribed by the Act.

VII. ORDERING CLAUSES

85. IT IS ORDERED that, pursuant to the authority of Sections 4(i), 302, 303(r), and 332(a)(2) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 302, 303(r), and 332(a), the rule changes specified in Appendix D are adopted.

86. IT IS FURTHER ORDERED that the rule changes set forth in Appendix D WILL BECOME EFFECTIVE 60 days after publication in the Federal Register.

87. IT IS FURTHER ORDERED that the petitions for reconsideration filed by the parties listed in Appendix A ARE GRANTED to the extent discussed herein, and ARE OTHERWISE DENIED.

88. IT IS FURTHER ORDERED that the petitions for reconsideration of the *Order on Reconsideration* filed by Pinpoint Communication Networks, Inc. and Teletrac License, Inc. ARE DENIED.

89. IT IS FURTHER ORDERED that the petition for reconsideration of the *Order on Reconsideration* filed by Amtech Corporation IS GRANTED to the extent specified herein and IS otherwise DENIED.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

FCC 96-115

In the Matter of)
)
Amendment of Part 90 of the) PR Docket No. 93-61
Commission's Rules to Adopt)
Regulations for Automatic Vehicle)
Monitoring Systems)

ORDER ON RECONSIDERATION

Adopted: March 18, 1996;

Released: March 21, 1996

By the Commission: Commissioner Barrett concurring in part, dissenting in part and issuing a statement

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I. INTRODUCTION AND BACKGROUND

1. In this *Order on Reconsideration*, we address several issues raised by petitions for reconsideration of our *Report and Order* in PR Docket No. 93-61¹, which established rules governing the licensing of the Location and Monitoring Service (LMS) in the 902-928 MHz band. Specifically, we modify and clarify certain aspects of our LMS rules in order to facilitate the expeditious construction and operation of LMS systems that must meet the April 1, 1996, deadline to attain grandfathered status.²

2. LMS encompasses both the Automatic Vehicle Monitoring (AVM) service established in 1974 and future advanced transportation-related services.³ Existing AVM systems were authorized in the 903-912 and 918-927 MHz bands, as well as in several bands below 512 MHz. Existing LMS systems in these bands generally fall into one of two broad technological categories: multilateration systems and non-multilateration systems.⁴ Multilateration systems use spread-spectrum technology to locate vehicles (and other moving objects) with great accuracy throughout a wide geographic area. Non-multilateration systems typically use narrowband

¹ Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Report and Order*, PR Docket No. 93-61, 10 FCC Rcd 4695 (1995) (*LMS Report and Order*).

² Other issues raised by petitioners will be addressed in a forthcoming reconsideration order.

³ *LMS Report and Order*, 10 FCC Rcd at 4696, ¶ 1.

⁴ Under the Commission's Rules, a "multilateration LMS system" is defined as "a system that is designed to locate vehicles or other objects by measuring the difference of time of arrival, or difference in phase, of signals transmitted from a unit to a number of fixed points or from a number of fixed points to the unit to be located." 47 C.F.R. § 90.7. A "non-multilateration LMS system" is defined generally as "a system that employs any of a number of non-multilateration technologies to transmit information to and/or from vehicular units." *Id.*

technology to transmit data to and from vehicles passing through a particular location.⁵

3. In the *LMS Report and Order*, we stated our expectation that in the future both types of LMS systems will play an integral role in the development and implementation of a variety of advanced transportation-related services, known as "Intelligent Vehicle Highway Systems" (IVHS) or "Intelligent Transportation Systems" (ITS).⁶ In fact, the underlying purpose for creating a new subpart for Transportation Infrastructure Radio Services (TIRS) in Part 90 of the Commission's Rules was the Commission's recognition of ITS's expected growth.⁷ LMS, which we authorized to use the 902-928 MHz band, constitutes the first service contained within the TIRS category.

4. LMS systems, both multilateration and non-multilateration, and Part 15 devices will play an important role in providing many valuable services to the public in the future. In the *LMS Report and Order*, we developed a spectrum plan that is designed to accommodate these service providers' requirements to the extent possible. Aspects of the spectrum plan include: 1) continuing to permit secondary operations by unlicensed Part 15 devices across the entire band; 2) providing a "safe harbor" in which Part 15 devices may operate, along with a testing requirement to determine questions of interference from multilateration systems; 3) authorizing additional spectrum in the 902-928 MHz band in order to enable non-multilateration LMS systems to operate on spectrum separate from multilateration systems; and 4) permitting only one new multilateration provider in each sub-band of spectrum allocated for multilateration operations.⁸

5. In the *LMS Report and Order*, we decided to stop accepting applications for the operation of multilateration LMS systems in the 904-912 and 918-926 MHz bands under our current rules as of February 3, 1995.⁹ In addition, we adopted certain grandfathering provisions that allowed existing, operating multilateration LMS systems until April 1, 1998, to complete the transition to the rules adopted in the *LMS Report and Order*.¹⁰ These grandfathering provisions were adopted to prevent any undue hardship on existing, operating multilateration LMS systems. We also conferred grandfathered status on multilateration LMS licensees who had not

⁵ *LMS Report and Order*, 10 FCC Rcd at 4697, ¶ 4.

⁶ *Id.* at 4698, ¶ 5. The term "Intelligent Vehicle Highway System" refers to the collection of advanced radio technologies that, among other things, are intended to improve the efficiency and safety of our nation's highways. Recently, both government and industry entities have begun referring to these technologies by the term "Intelligent Transportation System".

⁷ *Id.*

⁸ In some instances, a newly-licensed multilateration provider may have to share parts of its allotted spectrum with a pre-existing "grandfathered" multilateration licensee.

⁹ *LMS Report and Order*, 10 FCC Rcd at 4728, ¶ 61.

¹⁰ *Id.*

constructed their systems so that such licensees may construct and operate their licensed stations under the rules adopted in the *LMS Report and Order*. We concluded, however, that such systems must be constructed and operational by April 1, 1996, and must comply with the rules adopted in the *LMS Report and Order* by that date. The *LMS Report and Order* directed existing licensees to file applications to modify their licenses to reflect operations consistent with the new band plan for multilateration systems.¹¹

6. In addition to adopting a new spectrum plan and grandfathering provisions, the Commission resolved other technical issues in the *LMS Report and Order*. We established conditions under which Part 15 operations would not be considered to cause interference to multilateration licensees.¹² We allowed multilateration licensees to commence operations only after demonstrating efforts to minimize interference with Part 15 operations.¹³

7. In this *Order on Reconsideration*, we clarify our decision in the *LMS Report and Order* regarding the treatment of grandfathered LMS systems with respect to Part 15 interference testing. In addition, we clarify that the rule regarding non-interference by Part 15 devices set out in §90.361 applies to grandfathered LMS licensees that did not construct as of February 3, 1995, as well as future LMS licensees. We also consider modification of various technical rules, including emission mask specification, frequency tolerance, and site relocation, and we clarify our rules regarding type acceptance of LMS equipment. Any remaining issues raised in the petitions for reconsideration will be addressed in a later *Memorandum Opinion and Order*.¹⁴

8. It has been informally brought to our attention that some unbuilt LMS providers are concerned that they will not be able to complete construction by the April 1, 1996, deadline because they have delayed construction pending our resolution of the petitions for reconsideration. Moreover, the release of this *Order on Reconsideration* has been delayed because the Commission was closed due to the government shutdown that began in mid-December and due to the inclement weather that immediately followed. Accordingly, we believe that it would be appropriate to extend the build-out deadline by five months, to September 1, 1996. We recognize that because the 902-928 MHz frequency band is shared with federal government users, LMS operators are required to coordinate with the Interdepartmental Radio Advisory Committee (IRAC) concerning any proposed modifications to their systems. We are concerned that if existing licensees must await the completion of such frequency coordination

¹¹ *Id.* at 4728-29, ¶¶ 61-64.

¹² *LMS Report and Order*, 10 FCC Rcd at 4714-15, ¶¶ 35-36.

¹³ *Id.* at 4736-37, ¶¶ 81-82.

¹⁴ While we do not address here specific issues raised by petitioners regarding interconnection to the public switched network, we remind grandfathered operators that we do not intend that LMS be used for general messaging purposes. See *LMS Report and Order*, 10 FCC Rcd at 4709, ¶ 26. The forthcoming *Memorandum Opinion and Order* will consider the issues regarding interconnection to the public switched network. It also will be accompanied by a *Notice of Proposed Rulemaking* proposing competitive bidding rules for LMS.

process before commencing modifications to their systems, licensees may not have sufficient time to complete their system modifications by the build-out deadline. As a result, we conclude that these licensees should be permitted to begin modifications to their systems provided they have initiated the frequency coordination process with IRAC and on the condition that the Commission's final approval of such modifications will be contingent upon the successful completion of such frequency coordination.¹⁵ This procedure is consistent with our general approach for temporary and conditional operations under Part 90 of our Rules.¹⁶

9. In addition, On May 22, 1995, Southwestern Bell Mobile Systems (SBMS) filed a request for waiver of Section 90.363 of the Commission's Rules to grandfather SBMS applications that were pending as of the date the *LMS Report and Order* was adopted. SBMS contends that if its applications had been processed in 113 days as had been estimated by the Commission, its licenses would have been granted before the *LMS Report and Order* came out and would thus be eligible for grandfathering. Further, SBMS submits that it has been judicious in not applying for more licenses than needed for its LMS operations, while other applicants have warehoused spectrum by receiving licenses for systems that have remained unconstructed. SBMS notes that the Commission granted protected status to pending SMR applications based in part on the fact that there were processing delays at the Commission.¹⁷

10. We are not persuaded by SBMS that pending LMS applications should be eligible for grandfathering.¹⁸ Our stated purpose in adopting grandfathering provisions was "[t]o ensure that our new licensing scheme does not impose undue hardship on existing, operating multilateration [LMS] systems," and to allow already-licensed systems the opportunity to construct and operate pursuant to the LMS rules adopted in the *LMS Report and Order*.¹⁹ If some licensees are warehousing spectrum, as alleged by SBMS, then they will likely not construct in the time allotted so as to attain grandfathered status. That spectrum will then be available for competitive bidding by all prospective licensees, including SBMS if they so choose.

11. Further, the SMR example referred to by SBMS is distinguishable from the LMS situation. In the SMR context, the Commission adopted a grandfathering provision awarding

¹⁵ We note, however, that LMS operators are not required to notify IRAC of commencement of construction.

¹⁶ See 47 C.F.R. §90.159. While IRAC coordination is required before the Commission will grant a construction permit for some services, we note that construction permits are not issued for LMS facilities.

¹⁷ See Amendment of Parts 2 and 90 of the Commission's Rules to Provide for the Use of 200 Channels Outside the Designated Filing Areas in the 896-901 MHz and the 935-940 MHz Bands Allotted to the Specialized Mobile Radio Pool, *Second Report and Order and Second Further Notice of Proposed Rule Making*, PR Docket No. 89-553, PP Docket No. 93-253 and GN Docket No. 93-252, 10 FCC Rcd 6885, 6902-04 (1995) (*SMR Second Report and Order*).

¹⁸ We note that a number of LMS applications were pending at the time the *LMS Report and Order* was adopted, although SBMS is the only applicant that has specifically requested waiver of the grandfathering rules.

¹⁹ *LMS Report and Order* at 4728, ¶ 61.

certain secondary sites in the 900 MHz SMR service primary status so as to entitle them to full interference protection. On reconsideration, the Commission decided to grandfather pending applications for these secondary sites, concluding that this would promote service to the public, that the additional amount of protected spectrum would be *de minimis* and that such action would be equitable in light of processing delays.²⁰ A notable difference is that the 900 MHz SMR secondary sites were extensions of primary sites that were already licensed and constructed, while the LMS facilities at issue are unbuilt. Thus, it is questionable how service to the public would be facilitated by extending grandfathered status to sites that have not even been licensed, much less constructed. Moreover, grant of the pending applications could materially alter the LMS landscape by adding a number of additional sites and would thus not be a *de minimis* change. Accordingly, we decline SBMS's request and clarify that LMS applications filed prior to February 3, 1995, will not be eligible for grandfathering. SBMS also asks for an extension of the construction deadline for its pending applications. Because we are not affording SBMS grandfathered status with respect to these applications, this issue is moot. In addition, SBMS seeks a waiver of our rules to permit relocation of grandfathered sites by more than two kilometers and to add sites within a 75-mile radius. This same suggestion was made by petitioners for reconsideration and, for the reasons discussed *infra* in Section II-C-4, we deny SBMS's request.

II. DISCUSSION

A. Multilateration System Operations (Part 15 Testing)

12. Background. In the *LMS Report and Order*, the Commission adopted a spectrum band plan and established technical criteria for the operators of the various systems designed to minimize the potential for interference and provide a more conducive environment for sharing of the band by disparate services. Although this plan was crafted on the basis of an extensive record, we nonetheless recognized that additional testing would be beneficial. Thus, in an effort to ensure that the coexistence of the various services in the band would be as successful as possible, we decided to condition the grant of each MTA multilateration license on the licensee's ability to demonstrate through actual field tests that their systems do not cause unacceptable levels of interference to Part 15 devices. We noted that multilateration licensees may be able to employ technical refinements to minimize interference with Part 15 operations. We further expected that multilateration system users and Part 15 system operators would cooperate closely in designing and implementing testing procedures.²¹

13. Pleadings. Part 15 users request that grandfathered multilateration LMS systems be required to demonstrate through testing that their systems will not cause unacceptable

²⁰ *SMR Second Report and Order* at 6904, ¶ 53.

²¹ *LMS Report and Order*, 10 FCC Rcd at 4737, ¶ 82.

interference to Part 15 devices. Specifically, Metricom/SCE seeks clarification that all new rule sections adopted in the *LMS Report and Order* apply to all grandfathered LMS systems upon the issuance of a final order.²² Further, some Part 15 petitioners suggest that the Commission establish guidelines for the testing of LMS systems and the demonstration of non-interference to Part 15 devices.²³ They argue that the test parameters should be uniform and that the testing should cover a reliable sample of the applicable technologies available in the area, to ensure that the tests are developed in a comprehensive and fair manner.²⁴

14. However, some LMS providers contend that such testing of LMS systems is not necessary.²⁵ For example, Pinpoint contends that adopting a requirement to test a vague "standard" after spectrum has been auctioned and systems built is of questionable utility.²⁶ SBMS contends that because the probability of interference to Part 15 devices is de minimis, testing is not necessary.²⁷ In addition, some parties contend that the testing requirement violated the Administrative Procedure Act (APA) because testing procedures were not contemplated in the *Notice of Proposed Rule Making* in this proceeding and/or because testing requirements materially alter the Part 15 rules, which was not previously proposed.²⁸ Other parties believe that the testing requirement was a logical outgrowth of the proposals in the Notice and therefore does not exceed the Commission's discretion under the APA.²⁹

15. Discussion. The *LMS Report and Order* stated that interference testing will be a condition precedent to receiving a multilateration LMS license. We hereby clarify that as a condition of grandfathering, we will also require all multilateration LMS operators who did not construct stations prior to February 3, 1995, to demonstrate through testing that their LMS

²² Metricom/SCE Petition at 16. See Appendix A for a list of the acronyms used to cite parties filing petitions for reconsideration of the *LMS Report and Order*, oppositions thereto, and other associated pleadings.

²³ CellNet Petition at 7-8; Metricom/SCE Petition at 8-9; Ad Hoc Gas Petition at 18; Part 15 Coalition Petition at 15.

²⁴ Part 15 Coalition Petition at 15; Ad Hoc Gas Petition at 18-19; CellNet Petition at 7; Metricom/SCE Petition at 9-10.

²⁵ We note that Teletrac, MobileVision, Pinpoint, and Uniplex (collectively referred to as "The LMS Providers") filed an *ex parte* letter to reiterate their concerns regarding certain grandfathering and certain technical issues. See Letter from The LMS Providers to Rosalind K. Allen, Chief of Commercial Wireless Division, Wireless Telecommunications Bureau, Federal Communications Commission (FCC), dated August 22, 1995 (LMS Providers 8/22/95 Letter). We also note that SBMS filed an *ex parte* letter to support the concerns expressed in the LMS Providers 8/22/95 Letter. See Letter from SBMS to William F. Caton, Acting Secretary, FCC, dated September 21, 1995.

²⁶ Pinpoint Petition at 7.

²⁷ SBMS Petition at 8.

²⁸ See, e.g., SBMS Petition at 7-8; Airtouch/Teletrac Opposition at 3.

²⁹ See, e.g., Ad Hoc Comments at 11; EIA/CEG Comments at 5.

systems will not cause unacceptable interference to Part 15 devices. As we stated in the *LMS Report and Order*, we believe that testing may provide users of the band with data that could contribute to "fine-tuning" system operations.³⁰ We reiterate that multilateration licensees may employ any one of a number of technical refinements, *i.e.*, limiting duty cycle, pulse duration power, *etc.*, to facilitate band sharing and minimize interference to Part 15 operations. Further, the Commission seeks to ensure not only that Part 15 operators refrain from causing harmful interference to LMS systems, but also that LMS systems are not operated in such a manner as to degrade, obstruct or interrupt Part 15 devices to such an extent that Part 15 operations will be negatively affected. Of course, if a Part 15 operator agrees to accept interference from a multilateration LMS provider, the LMS operator need not make further efforts to reduce interference.

16. We, however, deny petitioners' request to establish specific guidelines for Part 15 testing at this time. We recognize that LMS systems employ different methods to provide location and monitoring that are constantly changing to keep up with consumer demand. Moreover, the Part 15 industry has an even greater array of technologies that fluctuate in response to the needs of the public. It would be inappropriate to apply uniform testing parameters to those varied technologies, as no one testing method would adequately address the needs of either LMS or Part 15 operations. Instead, we believe that the more prudent course of action would be for LMS and Part 15 operators to work closely together to reach consensus on testing guidelines that satisfy their respective requirements.

17. We do not agree that our adoption of the testing requirement violated the APA. The APA requires an agency to provide the public with "either the terms or the substance of a proposed rule or a description of the subject and issues involved."³¹ The APA, however, "does not require an agency to publish in advance every precise proposal which it may ultimately adopt as a rule."³² Rather, the notice is sufficient if the final rule is a "logical outgrowth of the underlying proposal."³³ We believe that the testing requirement was a logical outgrowth of the Notice of Proposed Rule Making in this proceeding, which sought comment on ways to accommodate the various users of the 902-928 MHz band.³⁴ Moreover, the rules adopted in the *LMS Report and Order* do not modify our Part 15 rules by elevating the status of Part 15 providers, as alleged by some petitioners. Part 15 operation remain secondary; the testing requirement is merely an

³⁰ *LMS Report and Order*, 10 FCC Rcd at 4737, ¶ 82.

³¹ 5 U.S.C. § 553 (B)(3).

³² *California Citizens Band Association v. United States*, 375 F.2d 43, 48 (9th Cir. 1967); *see also Spartan Radiocasting Co. v. FCC*, 619 F.2d 314 (4th Cir. 1980); *MCI v. FCC*, 57 F.3d 1136 (D.C. Cir. 1995).

³³ *United Steelworkers v. Marshall*, 647 F.2d 1189, 1221 (D.C. Cir. 1980); *see also Fertilizer Institute v. EPA*, 935 F.2d 1303 (D.C. Cir. 1991).

³⁴ Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Notice of Proposed Rule Making*, PR Docket No. 93-61, 8 FCC Rcd 2502, 2507 (1993).

attempt to achieve the most efficient coexistence possible among the various users of the band.

B. Accommodation of Secondary Users in the 902-928 MHz Band

18. Background. In the *LMS Report and Order*, we attempted to balance the equities and interests of each use of the 902-928 MHz band, including multilateration LMS systems and Part 15 users, without undermining the established relationship between unlicensed operations and licensed services. In this connection, we affirmed that unlicensed Part 15 devices in the 902-928 MHz band are secondary and, as in other bands, may not cause harmful interference to and must accept interference from all other operations in the band.³⁵ To accommodate the concerns of Part 15 users about their secondary status in light of multilateration LMS and our authorizing LMS to use the additional 8 MHz of the band (902-903, 912-918 and 927-928 MHz), however, we adopted rules that describe a "safe harbor" within which a Part 15 operation would be deemed not to cause interference to a multilateration LMS system.³⁶

³⁵ *LMS Report and Order* at 4714, ¶ 34 (citing 47 C.F.R. § 15.5(b)).

³⁶ See *LMS Report and Order* at 4715, ¶. A Part 15 system will not be considered to be causing interference to a multilateration LMS system if it is otherwise operating in accordance with the provisions of 47 C.F.R. § 15.1 *et seq.* and it meets at least one of the following conditions:

(a) it is a Part 15 field disturbance sensor operating under Section 15.245 of the rules and it is not operating in the 904-909.750 or 919.750-928.00 MHz sub-bands; or

(b) it does not employ an outdoor antenna; or

(c) if it does employ an outdoor antenna, then if

- (1) the directional gain of the antenna does not exceed 6dBi, or if the directional gain of the antenna exceeds 6dBi, it reduces its transmitter output power below 1 watt by the proportional amount that the directional gain of the

19. Pleadings. Many petitioners agree that a safe harbor provision is necessary to provide Part 15 technologies protection against claims of interference from existing LMS licensees.³⁷ The Part 15 petitioners contend that the "safe harbor" provision as stated in the *LMS Report and Order* will shield them from interference complaints. They argue that this is the most appropriate way to facilitate the Commission's band sharing plan because LMS systems are highly susceptible to interference.³⁸ On the other hand, most LMS petitioners argue that they should be able to rebut any presumption of non-interference by Part 15 operators.³⁹ If not, they argue, a large class of Part 15 devices will be immune from complaints of interference to multilateration licensees. They also contend that such result would be contrary to the secondary status of Part 15 devices.⁴⁰

20. Discussion. We hereby clarify that if Part 15 devices operate within the "safe harbor" provision they will be deemed not to cause harmful interference to LMS operators. In addition, this provision applies to all LMS licensees, including existing and grandfathered licensees. In the *LMS Report and Order*, we stated that a definition of what shall constitute harmful interference from amateur operations or unlicensed Part 15 devices to multilateration LMS systems would promote the cooperative use of the 902-928 MHz band.⁴¹ We noted that this "safe harbor" approach would promote effective use of the 902-928 MHz band by the various services through

antenna
exceeds
6dBi;
and

(2) either

(A) the antenna is 5 meters or less in height above ground; or
(B) the antenna is more than 5 meters in height above ground but less than or equal to 15 meters in height above ground and either:

(i) adjusts its transmitter output power below 1 watt by $20 \log(h/5)$ dB, where h is the height above ground of the antenna in meters;
or
(ii) is providing the final link for communications of entities eligible under Subparts B or C of Part 90 of the rules.

³⁷ CellNet Petition at 3; Part 15 Coalition Petition at 12-13; MobileVision Petition at 13; Pinpoint Petition at 23; Uniplex Opposition at 2.

³⁸ Metricom/SCE Opposition at 7; CellNet Opposition at 5-7; ATA Opposition at 5-6; Connectivity for Higher Learning Opposition at 4-6.

³⁹ MobileVision Petition at 13; Pinpoint Petition at 23; SBMS Petition at 9; Teletrac Petition at 6.

⁴⁰ Pinpoint Petition at 7; SBMS Petition at 11; Teletrac Opposition at 4; MobileVision Opposition at 9-10.

⁴¹ *LMS Report and Order*, 10 FCC Rcd at 4715, ¶ 36.

establishing the parameters under which such devices may operate without risk of receiving complaints of interference from service providers with a higher allocation status. Based on the technical diversity of the numerous existing LMS systems and the multiplicity of Part 15 devices that eventually will be placed in operation, we previously concluded that some interference problems would remain unresolved under our rules.⁴² As a result, we determined that by providing multilateration LMS system operators a means of recourse by way of complaint to the Commission only when a Part 15 device is not operating in the "safe harbor," the vast majority of equipment and services would be able to operate successfully in this band. Although the multilateration LMS system operators will not be able to file a complaint with the Commission where the Part 15 user has satisfied the "safe harbor" provisions, the Commission encourages LMS operators to resolve the interference by modifying their systems or by obtaining the voluntary cooperation of the Part 15 user. We disagree that such a result is inconsistent with the secondary status of Part 15 devices under our Rules. Rather, we believe our approach will assure the efficient and equitable use of the 902-928 MHz band.

C. Technical Issues

1. Emission Mask Specification

21. Background. In the *LMS Report and Order*, we required that licensees' emissions be attenuated by at least $55 + 10 \log(P)$ dB at the edges of the specified LMS subbands.⁴³ The band edges for multilateration systems where emissions must be attenuated are 904, 909.75, 919.75, 921.75, 927.50, 927.75 and 928 MHz. If the 919.75-921.75 and 921.75-927.25 MHz subbands were aggregated by a single licensee, the emission mask limitations at the band edges at 921.75 and 927.50 MHz may be ignored. The band edges for non-multilateration systems where emissions must be attenuated are 902, 904, 909.75 and 921.75 MHz. These emission limitations were designed to assure that multilateration and non-multilateration systems will not interfere with each other and that operations below 902 MHz and above 928 MHz are protected.⁴⁴

22. Pleadings. The LMS Providers contend that the emission mask adopted in the *LMS Report and Order* is "flawed and makes multilateration LMS impractical and economically unattractive."⁴⁵ MobileVision argues that "the inability to meet the specification is not a technical deficiency of a specific provider but is a consequence of the physical laws governing the processes involved in multilateration LMS systems."⁴⁶ The LMS Providers propose a modification of the

⁴² *Id.* at 4716, ¶ 37.

⁴³ *Id.* at 4744, ¶ 98. This rule is reflected in new rule §90.209(m).

⁴⁴ *Id.* at 4695, ¶ 98.

⁴⁵ LMS Providers 8/22/95 Letter.

⁴⁶ MobileVision Petition at 10.

present emission mask specification that they believe strikes an appropriate compromise.⁴⁷ They assert that their proposed emission mask should not inhibit the operation of non-multilateration systems, and the emission levels outside of the multilateration LMS sub-bands would be below the field strength levels permitted under Part 15 of the Commission's Rules for operation within the 902-928 MHz band.⁴⁸ The proposed emission mask specification is as follows:

For LMS wideband emissions, operating in the 902-928 MHz band, in any 100 kHz band, the center frequency of which is removed from the center of authorized sub-band(s) by more than 50 percent up to and including 250 percent of the authorized bandwidth: The mean power of emissions shall be attenuated below the maximum permitted output power, as specified by the following equation but in no case less than 31dB:

$$A = 16 + 0.4 (P-50) + 10\log B \text{ (attenuation greater than 66dB is not required)}$$

where A= attenuation (in decibels) below the maximum permitted output power level

P= percent removed from the center of the authorized sub-band(s)

B= authorized bandwidth in megahertz

23. On the other hand, CellNet, a Part 15 operator, objects to the relaxation of the emission mask specification, contending that the potential for interference to Part 15 devices will be increased if the emission mask requirements are relaxed.⁴⁹ Hughes contends that the attenuation used in the formula proposed by the LMS Providers would be insufficient to protect adequately against interference in the portion of the spectrum band set aside for non-

⁴⁷ LMS Providers 8/22/95 Letter. The LMS Providers also propose to modify LMS narrowband forward link emissions as follows:

The power of any emission shall be attenuated below the transmitter power (P), in accordance with following schedule:

- on any frequency outside the authorized sub-band and removed from the edge of the authorized sub-band by a displacement frequency (fd in kHz): at least $116 \log_{10} ((fd + 10)/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 70 decibels, whichever is the lesser attenuation. A minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used when showing compliance.

⁴⁸ Letter from Teletrac, MobileVision, PentaPage, and Pinpoint to William F. Caton, Acting Secretary, FCC, dated July 26, 1995.

⁴⁹ CellNet Opposition at 4.

multilateration systems.⁵⁰ Thus, Hughes proposes a variation of the LMS multilateration parties' formula that requires greater attenuation. Hughes argues that this is necessary to avoid significant risk of interference in the non-multilateration band.⁵¹ The Part 15 Coalition contends that there is no justification for relaxing the emission mask standard.⁵² TIA opposes the justification used by the LMS Providers to modify the emission mask specification.⁵³ TIA points out that the LMS Providers' proposal is very similar to Sections 21.106(a)(2) and 94.71(c)(2) of our rules, which specify emission limits for the Domestic Public Fixed Radio Services and Private Operational Fixed Microwave Service, respectively.⁵⁴ Further, TIA contends that in fixed services, the emission is but one of several ways to prevent interference, while in mobile services emission masks and power limits are the primary forms of interference control.⁵⁵ It contends that while it may be appropriate to base the limits of LMS wideband emissions on the limits that apply to high-speed digital microwave transmissions, "it is not reasonable that the LMS specification should be less stringent than the fixed microwave specification."⁵⁶

24. Discussion. We find that the LMS Providers have shown that the single emission mask we adopted in the *Report and Order* to cover all LMS operations in the 902-928 MHz band is not appropriate for multilateration LMS systems. In fact, the LMS Providers have stated that none of their various multilateration systems, either existing or proposed, can comply with the existing mask and still achieve a commercially marketable level of locating accuracy.⁵⁷ Additionally, the LMS providers have persuaded us that an emission mask similar to the one applicable to narrowband PCS channels is more appropriate for narrowband forward link equipment operating in the spectrum between 927.250 MHz and 928 MHz.

25. Therefore, we will not apply the existing mask to equipment used for wideband multilateration links, either forward or reverse, in the three subbands 904-909.75 MHz, 921.75-927.25 MHz and 919.75-921.75 MHz, or to equipment used for narrowband forward links in the spectrum between 927.25 and 928 MHz. Instead we will adopt two additional emission masks, both essentially the same as proposed by the LMS Providers, that will apply to

⁵⁰ Hughes Opposition at 12, Figure 1.

⁵¹ *Id.* at 13, Figure 2.

⁵² Part 15 Coalition Opposition at 16.

⁵³ TIA Comments at 8.

⁵⁴ *Id.* at 7. See 47 C.F.R. §§ 21.106(a)(2) and 94.71(c)(2).

⁵⁵ *Id.* at 8.

⁵⁶ TIA Comments at 8.

⁵⁷In order to comply with the existing mask, multilateration equipment would have to operate at a lower "chipping rate," which would significantly reduce the accuracy of multilateration systems.

this equipment.⁵⁸ All other equipment to operate in the LMS will remain subject to the emission mask we adopted in the *Report and Order*. We emphasize that this modification of the emission mask is based on the band plan and Part 15 interference criteria specified in the *Report and Order*. Petitions for reconsideration of the band plan and Part 15 interference criteria will be addressed in a future reconsideration order. Our decision to rely on current rules for purposes of resolving the emission mask issue is not to be taken as an indication that we will not consider modifications to the band plan or Part 15 interference criteria on reconsideration.

26. Although these new emission masks are less stringent than the one we adopted in the *Report and Order*, they do require a greater attenuation of out-of-band emissions than was considered to be required for multilateration systems operating under the interim rules. We further believe that these masks are adequate to prevent interference to non-multilateration systems. While TIA is correct that these new masks are less stringent than those for fixed microwave links, we do not agree with TIA that the masks for LMS multilateration systems must necessarily be more strict than for fixed microwave links.⁵⁹ These two services are very different and the expectations of potential interference must also be considerably different -- one is a highly coordinated fixed microwave service in exclusively allocated spectrum and the other is a mobile multilateration system operating in spectrum shared with a multitude of other users. Also, we are not persuaded that the refinement suggested by Hughes (increasing the slope of the wideband mask) is necessary to prevent interference, and we are concerned that to adopt it might unnecessarily preclude the use of some technologies or favor one type of system over another.

2. Frequency Tolerance

27. Background. In the *LMS Report and Order* we adopted a frequency tolerance of 0.00025 percent (2.5 parts per million (ppm)) for both multilateration and non-multilateration systems. We noted that tighter frequency tolerances were justified to help reduce the potential for interference to systems operating on adjacent frequencies.⁶⁰

28. Pleadings. Hughes, TI/MFS, and AMTECH request that the Commission relax the

⁵⁸We are modifying the language the LMS Providers submitted slightly as follows: (1) to require that all measurements be made using peak power, which is more appropriate for wideband pulse emissions, rather than mean power; (2) to require appropriate instrumentation resolution bandwidths, to facilitate measurements; and (3) to drop the reference to a 250% limit on the displacement frequency factor, which has no effect on the attenuation slope, but might be misconstrued to imply that harmonic emission attenuation beyond 250% of the authorized bandwidth is not required. We have also made other non-substantive modifications to the LMS Providers' language for purposes of administrative consistency.

⁵⁹The emission mask we are adopting for LMS wideband emissions is similar in format to a mask contained in § 21.106 of our rules governing the fixed microwave service, for digital microwave emissions, in that both have an attenuation factor based on authorized bandwidth.

⁶⁰ *LMS Report and Order*, 10 FCC Rcd at 4741, ¶ 91.

frequency tolerance.⁶¹ Hughes argues that the 0.00025 percent frequency tolerance is overly restrictive for non-multilateration systems.⁶² It contends that a frequency tolerance of 2.5 ppm does not add significantly to existing means of avoiding interference between non-multilateration systems within designated subbands.⁶³ Hughes submits that since non-multilateration systems operate over relatively short ranges, the instances of coverage overlap between facilities on adjacent channels will be rare.⁶⁴

29. Hughes further alleges that the present frequency tolerance level would necessitate a significant and expensive design modification for their Vehicle to Roadside Communications (VRC) system readers. In addition, they contend that equipment changes required to conform their VRC mobile transponders to the present frequency tolerance level would be economically prohibitive.⁶⁵ If the Commission decides to maintain the present frequency tolerance level for non-multilateration systems, Hughes requests that the Commission apply the frequency tolerance level only to the reader transmitters and not to the mobile transponders, which are designed to transmit with extremely low power and only while passing in close proximity to a reader.⁶⁶

30. According to TI/MFS there are no current LMS non-multilateration systems in operation that conform to the 2.5 ppm frequency tolerance. They note that most of the non-multilateration technology operates at frequency tolerance levels no greater than 50 ppm. TI/MFS believes that the imposition of the present frequency tolerance level will have the negative effect of decreasing both available technology and potential players in the market.⁶⁷

31. Discussion. In response to the concerns raised by the non-multilateration system operators, we will impose the present frequency tolerance level of 2.5 ppm on high power fixed reader transmitters operating near the band edges, but not on mobile transponders or hand-held portable readers. We are persuaded that the significant cost of tightening the frequency tolerance for mobile transponders and hand-held readers could severely raise the cost of the devices beyond the realm of economic feasibility. Thus, Section 90.213 of our Rules will be modified accordingly.⁶⁸ We are not changing the tolerance requirement for other non-multilateration LMS

⁶¹ Hughes Petition at 9-11; TI/MFS Petition at 5-6; AMTECH Petition at 13.

⁶² Hughes Petition at 1.

⁶³ *Id.* at 11.

⁶⁴ *Id.* at 11.

⁶⁵ *Id.* at 8.

⁶⁶ *Id.* at 13.

⁶⁷ TI/MFS Petition at 5-6.

⁶⁸ *See* Appendix C.

systems or for multilateration LMS systems.

3. Type Acceptance

32. Background. In the *LMS Report and Order*, we determined that the mobile nature of most LMS transmitters and the new advanced technology that will be employed by this equipment justified strict regulatory oversight of having equipment type accepted rather than continuing to use the notification procedure. Therefore, we decided that all LMS equipment imported or marketed after April 1, 1996, including the "transmitting tags" used in certain non-multilateration systems, must be type accepted for use under Part 90 of our Rules. If, however, these units met the requirements under Part 15 of our Rules, they may have been authorized under that part and do not need to be type accepted.⁶⁹

33. Pleadings. The LMS Providers insist that because their initial emphasis under the new rules is on the preservation of grandfathered status through the construction of systems that meet the FCC's technical requirements, formal compliance with type acceptance should assume a lower priority. They request that for systems constructed after February 3, 1995, that the type acceptance requirement for multilateration LMS be extended from the current date of April 1, 1996, until 12 months after any rule on reconsideration concerning the emission mask (the "1996 Effective Date").⁷⁰ The LMS Providers also request that all LMS transmitters imported or manufactured domestically prior to the 1996 Effective Date be exempt from type acceptance regardless of whether they are used before or after the 1996 Effective Date. In addition, they ask the Commission to clarify that LMS providers may indefinitely continue to use equipment deployed prior to the 1996 Effective Date provided that it is not marketed after that date (whether the deadline is April 1, 1996 or a later date), unless the equipment is first type accepted.⁷¹

34. The LMS Providers further request that for systems constructed before February 3, 1995, the installation of non-type accepted multilateration LMS transmitters imported or manufactured domestically on or before the 1996 Effective Date should be permitted through April 1, 1998. They urge that such equipment need not be type-accepted at any time unless such a step is necessary in order to resolve interference problems that cannot otherwise be accommodated, but that such equipment must comply with the emission mask requirements by April 1, 1998. In addition, for systems constructed and placed into operation before February 3, 1995, LMS Providers would mandate that transmitters imported or manufactured after the 1996 Effective Date must be type accepted.⁷² Similarly, AMTECH believes that because some or all of the technical requirements adopted in the *LMS Report and Order* will change, presumably due to

⁶⁹ *LMS Report and Order*, 10 FCC Rcd at 4739, ¶ 88.

⁷⁰ LMS Providers 8/22/95 Letter.

⁷¹ *Id.*

⁷² *Id.*

pending petitions for reconsideration, its efforts to comply with those rules may turn out to be unnecessary. In light of this, AMTECH requests that the Commission delay the type-acceptance date at least until 12 months after final technical requirements have been adopted.⁷³

35. Discussion. We believe that the type acceptance requirements we have adopted are necessary to ensure efficient deployment of LMS to the public without causing significant interference. We recognize the concern of multilateration LMS operators that they may experience difficulty in meeting the construction deadline if they must comply with type acceptance requirements. To alleviate this concern, the Office of Engineering and Technology has committed to process type acceptance applications within 40 days of receipt. Further, we have in this item extended the construction deadline.⁷⁴ Thus, we conclude that compliance with these type acceptance requirements should not impede a licensee's efforts to meet the build-out deadline. We note that constructed multilateration LMS systems must also meet type acceptance requirements after September 1, 1996.

36. With respect to non-multilateration systems, we recognize that these systems contain a substantial amount of embedded equipment with numerous users, particularly state and local governments. Thus, non-multilateration system operators will be able to continue operation of current equipment until replacement is needed. However, if non-multilateration system operators decide either to build new systems or replace existing equipment on or after September 1, 1996, the new equipment must comply with type acceptance by April 1, 1998.⁷⁵ Because non-multilateration LMS systems do not present a significant potential for interference, we believe that this decision will minimize the disruption, if any, to existing operations.

4. Site Relocation

37. Background. In the *LMS Report and Order*, we allowed LMS licensees to modify their applications to comply with the new band plan. In this connection, we stated that an alternate site must be within two kilometers (km) of the site specified in the original license.⁷⁶

38. Pleadings. The LMS Providers contend that the two kilometer restriction is unworkable due to the upcoming April 1, 1996, deadline for preserving grandfathered status. They argue that competition for wireless facilities has caused many sites to become unavailable or unsuitable for LMS use. They also note that site surveys and negotiations are time-consuming and in many cases replacements within the 2 km radius either do not exist or are unavailable.

⁷³ AMTECH Petition at 15-16.

⁷⁴ See *supra* ¶ 8.

⁷⁵ To the extent that this decision is inconsistent with March 22, 1995, letter sent by Rosalind K. Allen, Chief of the Commercial Wireless Division, Wireless Telecommunications Bureau, FCC, in response to Mark IV Industries', February 15, 1995, request to clarify some type acceptance issues, that letter is hereby overruled.

⁷⁶ See *LMS Report and Order*, 10 FCC Rcd 4728 at ¶ 63.

Thus, the LMS Providers propose that the Commission instead allow replacement sites within a ten-mile radius.⁷⁷

39. Discussion. We are unpersuaded by the argument of the LMS Providers. In the *Third Report and Order* in GN Docket No. 93-252,⁷⁸ we utilized two kilometers as the benchmark for determining whether an application for a site change of a CMRS facility is to be treated as a modification application or an "initial" application for the purpose of determining eligibility for competitive bidding procedures.⁷⁹ The LMS Providers have failed to demonstrate adequately that a different benchmark should apply in the LMS context. Thus, we will continue to place a 2 km restriction on replacement sites for LMS systems. We reiterate, however, that our decision here to use a 2 km replacement site restriction does not indicate that we have determined the regulatory status of multilateration LMS systems (*i.e.*, whether LMS is a Commercial Mobile Radio Service (CMRS)). We will review the regulatory status of multilateration LMS systems in our forthcoming *Memorandum Opinion and Order*.

III. CONCLUSION

40. We believe that the clarifications and modifications adopted in this Order will facilitate the timely construction of LMS systems. We have strived to fairly balance the diverse interests of the parties involved, keeping in mind our objective of allowing for the continued growth of LMS services and advancing Congress' goal of developing an intelligent transportation system infrastructure. At the same time, we have attempted to ensure that amateur operators and Part 15 users will be able to share this band with LMS providers without substantial disruption to their operations.

IV. PROCEDURAL MATTERS AND ORDERING CLAUSES

41. The Final Regulatory Flexibility Analysis, as required by Section 604 of the Regulatory Flexibility Act of 1980,⁸⁰ is set forth in Appendix B.

42. IT IS ORDERED that, pursuant to the authority of Sections 4(i), 302, 303(r), and 332(a)(2) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 302, 303(r), and 332(a), the rule changes specified in Appendix C are adopted.

43. IT IS FURTHER ORDERED that the rule changes set forth in Appendix C WILL

⁷⁷ LMS Providers 8/22/95 Letter, *supra*, n.25.

⁷⁸ See Implementation of Sections 3(n) and 332 of the Communications Act- Regulatory Treatment of Mobile Services, *Third Report and Order*, GN Docket No. 93-252, 9 FCC Rcd 7988 (1994) (*CMRS Third Report and Order*).

⁷⁹ *Id.* at 8415, ¶356.

⁸⁰ 5 U.S.C. §604.

BECOME EFFECTIVE 30 days after publication in the Federal Register, except for Sections 90.203(b)(7) and 90.363(d). Sections 90.203(b)(7) and 90.363(d) ARE EFFECTIVE upon adoption of this Order on Reconsideration.⁸¹

44. IT IS FURTHER ORDERED THAT the petitions for reconsideration filed by the parties listed in Appendix A ARE GRANTED to the extent discussed herein, and DENIED to the extent discussed herein. Those issues not resolved by this *Order on Reconsideration* will addressed in a future *Memorandum Opinion and Order*.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

⁸¹Sections 90.203(b)(7) and 90.363(d) extend the type acceptance and construction deadlines, respectively, from April 1, 1996, to September 1, 1996. As such, these rules relieve a restriction and are not subject to the 30 days' notice requirement of the Administrative Procedure Act (APA). *See* 5 U.S.C. § 553(d)(1). Moreover, the Commission finds good cause to make these rules effective on less than 30 days' notice to prevent the former type acceptance and construction deadline of April 1, 1996, from taking effect. *See* 5 U.S.C. § 553(d)(3).

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

FCC 95-41

In the matter of)
)
Amendment of Part 90 of the) PR Docket No. 93-61
Commission's Rules to Adopt)
Regulations for Automatic)
Vehicle Monitoring Systems)

REPORT AND ORDER

Adopted: February 3, 1995

Released: February 6, 1995

By the Commission: Commissioner **Quello** concurring and issuing a statement;
Commissioner Barrett dissenting and issuing a statement; Commissioners Ness and Chong
issuing separate statements.

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I. INTRODUCTION

1. In this Report and Order, we adopt rules for the future licensing and continued development of a number of services and equipment using the 902-928 MHz band. In recent years, Automatic Vehicle Monitoring (**AVM**) systems and unlicensed Part 15 devices have developed and proliferated in this band and are providing services that are valuable and in the public interest. These services range from licensed vehicle location and automatic toll collection systems to unlicensed devices used for utility meter reading and inventory control. Our allocation plan for the **902-928** MHz band includes 8 MHz of additional spectrum for AVM services and establishes new provisions for governing the interference obligations of Part 15 and amateur operations in this band. This plan balances the differing operational needs of these varied types of uses so that most AVM systems and Part 15 devices will be able to achieve their service objectives without impeding each other's use of the spectrum. We also modify and eliminate outdated regulations that have not kept pace with the technological evolution of AVM and establish a new service, the Location and Monitoring Service (**LMS**), that both encompasses the old AVM service and future advanced transportation-related services.

2. A key feature of our new spectrum allocation plan is the establishment of separate sub-bands for licensed LMS uses. We have provided three sub-bands for exclusive licensing of **wideband** "multilateration" LMS systems in addition to two sub-bands for the sharing of narrowband "non-multilateration" LMS systems. Subject to grandfathering certain existing AVM licensees, mutually exclusive applications for multilateration LMS licenses in the three sub-bands will be resolved through competitive bidding. We also clarify the status of licensed systems in the **902-928** MHz band in relation to other uses of the band, with distinctions made for amateur radio and unlicensed Part 15 users operating under certain, specified parameters. The new band plan, combined with the provisions for continued amateur and unlicensed Part 15 operation, will allow efficient and competitive use of the spectrum. Our decisions herein also provide certainty for all users of the band so they can invest in the equipment and facilities necessary to bring quality, low cost services to consumers.

II. BACKGROUND AND EXECUTIVE SUMMARY

3. The Commission initiated the AVM service in 1974, when it adopted its **Report and Order** in Docket No. **18302**.¹ In the **1974 Order**, we found that AVM had the potential to accommodate a number of important functions, such as tracking and monitoring large fleets of vehicles and providing information to allow more **efficient** use of vehicles through better dispatch and routing information.² **We also noted that AVM systems had already been**

¹ Report and Order, Docket No. **18302**, 30 RR **2d** 1665 (1974) (**1974 Order**).

² **Id.**

operating for several years on an experimental and developmental basis, allowing us to gain valuable information regarding advances in AVM **technology**.³ While recognizing the technological progress made by **AVM**, we concluded that development of new vehicle monitoring technologies was also likely in the future, making it inadvisable to adopt permanent rules until more information was available regarding the viability of such new technologies. **Accordingly**, we decided to provide for the licensing of AVM systems on both a permanent and a developmental basis under "interim" rules.⁴ These rules have remained in effect until now.

4. Our 1974 AVM rules provide for licensing of AVM systems in the 903-912 and **918-927** MHz bands, as well as in several bands below 512 MHz. While little licensing of AVM has **occurred** below 512 MHz, there has been significant AVM use of the 900 MHz bands in recent years. Existing AVM systems in these bands generally fall into one of two broad technological categories: multilateration systems and non-multilateration systems. Multilateration systems use spread-spectrum technology to locate vehicles (and other moving objects) with great accuracy throughout a wide geographic area. This technology is used, for example, by trucking companies to locate and track their vehicle fleets, by municipal governments to pinpoint the location of their buses,⁵ and by entrepreneurs who are developing subscriber-based, stolen vehicle recovery **systems**.⁶ Non-multilateration systems use narrowband technology to transmit data to and from vehicles passing through a particular location. This technology is now providing valuable services to state and local governments operating various types of automated toll collection systems -- with an estimated 500,000 cars currently served by such systems⁷ -- and by the railroad industry in the monitoring of their

³ The Commission first licensed **AVM** on a developmental basis in **1968**. In 1972, the Commission sought additional information on the development of AVM since its **original inquiry** and proposed to adopt rules for **permanent** licensing. **See** Further Notice of Inquiry and Notice of Proposed Rule Making, Docket No. 18302, 35 FCC 2d 692 (1972).

⁴ **1974 Report and Order** at para. 5.

⁵ **See** Joe Dysart, *Bus 54, Where are You? Automatic Vehicle Locator System Used by Baltimore Mass Transit Administration*, Mass Transit (July 1991).

⁶ **See** Teletrac petition at 614.

⁷ Moshe Ben-Akiva *et al*, *The Case for Smart Highways; Intelligent Vehicle-Highway Systems*, Technology Review (July 1992) (noting that electronic toll collection devices have already been **implemented** in Dallas, Oklahoma and Louisiana); Terry Sweeney, *Wireless Net to Keep Traffic, Tolls Flowing*, Communications Week (Feb. 8, 1993) (describing plans for a California toll collection system, which is expected to reduce traffic, fuel costs and air pollution). Drivers simply purchase an electronically encoded tag that allows them to drive at a normal speed through the toll station. Electronic readers transmit a radio signal to passing cars, debit@ the tag or recording the identification of the tag for monthly billing. **Id.**; *For Whom the Card Tolls*, Electronics (July 25, 1994) at 9 (noting that 500,000 cars take advantage of automated toll systems).

systems' railway cars.⁸

5. It is expected that in the coming years both types of LMS systems will play an integral role in the development and implementation of the variety of radio advanced transportation-related services, known as "Intelligent Vehicle Highway Systems" (M-IS) or "Intelligent Transportation Systems" (ITS).⁹ The ITS is a collection of advanced radio technologies that promise to improve the efficiency and safety of our nation's highways, reduce harmful automobile emissions, promote more efficient energy use, and increase national productivity.¹⁰ For example, it is anticipated that ITS systems will increase traffic mobility and efficiency by notifying motorists of traffic delays and recommending alternate routes, adjusting the settings of traffic signals to prevent anticipated traffic jams, and providing navigational assistance to direct a car to its destination according to the most efficient route. ITS warning systems can also be used to notify drivers of impending collisions (or even take control of the vehicle to avoid a collision), and display electronic traffic and safety signals on a car's windshield when poor weather conditions impair drivers' vision of road-side signs. It is estimated that ITS will help reduce air pollution caused by automobiles and will cut wasteful fuel consumption. Traffic congestion, which costs the United States \$100 billion annually in lost productivity, will also be minimized by innovative ITS traffic management technologies. Finally, ITS is expected to create new economic and employment opportunities. Not all of these services, however, require or rely on the use of the 902-928 MHz band.

6. To recognize the expected growth of ITS, this **Report and Order** creates a new subpart in Part 90 for Transportation Infrastructure Radio Services (**TIRS**). The Location and Monitoring Service (**LMS**), which uses the **902-928** MHz band, constitutes the first service contained within the **TIRS** category. As we allocate additional spectrum or create new services intended to further the efficiency of the nation's transportation **infrastructure**,

⁸ See also, comments of **Amtech** Corporation (**Amtech**) at 3-5; Mark IV **IVHS** Division (Mark IV) at 1; and Hughes Aircraft Company (Hughes) at 4.

⁹ The term "Intelligent Vehicle Highway System (**IVHS**)" refers to the collection of advanced radio technologies that, among other things, is intended to improve the efficiency and safety of our nation's highways. Recently, both government and industry entities have begun referring to these technologies by the term "Intelligent Transportation System (**ITS**)."

¹⁰ See **Intermodal** Surface Transportation Efficiency Act of 1991, Pub. L. No. **102-240**, § **6052(b)**, **105 Stat. 1914, 2189** (1991) (**ISTEA**); H.R. Rep. No. **171(I), 102d** Cong., 1st **Sess.** 11 (1991), *reprinted in* 1991 U.S. Code Cong. & Admin. News 1537; **IVHS** America, Strategic Plan for Intelligent Vehicle-Highway Systems **III-31-III-35** (May 1992) (**IVHS** Strategic Plan). **ISTEA** calls for the development of a national **IVHS** program employing advanced traffic management systems, advanced traveler information systems, advanced vehicle control systems, commercial vehicle operations and advanced public transportation systems. **ISTEA** at §§ 6053-58. Congress also imposed reporting requirements to monitor the progress made in developing and implementing the **IVHS** program. *Id.*

these new services will likely be regulated under the **TIRS**.¹¹ The **TIRS** will thus further Congress's goal of encouraging ITS by providing an organized and unified approach towards regulating spectrum for ITS-related services. Today's creation of the **TIRS** clearly demonstrates this agency's commitment to the continued integration of radio-based technologies into the nation's transportation infrastructure and our commitment to the development and implementation of the nation's intelligent transportation systems of the future.

7. AVM systems share their portion of the 902-928 MHz band with other **users**.¹² The band is allocated on a primary basis for use by Government radiolocation systems and Industrial, Scientific, and Medical (**ISM**) equipment, with Government fixed and mobile operations secondary to these users.¹³ Amateur Radio Service licensees operate in the entire band, but on a secondary basis to the ISM, Government and **AVM** users. Part 15 uses are permitted in this band, but are secondary to all other uses, including **AVM** and amateur operations.

8. In 1989 and 1990, we also modified our rules to permit enhanced operation of spread spectrum-based radio devices throughout the **902-928** MHz band on an unlicensed basis, pursuant to Part 15 of our Rules.¹⁴ Since modifying our rules to provide for enhanced Part 15 operations, a large number of equipment manufacturers and entrepreneurial companies have developed radio devices and implemented radio systems employing **spread-spectrum** technology in the 902-928 MHz band. It is estimated that several million Part 15 devices have been sold and are being used every day to provide a wide variety of valuable services to the American public. For example, consumers are now able to purchase cordless telephones operating in the band offering high quality voice **operations**,¹⁵ wireless local area networks are being implemented in offices and buildings to enable tetherless voice and data

¹¹ We recently adopted two proceedings that suggest potential spectrum allocations for **ITS-type** operations. In the Notice of Proposed Rule Making in ET Docket No. 94-32, we suggest the possible allocation of the 2390-2400 MHz or the 2300-2310 MHz bands for short range **ITS** services **and in** ET Docket No. 94-124, we suggest providing 3.2 GHz of spectrum (47.2 - 47.4 GHz, 76-77 GHz, 94.7-95.7 GHz, and 139 -140 GHz) for ITS-related automobile radar technologies.

¹² AVM services are allocated the 903-912 and 918-927 MHz portions of the **902-928** MHz band and are licensed on a shared basis.

¹³ For additional information on Federal Government use in this band see Federal Government Spectrum Usage in the 902-928, 2400-2500, and 5725-5875 MHz Bands. This document is available from the National Technical Information Service, Springfield, VA, 22161, NTIS No. PB 93176739.

¹⁴ See *Report and Order*, **Gen.** Docket No. 87-389, 4 FCC **Rcd** 3493 (1989) and *Report and Order*, **Gen.** Docket No. 89-354, 5 FCC **Rcd** 4125 (1990).

¹⁵ See Comments of the Consumer Electronics Group at 4.

transmission,¹⁶ and utility companies are now able to read residential utility meters from the street or remote locations using Part 15 radio devices.¹⁷ In addition to the enormous benefits to both businesses and consumers that will result from the continued growth in the use of the Part 15 industry, our nation's economy also benefits due to the continued development of **these** new, advanced radio technologies by American **companies**.¹⁸

9. On May 28, 1992, North American Teletrac and Location Technologies (Teletrac) filed a Petition for Rule Making requesting that we adopt permanent rules for licensing AVM systems.¹⁹ On March 11, 1993, in response to Teletrac's petition, we adopted the **Notice of Proposed Rule Making (Notice)** in this proceeding to examine the future licensing and continued development of AVM systems.²⁰ In the **Notice**, we proposed to replace the existing interim rules for AVM with permanent rules. We also proposed to expand the technical parameters of the service to permit locating and monitoring of people and objects, as well as vehicles, and therefore proposed to rename the service as the Location and Monitoring Service (**LMS**). Additionally, we proposed to allocate the entire **902-928** MHz band for **LMS**, with separate allocations for multilateration LMS systems and **non-**multilateration LMS systems. We proposed that all LMS systems operate on a shared basis.

10. **In response to our Notice**, we received numerous comments and reply comments from LMS service providers, LMS licensees that use **LMS** systems to meet their own internal needs (such as railroad companies and local government entities), LMS users, manufacturers and users of Part 15 equipment, and Amateur operators. We solicited further comments and reply comments in response to **ex parte communications we received**.²¹ Commenters offered a wide array of suggestions on the many complex issues raised in the **Notice**. Although we are adopting many of the proposals set forth in our **Notice**, the comprehensive record developed in this **proceeding** has led us to modify some of our proposals, especially as they concern the spectrum available for the different types of LMS systems, the licensing procedures for the band, and the general obligations of various users of the band.

¹⁶ **See e.g.**, Comments of **Cylink**.

¹⁷ **See** Ex Parte Comments of **Cellnet** dated March 15, 1994, at 2.

¹⁸ **See** Comments of Symbol Technologies at 34.

¹⁹ RM-8013, filed May 28, 1992, and placed on Public Notice June 23, 1992, Report No. 1897. Teletrac's request was primarily **directed** at the tentative nature of "interim" rules as well as the exclusivity of AVM licenses.

²⁰ Notice of Proposed Rule Making, PR Docket No. **93-61**, **8 FCC Rcd.** 2502 (1993).

²¹ **See** Public Notice, DA 94-129, PR Docket No. 9361, 59 Fed.Reg. 7239 (February 15, 1994).

11. Multilateration and non-multilateration **LMS** systems, amateur operations, and Part 15 devices will all play an important role in providing **valuable** services to the American public **in** the coming years. We believe that our decisions in this proceeding recognize this importance and **will enable all** of these services to make continued use of this spectrum. As detailed in our later discussion, commenters representing each of these services indicate the need for varying amounts of spectrum and varying degrees of interference protection from each other's operations in the band. We have therefore developed a spectrum plan that attempts to accommodate all of these users' requirements. The plan: 1) continues to permit secondary operations by unlicensed Part 15 and amateurs across the entire band, but affords users in these services a greater degree of protection to their operations; 2) enables **non-multilateration** LMS systems to operate on **spectrum** separate from multilateration systems; and 3) allocates spectrum on an exclusive basis for multilateration LMS licensees.

12. **In this Report and Order** we have therefore made the following decisions:

- Change the name of this service from the Automatic Vehicle Monitoring (**AVM**) to the Location and Monitoring Service (**LMS**) (see paragraph 1).

- Change the terminology used to refer to the two general categories of **LMS** technologies from "wideband" and "narrowband" to "multilateration" and "**non-multilateration**," respectively, (see paragraph 14).

- Permit multilateration LMS systems to locate any object -- animate or inanimate -- ancillary to their primary vehicular location and monitoring services (see paragraph 24).

- Permit LMS systems to transmit **and** receive status and instructional information, both non-voice and voice, related to the location and monitoring of a mobile unit and permit LMS systems to interconnect with the Public Switched Network (**PSN**) on a restricted basis (see paragraphs 26-27).

- Expand LMS license eligibility to all entities eligible to be licensed under Part 90 of our Rules and allow service in the **902-928** MHz band to be provided by LMS licensees to both individuals and the Federal Government on a commercial basis to paying subscribers. (see paragraph 28).

- **Clarify** what constitutes harmful interference to multilateration licensees by **unlicensed** Part 15 devices and amateur operations (see paragraphs 35-36).

- **Allocate an additional 8 MHz of spectrum in the 902-928 MHz band for LMS** use, permitting the entire band to be used for this purpose. Adopt a spectrum allocation scheme for the **902-928** MHz band that assigns separate sub-bands for multilateration and non-multilateration operations as follows (see paragraphs 46-49):

<u>Band (MHz)</u>	<u>System License</u>
902.000 - 904.000	Non-multilateration
904.000 - 909.750	Multilateration
909.750 - 919.750	Non-multilateration
919.750 - 921.750	Multilateration and Non-Multilateration
921.750 - 927.250	Multilateration
927.250 - 928.000	Multilateration²² .

■ License exclusive multilateration LMS systems within each Major Trading Area (MTA)²³ and four additional MTA-like service area? in the three sub-bands designated above, and resolve mutually exclusive applications through competitive bidding (see paragraphs 50-57).

■ Grandfather base stations of multilateration system licensees authorized as of February 3, 1995 and constructed and in operation by April 1, 1996 (see paragraphs 61-64).

■ License non-multilateration systems on a shared basis in the three sub-bands designated above (see paragraphs 69-70).

■ Allow multilateration licensees to commence operations only after demonstrating interference with Part 15 operations is **minimized** (see paragraphs 81-82).

²² This is not considered a separate sub-band. Each licensee in the 904.000-909.75 MHz, 919.750-921.750 MHz and **921.750-927.250** MHz sub-bands will obtain a narrowband assignment at the top of the **902-928** MHz band for forward link operations, as follows: 927.250-927.500 MHz for the 921.750-927.250 MHz band; **927.500-927.750** MHz for the **919.750-921.750** band; and **927.750-928.000 MHz** for the 904-909.750 band.

²³ Rand McNally organizes the 50 states and the District of Columbia into 47 **MTAs**. See Rand-McNally Commercial Atlas and Marketing Guide, 3639, (123d ed. 1992). **PCIA** and Rand McNally have recently entered into an **agreement regarding** the use of Rand McNally's market area designations (i.e., Basic Trading Areas (**BTAs**) and Major Trading Areas (**MTAs**) for the licensing of various mobile radio services. LMS is not covered by this agreement. The listings of the Major Trading Areas, **including** the counties, **parishes and** census divisions that comprise each **MTA**, are available for public **inspection** in the Office of Engineering and Technology's Technical Information Center, 2nd **Floor, 2000** M Street, N.W., **Washington, D.C.**

²⁴ The four additional regions are: (1) Guam and the Northern **Mariana** Islands; (2) the Commonwealth of Puerto Rico **and** the U.S. Virgin Islands; (3) **American** Samoa; and (4) Alaska will be treated as a single area **separate** from the Seattle MTA. This is consistent with our MTA-based service area definitions for **broadband** PCS (see 47 C.F.R. § 24.102) **and** for the Commercial Mobile Radio Services.

III. DISCUSSION

A. Definitions

13. In the Notice, we characterized **LMS** systems as “wideband” and “**narrowband**.” A number of commenters, including Mark **IV**, Hughes, **Amtech**, and Pinpoint, suggest that **LMS** systems should be categorized as either “wide-area” or “local-area” rather than as “wideband” or “narrowband.”²⁵ These commenters state that because some “narrowband” systems require a bandwidth in excess of 2 MHz it would be inappropriate to categorize these systems as narrowband. Teletrac opposes such a change in terminology, claiming that it would be difficult to distinguish wide-area/local-area systems without reference to a specific coverage **standard**.²⁶

14. While we agree that the **wideband/narrowband** terminology used in the Notice is imprecise and could be misleading, we believe that **characterizing** systems as “wide-area” or “local-area” could also lead to confusion because not all LMS systems have predetermined service contours. Therefore, to address commenters’ concerns, we shall refer to “wideband” pulse ranging systems as “multilateration” systems, and we shall refer to “narrowband” systems as “non-multilateration” systems. We define **multilateration** systems as systems that are designed to locate vehicles or other objects by **measuring** the difference of time of arrival, or difference in phase, of signals transmitted from a unit to a number of fixed points or **from** a number of fixed points to the unit to be located. We define non-multilateration systems as systems that employ any technology other than multilateration technology to transmit information to and from vehicles. Unlike a multilateration AVM system, which determines the location of a vehicle or object somewhere over a wide area, a typical **non-multilateration** AVM system uses an electronic device placed in a vehicle to transfer information to and/or from that vehicle. When the vehicle passes near one of the system’s stations, the station transmits an interrogating signal. The interrogating signal is then either modulated with **unit-specific** information and reflected back to the station’s receiver or the tag transmits its own signal in response to the interrogation. By dividing LMS into the broad multilateration and non-multilateration categories, we adopt a definitional framework that is flexible enough to accommodate all operational modes LMS is anticipated to evolve towards.

²⁵ See Mark **IV** comments at n.2; Hughes **comments** at 6-7; **Amtech** comments at n.3; **Pinpoint** comments at n. 3.

²⁶ Teletrac reply comments at 31-33.

B. Permanent LMS Operation in the 902-928 MHz Band

15. In addition to the current allocation within the 902-928 MHz band for AVM, this band is currently allocated for Industrial, Scientific, and Medical (ISM) equipment,²⁷ radiolocation, fixed and mobile by the Federal Government,²⁸ amateur operations,²⁹ and unlicensed operation of devices under Part 15 of the Rules.³⁰ In addition, we have initiated a proceeding exploring the possibility of making the middle portion of the 902-928 MHz band available for non-government wind profiler radar systems.³¹ Because of the diversity of services that share this band, many commenters observe that changes in the rules that relate to one group of users could affect the other users of the band. A number of commenters further argue that it is premature to adopt permanent rules for LMS systems because many LMS system operators, Part 15 users, and amateur operators are implementing new technologies.³² Other commenters urge us to take additional time to study the relative merits of the various services, devices, and technologies; still others argue that changes in the rules should be delayed to permit creation of a technical committee to study the sharing of the band among its various users.³³ Relatedly, the American Radio Relay League (ARRL) filed a petition for rule making, dated January 13, 1994, requesting a primary allocation of 902-904 and 912-918 MHz for the Amateur Radio Service.³⁴

16. Notwithstanding these concerns, we believe that delaying implementation of permanent rules for LMS systems could jeopardize the continued development of this service. Although a number of companies have already developed LMS systems and are on the verge

²⁷ See 47 C.F.R. § 18.305.

²⁸ See 47 C.F.R. § 2.106.

²⁹ See 47 C.F.R. § 97.301.

³⁰ See 47 C.F.R. §§ 15.243, 15.245, 15.247 and 15.249.

³¹ See Notice of Proposed Rule Making and Notice of Inquiry, Amendment of section 2.106 of the Commission's Rules to Allocate Spectrum for Wind Profiler Radar Systems, (NPRM/NOI), ET Docket 93-59, 8 FCC Rcd 2546 (1993).

³² See generally comments of the Telecommunications Industry Association (TIA); the Part 15 Coalition (Coalition); Spectralink, the North American Telecommunications Association (NATA); the Domestic Automation Company (DAC); Itron, Inc. (Itron); Symbol Technologies, Inc. (Symbol); Telxon Corporation (Telxon); Thomson Consumer Electronics (Thomson); Norand Corporation (Norand); and American Radio Relay League, Inc. (ARRL).

³³ Coalition comments at 12; Interdigital comments at 6-7; Spectralink comments at 5; Uniplex comments at 2; and TIA comments at 5.

³⁴ The Petition for Rule Making filed by the American Radio Relay League & cause it involves matters that are under consideration in this docket, was accepted as Comments in this proceeding.

of making services widely available, they argue that uncertainty about possible changes in our rules has deterred or prevented them from committing greater capital or obtaining **financing**.³⁵ In addition, LMS equipment manufacturers, state and local government entities, toll road operators, and Part 15 manufacturers and users require regulatory certainty. Further postponement of final decisions regarding our LMS rules would make it **difficult** for users of the band to plan the long-term development of their products or **services**.³⁶ Establishing permanent rules for LMS will also provide opportunities for new entrants into location and monitoring businesses. Accordingly, we find that it is in the public interest and consistent with Commission precedent to adopt permanent rules for location and monitoring services.

17. A number of other commenters argue that even if permanent rules are adopted, the Commission should find a permanent home for some or all LMS systems in another frequency band. For example, Lockheed, a manufacturer of narrowband LMS equipment, **argues that the 902-928 MHz band is an inappropriate place for LMS systems and proposes use of the 5.8 GHz band.** Saab requests an exclusive allocation in the 24502470 MHz band for an Electronic Toll and **Traffic Management (ETTM) Service** claiming that this is neither a narrow-band nor a wide-band LMS service.³⁷ The Part 15 Coalition also suggests that **LMS services be moved to the 2390-2400 MHz band that is part of the 50 MHz transferred to the FCC by NTIA.**³⁸ Other commenters suggest that we should restrict or eliminate multilateration LMS systems in the **902-928 MHz band** and instead promote alternative location technologies such as Global Positioning Satellite (GPS), **LORAN**, dead reckoning, or cellular **systems**.³⁹

18. We conclude not only that the **902-928 MHz band** should continue to be made available for LMS services, but that the 8 MHz within the band not previously allocated to AVM should also now available for LMS. Although prior AVM operation in the band has **occurred** under interim rules, we have always regarded the band as a permanent home for

³⁵ **See**, for example, Ex **Parte** Comments of **MobileVision** dated August 12, 1994 at 2.

³⁶ Teletrac **comments** at 4; **MobileVision** reply comments at 3.

³⁷ SCG **comments** at 3-5; **Sensormatic** comments at 17-20; Part 15 Coalition comments at 13-15; **Saab-Scania Combitech** (Saab) comments at 11; and Lockheed comments a 4. **ETTM** systems do fall into the "non-multilateration" LMS category (**see para. 14 supra.**) and as such are adequately **accommodated** in our **licensing** plan.

³⁸ Comments of the Part 15 Coalition at 8-9; Further Comments of the Part 15 Coalition.

³⁹ AT&T comments; **TIA** comments at 24; and **NATA** comments at 11-13.

AVM.⁴⁰ The 903-912 and **918-927** MHz segments of this band are currently the only spectrum specifically allocated for AVM use and there exists no other low-cost, **consumer-oriented** spectrum where AVM service providers operate their systems without facing concerns similar to those present in this band. The **902-928** MHz band is ideally suited for location services due to the propagation characteristics of the band that permit widespread coverage of a market area without the use of an inordinate number of base stations. In addition, while some commenters argue that GPS or terrestrial-based communications systems with location capabilities are more spectrally efficient," we are not persuaded that LMS should be eliminated from the **902-928** MHz band on this basis. The alternative technologies put forward by commenters have disadvantages as well as advantages in comparison to LMS. For example, GPS and LORAN-based systems used in fleet tracking permit a vehicle to determine its location, but a separate communications link is required to transmit this information back to a dispatch location. Similarly, **Lojack, Inc. (Lojack)** manufactures a vehicle location system that operates on a single channel in the 170 MHz band, but this system requires use of **direction-finding** antennas to locate the vehicle. By contrast, multilateration LMS systems use larger amounts of spectrum, but can both receive "**fixes**" on large numbers of vehicles and transmit messages back to such vehicles from a central source -- all within one integrated system.

19. We further conclude that the public will be best served by expanding the current AVM allocation of 18 MHz to include an additional 8 MHz so that LMS will be permitted to use the entire **902-928** MHz band. This will allow development of diverse LMS services and technologies. LMS providers are already developing systems with differing capacities, and future designs may surpass the capacity of systems available today. In addition, we believe that developing a diversity of LMS services is important to promote competition and continued technological advances. Promoting alternative technologies will provide consumers choices of a variety of locating services, enabling them to address their individual communications needs. The demand and need for greater capacity, capability and alternatives will grow. Thus, providing additional spectrum for LMS systems within the **902-928 MHz** band allows for development of the full scope of location and monitoring techniques.⁴²

⁴⁰ In the Report and Order in Docket 18302, we stated that the interim nature of the rules was to allow continued development of AVM systems under a flexible licensing arrangement and to allow the rules to be fine tuned as additional **information** is gained regarding the operation of various types of **AVM** systems. Report and Order, Docket No. 18302, at **paras. 5 and 10, 30 RR 2d 1665** (1974).

⁴¹ See Comments of the Portland Amateur Radio Club (PARC), Technology Radio Amateur Club (TRAC), the Part 15 Coalition, **Spectralink** Corporation (Spectralink), American Telephone and Telegraph Company (AT&T), and **NATA**.

⁴² See Report and Order, Docket No. 18302 at **para. 10, 30 RR 2d 1665** (\$4).

C. Eligibility and Permissible Uses

20. As discussed in the Notice, LMS systems have the potential to offer a wide array of services that go beyond the mere tracking of **vehicles**.⁴³ We therefore proposed to expand the permissible uses of LMS to include the location of all animate and inanimate **objects**.⁴⁴ In addition, we proposed expanding the types of entities eligible to acquire LMS service to include individuals and the Federal Government,” and we proposed to allow LMS service to be rendered on a for-profit basis.⁴⁵ We requested comment on whether these proposals to expand eligibility and permissible uses would create unacceptable congestion of the 902-928 MHz band.”

21. In response to the Notice, providers of multilateration LMS services contend that there are significant potential public benefits to expanding LMS beyond vehicle location **alone**.⁴⁶ Southwestern Bell Mobile Systems (SBMS) urges that the **definition** of LMS be further expanded to permit messaging and data **transmissions** to **fixed** units and units for which location and monitoring is not being **provided**.⁴⁷ Additionally, certain multilateration providers have requested that it be made clear that LMS will be permitted to provide interconnected service to the public switched network (**PSN**).⁴⁸ Other commenters, however, such as IVHS America and the United States Department of Transportation (DOT), argue that LMS should remain primarily a vehicle-oriented service, with an emphasis on **ITS-related communications**.⁴⁹ Part 15 manufacturers and users and amateur operators also **contend** that expansion of the possible uses of LMS will result in more intensive use of the band, thus leading to severe spectrum **congestion**.⁵⁰

⁴³ Notice 8 FCC **Rcd** 2502, 2503 (1993).

⁴⁴ Id. at para 9.

⁴⁵ Id. at para. 7.

⁴⁶ &at para. 8.

⁴⁷ Id.

⁴⁸ Teletrac comments at 9-10; **MobileVision** comments at 4143; SBMS comments at 3-7; and Location Services **comments** at 6.

⁴⁹ SBMS **comments** at 3-7.

⁵⁰ Ex Parte Comments of **MobileVision**, Teletrac and Uniplex dated December 12, 1994, at 2.

⁵¹ M-IS America **comments** at 16; DOT reply **comments** at 15.

⁵² See comments of **Sensormatic** Electronics (Sensormatic); TIA; the Part 15 Coalition; Interdigital Communications (**Interdigital**); Spectralink; **NATA**; DAC; **Itron**; **Symbol**; **Telxon**; Thomson; **Norand**; the Alarm Industry Communications Committee (Alarm Industry); ARRL; PARC;

22. Commenters **also** express diverse views on whether LMS licensees should be allowed to provide for-profit service. SBMS and Southern California Gas Company (**SCG**) support offering multilateration LMS as a subscriber-based private radio **service**.⁵³ **MobileVision** also supports permitting LMS licensees to provide services to paying subscribers, stating that such licensing “recognizes the massive capital cost incumbent in deploying the type of extensive **infrastructure** required for an LMS system of appropriate scope and scale to effectively **serve** a market.”⁵⁴ On the other hand, the American Radio Relay League (ARRL) and the Part 15 Coalition oppose allowing multilateration LMS licensees to provide subscriber-based service.”

23. We recognize the concerns of the Part 15 and amateur communities that the expansion of permissible uses of the LMS service will result in more intensive use of the 902 - 928 MHz band. Unfettered interconnection and messaging in the LMS could not only increase the potential for harmful interference to other users of the band, but detract from the intended purpose of the LMS allocation. Based on these concerns, we conclude that while a limited expansion of potential applications of LMS is **warranted**, operational restrictions should be imposed to **maintain** the coexistence of the many varied users of the band. We **find** therefore that it is appropriate to impose: 1) limitations on the provision of **non-vehicular** location services; 2) restrictions on messaging services and interconnection and; 3) a prohibition against message **and** data **transmissions** to **fixed** units and units for which location and monitoring is not being provided. We believe that these restrictions strike an equitable balance between the needs of LMS service providers and those of the Part 15 users and manufacturers and amateur operators, and additionally ensure that LMS systems are utilized primarily for location service and not as a general messaging or interconnected voice or data service. To ensure compliance with these restrictions, we may request, and licensees shall supply, whatever records or information necessary to demonstrate that these provisions are being followed.

24. Accordingly, we will allow non-vehicular location services to be rendered only by multilateration LMS systems whose **primary** operations involve the provision of vehicle location services. This limited expansion of permissible LMS uses recognizes the general capability of multilateration systems to cover a wide area and perform location determinations for any type of object within that area. We believe that non-multilateration systems, however, should continue to be used for vehicle monitoring only because the

and **TRAC**.

⁵³ **See Comments** of SBMS dated June 29, 1993, at 4; and Comments of **SGC** dated June 29, 1993, at 2-3 (“private carrier” support, but outside of **902-928** MHz).

⁵⁴ **MobileVision** Comments dated **June** 29, 1993, at **40-41**.

⁵⁵ **See** Comments of ARRL dated June 29, 1993, at 11-12; and **Comments** of the Part 15 Coalition at 16.

spectrum they occupy has a heavier concentration of amateur radio operators, Part 15 devices and Federal Government radiolocation operations than other portions of the band. We are concerned that permitting non-multilateration systems to provide this additional service will cause more intensive use of the sub-band, to the detriment of these other users.

25. While we expand the potential applications of LMS as described above, we decline to allow LMS to be used for the type of messaging proposed by Southwestern Bell. We agree with numerous commenters who argue that creating such a broad messaging and data service would be an inappropriate use of this **spectrum**.⁵⁶ The LMS service is a mobile location and monitoring service. We do not intend to expand use of this band so that it becomes primarily a **fixed**, point-to-multipoint or point-to-point messaging service. Our rules make adequate provision elsewhere for this type of communications.” The 902-928 MHz band, however, is the only allocation for location services that provides **sufficient** spectrum to accommodate the types of advanced location and monitoring systems currently being implemented. Although there are other methods and spectrum available to determine the location of a unit, these other methods do not offer the same capabilities or potential as systems developed in the **902-928 MHz band**.⁵⁸

26. We do not intend for this service to be used for general messaging purposes. Accordingly, we will require that all messaging be associated with the location or monitoring of the vehicle or unit. We will permit communications necessary to provide accurate, timely and complete status and instructional information relating to the vehicle being located or the occupant(s) of the vehicle, including voice communications. Thus, LMS systems will be permitted to transmit status and instructional messages, either voice or non-voice, so long as they are related to the location or monitoring functions of the system. We find that such use of **LMS** will be invaluable to the implementation of ITS of the **future**.⁵⁹

⁵⁶ **TIA comments** at 6; Interdigital comments at 3; Alarm Industry comments at 7; **Ademco** comments at 4; Consumer Electronics Group of the Electronic Industry Association (**EIA/CEG**) **comments** at 5; and Proxim, Inc. (Proxim) comments at 3. Uniplex notes that the **NPRM** requires that messages be related to the unit being located but urges that tighter restrictions be placed on messages, Uniplex comments at 3.

⁵⁷ **See generally**, Parts 21 and 94 of our Rules, 47 C.F.R. Part 21 and 94.

⁵⁸ **See para.** 18, **supra**.

⁵⁹ Both **IVHS** America and DOT **emphasized** the need for sufficient communications capacity to implement ITS services, including Advanced **Traffic** Management Systems, Advanced Traveler Information Systems, Advanced Vehicle Control Systems, Commercial Vehicle Operations, and Advanced Public Transportation Systems. **See** comments of **IVHS** America and DOT. **See also** Strategic Plan for Intelligent Vehicle Highway Systems in the United States, prepared by **IVHS** America. **Implementation** of such an array of ITS services will require substantial **communications** capacity and a combination of various technologies to provide **sufficient location** and traffic management information in many different circumstances.

27. In addition, we will permit limited **LMS interconnection**.⁶⁰ We will permit “store and forward” interconnection, where either (1) **transmissions** from a vehicle or object being monitored are stored by the **LMS** provider for later transmission over the PSN, or (2) **transmissions** received by the **LMS** provider from the PSN are stored for later transmission to the vehicle or object being monitored. We will not permit real-time interconnection between vehicles or objects being monitored and the PSN, except for emergency communications related to a vehicle or a passenger in a **vehicle**.⁶¹ Additionally, the vehicle or object being monitored may only send or receive real-time interconnected communications to or from entities eligible in the Public Safety or Special Emergency Radio **Services**⁶² or a system dispatch point. Finally, the requirement discussed above that all messages be associated with the location or monitoring of the vehicle continues to apply. We believe these limitations on interconnection will serve to impede the proliferation of interconnected voice and data communications by **LMS** systems while also providing them the flexibility to better serve the subscribers to the **service**.⁶³

28. Finally, we **find** it in the public interest to allow LMS licensees to make service available to individuals and the Federal Government in addition to Part 90 eligibles. This step will effectively enable LMS operators to serve all members of the public, thus increasing the potential for the public to benefit from the expansion of ITS services. In addition, because many LMS systems will entail construction of extensive **infrastructure** over wide geographic areas, we also find it in the public interest to permit LMS to be offered to paying subscribers. By **permitting** LMS offerings to be **structured** as commercial **subscriber-based** service, we afford licensees a realistic means of underwriting system development.

D. Accommodation of **Secondary** Users in the **902-928** MHz Band

29. As **noted** above, there are **currently** five separate user groups sharing the **902-928** MHz band. In addition, the relative hierarchy among these users is well established. The **902-928** MHz band is allocated for primary use by the Federal Government for Radiolocation, Fixed and Mobile services and by users of **Industrial, Scientific, and Medical (ISM)** devices. Use of the **spectrum** by government fixed and mobile and AVM **systems** is secondary to both of these uses. The **remaining users of the 902-928 MHz band, licensed** amateur radio operators and users of Part 15 equipment, operate on a **secondary** basis to all

⁶⁰ We note that Part 15 devices performing functions similar or identical to those of licensed **LMS operations are not restricted from interconnecting with the PSN**.

⁶¹ **Emergency** communications may include information about a medical condition that **requires** immediate attention or the mechanical breakdown or **failure** of an automobile.

⁶² **See 47 C.F.R. Part 90, Subparts B and C. This would also permit “911” interconnection** where this service is available.

⁶³ **See** Ex Parte Comments of **MobileVision** dated **December 14, 1994**, at **5-6**.

other uses, including **AVM**. In the Notice, we requested comment on whether LMS systems would be able to share the band with these other classes of users. The Notice also sought comment on whether a warning label should be **required** on LMS instruction manuals, operator manuals, and brochures to warn potential **LMS** users that **LMS** systems are secondary to Federal Government users and to ISM equipment? The Notice also requested comment on potential alternatives to LMS sharing with other user categories, “short of removing Part 15 users and amateur operations from the band, restricting where such users could operate in the band, or placing stricter limitations on the operation of such users in this band.”⁶⁵

30. The Federal Government and ISM users did not comment on sharing of the band, and LMS manufacturers and users generally did not express concern about continued sharing of the spectrum with either the Federal Government or ISM equipment. The American Radio Relay League (ARRL), however, **requests** that we provide a primary allocation in a portion of the **902-928 MHz** band for amateur **operations**.⁶⁶ The Interagency Group requests that LMS systems providing electronic toll **and** traffic management (**ETTM**) services be given co-primary status with Federal Government and ISM users, claiming that this is required to “instill confidence” in **ETTM** users that their long-term use of this band is **assured**.⁶⁷ We do not believe that these considerations warrant disturbing the primary status of Federal Government and ISM operations in relation to other uses of the band. Therefore, under the rules adopted today, LMS licensees **will** continue to operate on a secondary basis to Federal Government users and ISM equipment. Further, we **conclude** that no primary allocation for amateur operations in the requested sub-bands is **warranted**. Although the ARRL states that there has been “rapid increases in amateur **use**”,⁶⁸ that “the **Amateur** Radio Service is increasingly looking to the **902-928 MHz band**,”⁶⁹ and that “amateur use of the band has been growing”,⁷⁰ the only quantitative support that it provides is that there are 16 known manufacturers of amateur equipment for this band and that there are 20 amateur stations in

⁶⁴ Notice at **para. 24**, **8 FCC Rcd. 2502, 2506** (1993).

⁶⁵ **8 FCC Rcd 2502, 2506-2507** (1993), as revised by Erratum, **8 FCC Rcd 3233** (1993).

⁶⁶ See footnote 34, supra. The ARRL requests a primary allocation in the 902-904 MHz and 912-918 MHz bands. Also, by letter to **Chairman, Reed E. Hundt**, dated October 4, 1994, ARRL asks that the Commission not extend any substantive accommodation for Part 15 entities that is not extended as well to the Amateur service.

⁶⁷ Interagency Group **comments** at 11-12.

⁶⁸ **ARRL Petition for Rule Making** at 3.

⁶⁹ ARRL Petition for Rule **Making** at 10.

⁷⁰ ARRL Petition for Rule Making at 9.

Rochester, New York using the band.” There are, on the other hand, a large number of various uses of this band with quantitatively **known** combined (and competing) requirements. They include the existence of more than 4 million Part 15 devices and 500,000 **non-multilateration** LMS tag readers. **ARRL’s** petition thus fails to adequately justify a change in the allocation status for the Amateur Radio Service in any portion of this band.

31. In the Notice, we proposed that a warning label be required on all LMS instruction manuals, operator manuals, and brochures to warn potential LMS users that **LMS** systems are secondary to Government radiolocation and to ISM equipment and that, as a result, such systems may suffer from “undesired operation.” Notice at **para. 24**, 8 FCC **Rcd.** 2502, 2506 (1993). We have decided not to require such a warning label. Many wireless telecommunications systems operate on spectrum that is also allocated for other uses and are susceptible to varying degrees of interference. We generally do not place warning labels on these systems. To do so in this instance might unfairly label **LMS** as an inferior service to other similarly-situated services, quite possibly deterring growth of the service and reducing the likelihood of prompt public benefit from its use. Moreover, LMS providers have an inherent incentive to **minimize** the deleterious effects of interference to provide reliable service and to attract and retain a loyal customer base. We do warn **LMS** licensees and users, however, that many LMS systems in the 902-928 MHz band will be sharing the band with one another, and operating on a secondary basis to Federal Government users and ISM equipment. Systems operating in such an environment are always subject to the possibility of interference, and must comply with our criteria for co-channel sharing where applicable.

32. The relationship between LMS, especially multilateration systems, and Part 15 uses of the **902-928** MHz band presents more complex issues, as the comments indicate. There are millions of Part 15 devices in operation throughout the United States today and this number is expected to increase in the future. Because Part 15 devices operate at extremely low power and each has a limited area of operation, the record indicates that they can coexist more easily with non-multilateration LMS systems, which also operate with relatively short **range**.⁷² Conversely, Part 15 commenters generally contend that they will not be able to effectively share the spectrum with multilateration LMS systems.” These commenters believe that Part 15 devices and **multilateration** LMS cannot coexist in the same band because the high power multilateration **transmissions** will overpower and desensitize their low power,

⁷¹ ARRL Petition for Rule Making at note 18.

⁷² Ex Parte **Comments** of **Amtech** dated **March 29, 1994**, at 8-9.

⁷³ **See** Ex Parte Comments of Ademw dated March 15, 1994 at 5-11; Ex Parte Comments of Part 15 Coalition dated August 12, 1994 at 3; Ex Parte Comments of the Ad Hoc Gas Distribution Utilities Coalition dated August 12, 1994 at 7; Ex Par&e Comments of **Itron** dated August 12, 1994 at 1.

unlicensed operations.” Additionally, Part 15 commenters believe that with **unrestricted** use of high power services, the noise floor will increase throughout the band. They claim that this increase of noise in the band, without a limitation in the power and location of the multilateration **transmissions**, would make their sensitive receivers -- which must accurately detect low-power signals -- obsolete and unusable anywhere in the 902-928 MHz **band**.⁷⁵ Multilateration **LMS** commenters argue that operation of some Part 15 devices is likely to cause harmful interference to LMS systems. Examples of potential interference sources identified by multilateration operators include anti-shoplifting field disturbance sensors that operate under Section 15.245 of the rules and certain video links that operate under Section 15.249 of the **rules**.⁷⁶ Multilateration parties also contend that harmful interference is likely to be caused by Part 15 devices that either transmit continuous signals or transmit from antennas placed at relatively high out-of-doors elevations. On the other hand, multilateration proponents do not believe that interference is likely to be received from any other type of Part 15 operations?

33. Commenters have suggested a number of solutions to mitigate potential harmful interference, including 1) limiting the permissible uses for the LMS service, 2) moving the LMS service to another band, 3) elevating Part 15 devices to w-equal status with LMS systems, 4) retaining existing rules until a joint technical committee can be established to study the feasibility of sharing, and 5) giving amateur operators primary status in a part of the **band**.⁷⁸ In ex parte comments **filed** in mid-August 1994, some LMS commenters discussed additional alternatives for continuing to allow Part 15 operations in the 902-928 MHz **band while seeking to minimize** possible interference to **LMS** operations. These commenters focused on establishing thresholds that would determine whether Part 15 devices were causing harmful interference to **LMS** systems, based on criteria such as field strength limits, height of outdoor antennas used by Part 15 devices, the directional gain of antennas associated with Part 15 devices, and the **existence** of field disturbance sensors operating under Section 15.245 of our rules.⁷⁹ Part 15 commenters, however, had little, if any,

⁷⁴ See Ex Parte Comments of the Part 15 Coalition dated August 12, 1994, at 4.

⁷⁵ See e.g., Ex Parte Comments of **Cellnet & KNOGO** dated **August 19, 1994**, at 3.

⁷⁶ Letter from **AirTouch** Teletrac, Pinpoint Communications, **Inc.**, Uniplex and **MobileVision**, L.P., to Ralph A. **Haller, Chief**, Private Radio Bureau, dated June 23, 1994.

⁷⁷ See ex parte comments of Teletrac, **MobileVision**, Pinpoint and Uniplex, dated June 23, 1994 at 5.

⁷⁸ See Ex Parte Comments of **Metricom** and Southern California Edison Company dated August 12, 1994 at 4; Ex Parte Comments of Symbol Technologies at 34; Ex Parte Comments of Part 15 Coalition dated August 12, 1994 at 6-7; Petition for Rule **Making** filed by the American Radio Relay League (ARRL) on January **13, 1994** at 1.

⁷⁹ See Further Comments of **AirTouch** Teletrac, **MobileVision** and SBMS dated August 12, 1994.

support for these types of interference threshold **criteria**.⁸⁰

34. We recognize the important contribution to the public that both Part 15 technologies and amateur operators provide in the **902-928** MHz frequency band. For example, Part 15 devices currently operating in the 902-928 MHz band provide **valuable** services such as automated meter reading, inventory control, package tracking and shipping control, alarm services, local area networks, and cordless telephones. These devices allow businesses to operate more effectively and efficiently, without the regulatory complexities of many licensed services. The amateur service is used by technically inclined private citizens world-wide to engage in self-training, information exchange, and radio experimentation. It is at the forefront of communications technology and has been instrumental in the development of land mobile systems, hand held radios, and satellite communications. In times of disaster when normal communications are disrupted, amateur systems often alert the world to the disaster and provide assistance in relief operations. By the actions in this proceeding we seek to **maximize** the ability of Part 15 and amateur operations to coexist with the operation of **LMS** systems.

35. We also conclude that effective sharing of this band between amateur and Part 15 users and multilateration **LMS** systems does not require a change in the relative status between these two allocations and uses, as some parties have suggested. Rather, we have decided to balance the equities and value of each use without undermining the established relationship between unlicensed operations and licensed services. Thus, we affirm that unlicensed Part 15 devices in the **902-928** MHz band, as in any other band, may not cause **harmful** interference to and must accept interference from all other operations in the **band**;⁸¹ persons operating unlicensed Part 15 devices have no vested or recognizable right to continued use of any given frequency;” and finally, an operator of an unlicensed Part 15 device is **required** to cease operations upon notification by a Commission representative that the device is causing harmful interference and may not resume operations until the condition causing the harmful interference has been **corrected**.⁸³ Furthermore, the amateur radio service will retain its status as a licensed, secondary service.

⁸⁰ **See Ex Parte Comments** of ADEMCO, Axxon Corp., C&K Systems, Gas Utilities, **ITRON, Metricom & Southern** Cal Edison, **NavGuard/Summit** Telewm, Sensormatic, Symbol Technologies, Tatung Telewm, Teatherless Access, TIA, Uniplex Corp., **Utilicom**, UTC, **WINFORUM and WISE** Communications, August 1994.

⁸¹ 47 C.F.R. § 15.5(b).

⁸² 47 C.F.R. § 15.5(a).

⁸³ 47 C.F.R. § 15.5(c).

36. Amateur **and Part 15** operations will continue to be secondary to services with a higher allocation status. They may continue to operate as their licenses and/or the rules permit. To accommodate their concerns about their secondary status in light of multilateration LMS, however, we are adopting rules that define and clarify what constitutes harmful interference from their secondary operations. **Harmful** interference is **defined** as **"(a)ny** emission, radiation or induction that endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with this chapter."⁸⁴ To promote cooperative use of the 902-928 **MHz** band we are elaborating on this standard to define what is **not harmful** interference **from** both amateur operations and **unlicensed** Part 15 devices to multilateration LMS systems. This "negative definition" will promote effective use of the 902-928 MHz band by the various services by clearly establishing the parameters under which licensed Amateurs and unlicensed users of Part 15 devices may operate without risk of being considered sources of harmful interference to services with a higher allocation status. Part 15 and amateur operators who voluntarily operate within the following parameters will not be subject to harmful interference complaints from multilateration **LMS** systems at 902-928 MHz. Thus, we are adopting rules that provide that a Part 15 device will **not** be deemed to be causing interference to a multilateration LMS system if it is otherwise operating in accordance with the provisions of 47 C.F.R. Part 15 and it meets at least one of the following conditions:

- (a) it is a Part 15 field disturbance sensor operating under Section 15.245 of the rules and it is not operating in the 904909.750 or **919.750-928.000 MHz sub-bands;**⁸⁵ or
- (b) it does not employ an outdoor antenna; or
- (c) if it does employ an outdoor antenna, then if
 - (1) the directional gain of the antenna does not exceed **6 dBi**, or if the directional gain of the antenna exceeds **6 dBi**, it reduces its transmitter output power below 1 watt by the proportional amount that the directional gain of the **antenna** exceeds **6 dBi;**⁸⁶ and
 - (2) either

⁸⁴ 47 C.F.R. § 15.3(m). See also 47 C.F.R. § 2.1.

⁸⁵ SBMS and **MobileVision** stated they supported this field disturbance sensor limitation as an interference determinant. See Ex Parte Comments of SBMS dated August 12, 1994, and **Ex Parte** Comments of **MobileVision** dated August 12, 1994. Multilateration entities **concur** that the majority of interference complaints from Part 15 devices **concern** field disturbance sensors and long **range** video links. See the LMS Consensus Position on Part 15 Interference dated June 22, 1994; see also the Ex Parte Letter from **Teletrac** to the Chief, **Private** Radio Bureau, dated June **21, 1994**.

⁸⁶ See 47 C.F.R. Section 15.247.

- (A) the antenna is 5 meters or less in height above ground; or
- (B) the antenna is more than 5 meters in height above ground but less than or equal to 15 meters in height above ground and either:
 - (i) adjusts its transmitter output power below 1 watt by $20 \log(h/5)$ dB, where h is the height above ground of the antenna in meters; or
 - (ii) is providing the **final** link for communications of entities eligible under Subparts B or C of Part 90 of the rules.

Amateur operations in this band meeting these same parameters concerning antenna location, gain, and height as well as transmitter output power will also not be considered as sources of **harmful** interference. Conversely, Part 15 and Amateur operations not meeting these parameters **and** seriously degrading, obstructing or repeatedly interrupting the operation of a multilateration system, will be deemed to be causing harmful interference and, thus, upon Commission notification, be required to cease operations until the condition causing the interference has been corrected. We emphasize, however, that Part 15 or Amateur use is not restricted from operating beyond these parameters. Part 15 and Amateur operations can continue to operate as long as interference is not caused and are limited only by the technical parameters contained in the rules applicable to their **respective** services.

37. We agree with SBMS that the appropriate threshold for determining that Part 15 devices are presumptively **not** causing harmful interference to multilateration LMS systems is whether they are operating above 1 watt, because 1 watt "is approximately the level at which some **current** LMS devices transmit, and is well above most cordless phones and other personal Part 15 **devices**."⁸⁷ Under our rules, the transmitter output power of a Part 15 device is not permitted to be more than 1 watt. An antenna less than 5 meters in height driven by a transmitter with 1 watt or less of output power will only affect LMS operations that are relatively close. A higher antenna, however, has the capability to affect a larger number of LMS operations. This is why, between 5 **and** 15 meters, we adopt the stated formula to adjust the Part 15 transmitter output power. This assures that between 5 and 15 meters an outdoor antenna has the equivalent effect on multilateration LMS operations of a **5-**meter antenna using no more than 1 watt transmitter output power. (We have not applied this sliding power reduction scale to devices directly serves public safety and special emergency eligibles so as to **minimize** the effect on communications involving the safety of life or property.) Height and transmitter power alone, however, are not the only components of a transmitted signal. The directional gain of the antenna also affects the radiated power, and thus the signal strength at the affected receiver. **"If a 6 dBi antenna is used, pointing in the direction of the LMS site, then the received signal level, at the LMS site, will be 6 dB higher than if a 0 dBi antenna were used."**⁸⁸ We conclude, therefore, that use of a Part 15 outdoor antenna with a directional gain of equal to or less than 6 **dBi**, or a Part 15 outdoor

⁸⁷ Ex Parte Comments of SBMS dated August 12, 1994.

⁸⁸ Ex Parte Comments of **MobileVision** dated August 12, 1994, at **Annex 1**, page 4.

antenna with a **directional gain** of greater than 6 **dBi** having a proportional transmitter output power reduction, constitutes an appropriate threshold at which there is little likelihood of desensitization of the receiver(s) at an LMS site. Finally, because multilateration entities concur that most Part 15 interference to multilateration LMS systems is likely to be from field disturbance sensors and long range video **links**,⁸⁹ we will not make any presumption of interference-free operations for these devices when they operate in exclusive-use bands.

38. In view of the technical diversity of the many LMS systems in existence and the multiplicity of Part 15 devices that will eventually be placed in operation, we conclude that the above **standards** will not provide solutions to all interference problems, and this agency may not be able to resolve all interference problems that may arise between unlicensed Part 15 and LMS systems. As such, multilateration LMS systems that experience interference from an amateur or Part 15 transmission may face two different scenarios. Under the first scenario, where the interference is from an amateur or Part 15 system operating within the parameters set forth in paragraph 36, the interference is not considered to be harmful. The multilateration LMS system experiencing the interference has no recourse by way of complaint to the Commission. It may only attempt to resolve the interference by modifying its own system or by obtaining the voluntary cooperation of the amateur operator or Part 15 user. Under the second scenario, where the interference is from an amateur or Part 15 **transmission** that does not fall within the parameters set forth in paragraph 36, the multilateration LMS system experiencing the interference may have recourse by way of complaint to the Commission if voluntary measures fail to resolve an interference **problem**.⁹⁰ To assure that our limited resources are used efficiently and effectively, the complaint must identify the exact source of the **interference**. A Part 15 user that is causing harmful interference may resolve such a complaint by **voluntarily** adhering to the parameters stated above. Alternatively, the Part 15 user causing harmful interference may choose other courses of action, including: (1) reducing power sufficiently to avoid causing harmful interference; (2) lowering antenna height sufficiently to avoid causing harmful interference; (3) changing antenna directionalization to avoid causing harmful interference; (4) any combination of 1-3; (5) reaching an accord with the complaining LMS system; or (6) terminating operations. We do not envision readily solving all interference problems because of the technical diversity of the many LMS systems in existence and the multiplicity of Part 15 devices in operation, but believe that the vast majority of equipment and services can operate successfully in this band.

39. We believe that the **procedures** described above afford the best opportunities for amateur, Part 15 and multilateration LMS operations to coexist in the 902-928 MHz frequency band.. Manufacturers of Part 15 devices whose equipment may cause harmful interference to multilateration systems may choose to restrict the operating frequency of their

⁸⁹ **See** the LMS Consensus Position on Part 15 Interference dated June 22, 1994; **see also** the Ex Parte Letter from **Teletrac** to the Chief, Private Radio Bureau, dated June 21, 1994.

⁹⁰ See footnote 210 for a discussion of the nature of harmful interference to an LMS system.

devices to the **902-904** and **909.750-919.750 MHz** sub-bands that will not be occupied by multilateration systems. Additionally, the 24002483.5 MHz band may prove to be useful to Part 15 operations that may not be accommodated successfully in the 902-928 MHz band (see discussions of the 2402-2417 MHz band in the Notice of Proposed Rulemaking in ET Docket **94-32**).

E. Spectrum Allocation Plan

40. Currently, LMS systems can be licensed on a permanent basis at 904-912 and 918-926 **MHz** and on a developmental basis at **903-904** and **926-927 MHz**.⁹¹ In the Notice, we proposed that LMS systems be licensed on a permanent basis throughout the **902-928 MHz** band, and that the band be divided into five sub-bands: **902-904**, 904-912, 912-918, 918-926, 926-928 **MHz**.⁹² We further proposed that multilateration systems be licensed in the 904-912 and 918-926 **MHz** sub-bands and that non-multilateration systems be licensed in the **902-904**, 912-918, and 926-928 MHz **sub-bands**.⁹³

41. Most entities providing or developing **LMS** systems support licensing LMS systems throughout the **902-928 MHz band**.⁹⁴ Part 15 and amateur operators **uniformly** oppose our proposal to expand LMS use to all of the **902-928 MHz** band. The Part 15 Coalition originally proposed that LMS systems be **restricted** to the existing two 8 megahertz bands and that each multilateration system be authorized for only 4 **MHz** each. Other commenters, such as **NATA, DAC, and the Alarm Industry**, propose that the total amount of spectrum for all LMS **services** be reduced to 8 **MHz**.⁹⁵ AT&T proposes that **LMS** systems be licensed only in the two 8 megahertz sub-bands **currently** allocated for LMS and that the rules be changed to eliminate multilateration systems, permitting only non-multilateration systems in the bands.”

42. Teletrac, **MobileVision**, Location **Services**, and SBMS support our proposal to

⁹¹ See Section 90.239 of the Rules, 47 C.F.R. § 90.239.

⁹² Notice at para. 15, 8 FCC Rcd 2504 (1993).

⁹³ Id.

⁹⁴ See **Teletrac comments** at 20; **MobileVision comments** at 29-32; Mark IV comments at 6; **Location Services comments** at 4-5; **AT/comm** comments; **Hughes comments** at 6-7; **Amtech** comments at 2; **Pinpoint** comments at 2-3; and **SBMS** comments at 10.

⁹⁵ **NATA** comments at 12; **DAC comments** at 14; **Alarm Industry comments** at 9.

⁹⁶ Comments of AT&T.

create separate sub-bands for multilateration and non-multilateration systems.⁹⁷ Amtech and Pinpoint advocate shared use of the entire 902-928 MHz band by both multilateration and non-multilateration systems to maximize the capacity of multilateration systems and provide sufficient spectrum for non-multilateration systems requiring larger amounts of spectrum.⁹⁸ Texas Instruments/MFS proposes that multilateration systems be allocated only one 8 megahertz sub-band and that the rest of the band be available for non-multilateration use.⁹⁹ IVHS America and the DOT support our proposed division of the band, but would also permit multilateration and non-multilateration systems to have immediate access to each other's spectrum on a secondary basis and, after six years, would allow any unlicensed spectrum to be available for primary use by either multilateration or non-multilateration systems.¹⁰⁰ Mark IV and the Interagency Group would permit only electronic toll and traffic management (ETTM) systems to have access on an equal basis with multilateration systems on the proposed multilateration spectrum.¹⁰¹ Several commenters have submitted studies to illustrate the difficulties that multilateration and non-multilateration systems would have in sharing the same spectrum.¹⁰² Only two commenters, Amtech and Pinpoint, claim that such sharing is feasible and present a detailed sharing plan.¹⁰³

43. In addition to requesting comment on the appropriate use of spectrum in the 902-928 MHz band for multilateration and non-multilateration LMS systems, we also made proposals and solicited comment on how multilateration systems, in particular, should be licensed. Specifically, we proposed that multilateration systems be licensed on a shared basis in the 904-912 and 918-926 MHz bands and that licensees be responsible for coordinating

⁹⁷ See Teletrac wmmments at 20; MobileVision wmmments at 29; Location Services comments at 5; and SBMS comments at 10 [SBMS supports further dividing the sub-bands proposed for use by multilateration systems].

⁹⁸ Pinpoint comments at 9; Amtech comments at 7-14. Amtech, in its August 12, 1994 comments, indicates that ". . . at a minimum, the rules should accommodate the use of two 6 MHz channels for read-write tags." Comments at 2.

⁹⁹ Texas Instruments Incorporated/MFS Network Technologies, Inc. (TI/MFS) wmmments at 11-13.

¹⁰⁰ IVHS America wmmments at 20; DOT reply wmmments at 16-17.

¹⁰¹ See Interagency group comments at 11-12; and Mark IV reply comments at 6-8.

¹⁰² Teletrac comments at Appendix 2; MobileVision reply comments at appendix 3.

¹⁰³ See Amtech wmmments at 17-35; and Pinpoint wmmments at 9-39. Although Mark IV supports permitting co-equal access to spectrum for multilateration and at least ETTM non-multilateration systems, it does not provide a detailed sharing plan and does not evaluate the effects that non-multilateration systems would have on multilateration systems.

among themselves to avoid interference.¹⁰⁴ We also offered an alternative that systems be licensed on an exclusive basis for five years, after which licensing would be on a shared basis with any new licensees required to protect **incumbents**.¹⁰⁵

44. Several multilateration parties oppose our proposal to license these systems on a shared basis, claiming that it is not technically or economically feasible to share spectrum on a co-equal basis with other multilateration **licensees**.¹⁰⁶ Two commenters that are developing multilateration systems, Pinpoint and Uniplex, support shared licensing, albeit on a limited basis? SBMS, while opposing shared use of spectrum for multilateration systems, would divide the two 8-megahertz bands into four 4-megahertz bands licensed on an exclusive **basis**.¹⁰⁸ The commenters agree that sharing of **spectrum** among multilateration licensees would require the use of an interference avoidance measure, such as time **sharing**.¹⁰⁹ Time sharing would reduce system capacity since it requires the use of guard bands and other additional system overhead that represent additional uses of capacity that do not contribute to the content of the message.¹¹⁰ With each addition of a new multilateration system, the quality of service provided by incumbent **operators** would **diminish** due to **increases in system** delays and time **required** for a subscriber to access the **system**.¹¹¹ In a shared environment, the multilateration interference tolerance threshold would be more likely to be violated, causing the time of arrival to be distorted for the return signal and therefore, not accurately providing location services.¹¹² Finally, if there is more than one multilateration system using the same **frequency** band, it would be extremely **difficult** to have adequate power control

¹⁰⁴ Notice at **para.** 65, 8 FCC **Rcd** 2502, 2506 (1993).

¹⁰⁵ Id.

¹⁰⁶ Comments of Teletrac at 24-39; Comments of **MobileVision** at 33-36; Comments of Southwestern Bell Mobile Systems (SBMS) at 12-14; and Comments of Location Services at 4. We hereby grant **SBMS's** Motion to Accept Supplement to Reply Comments because it serves the public interest and best ensures the proper dispatch of Commission business to develop a full and **complete** record in this **proceeding**. See 47 U.S.C. § 154(j).

¹⁰⁷ See Comments of Pinpoint at **9-20**; Ex Parte Comments of **Pinpoint** dated August 3, 1994; Ex Parte Comments of Uniplex dated September **30, 1994** (supporting Pinpoint's August 3, 1994 position).

¹⁰⁸ SBMS **comments** at **12-14**.

¹⁰⁹ See Pinpoint **comments** at 17.

¹¹⁰ See Ex **Parte Comments** of SBMS dated March 29, 1994, at 16-17.

¹¹¹ See Ex **Parte Comments** of Teletrac dated **March 15, 1994**, at **2**, Ex **Parte Comments** of SBMS dated **March 29, 1994**, at 16-17.

¹¹² See Comments of **MobileVision** at 33-4, Reply Comments of Mobile&ion at 12-13.

among users from disparate systems. Without adequate power control, overall system capacity would suffer.¹¹³ Sharing could also require the establishment of **standards** to which all of the systems would have to conform. With different technologies employed by the various systems being proposed, we are not in a position, nor are we inclined, to set such **standards**. For these reasons, we conclude that sharing in the multilateration segment of this service is neither practical nor desirable from either a technical or regulatory standpoint.

45. Some commenters also provided economic analyses of the impact of sharing on competition in the multilateration LMS market over the **long-term**.¹¹⁴ Teletrac opposed sharing, pointing to various substantial **fixed** costs and technical difficulties to argue that a market with open entry to shared spectrum would not necessarily sustain more than two **firms**. Teletrac suggested that the close coordination among licensees needed to make sharing spectrum successful could inhibit vigorous competition. Teletrac also argued that exclusive licensing would not allow licensees to exercise market power because of the availability of alternative location services. SBMS, on the other hand, argues that sharing may be economically beneficial because it would encourage competition and technical innovation. SBMS also expressed concern that exclusive spectrum assignments would make the multilateration LMS market a natural monopoly.

46. We believe that both multilateration and non-multilateration systems will play an important role in achieving a nationwide ITS **infrastructure and** that a sufficient amount of spectrum must be available to enable both types of systems to **develop**.¹¹⁵ We also agree with commenters that to enable both multilateration and **non-multilateration** systems to develop **effectively**, we should create separate allocations for the two types of systems to the extent possible.¹¹⁶ Further, we believe that, for the most part, non-multilateration systems can share **spectrum** with one another if they are separated from multilateration operations (see paragraph 66, infra). separated, as discussed earlier, we believe that there are technical, operational and economic justifications supporting our decision to provide exclusive spectrum for exclusive assignments for multilateration systems.

¹¹³ See Ex Parte Comments of SBMS dated October 19, 1994, Final Report of the Mobile and Portable Radio Research Group at 35.

¹¹⁴ See Comments of North American Teletrac and Location Technologies, Inc. (Teletrac), Reply comments of Mob&vision, L.P., Pinpoint Communications, Inc., and supplemental reply comments of SBMS.

¹¹⁵ IVHS America comments at 13-15; DOT reply comments at 12-15.

¹¹⁶ MFS/TI, in its August 12, 1994 comments suggests that multilateration use, "... even on a **secondary** basis [to non-multilateration use] would prove to be unworkable in day-today operations" and could "... present an untenable situation for non-multilateration systems with **primary** use over the band." Comments at 8 and 9.

F.¹²¹

49. The plan also accommodates the **needs** of non-multilateration systems by providing a total of 14 **MHz** for such systems rather than the 10 **MHz** of spectrum proposed in the Notice (see footnote 98, supra). Of this 14 **MHz**, 10 **MHz** is contiguous spectrum at 909.750-919.750 **MHz** that is not shared with multilateration systems, which should address the spectrum requirements of most non-multilateration systems.” In addition, **non-multilateration** systems may obtain up to a 12 **MHz** block of contiguous spectrum by also **using the 2 MHz** of spectrum at 919.750-921.750 **MHz** (Band D). Although this 2 MHz block will be shared on a co-equal basis with multilateration systems, it will nonetheless provide opportunities for non-multilateration systems that require additional spectrum to operate effectively. ¹²³

F. Geographic Areas for Exclusive Licenses

50. In the Notice, we sought comment on how to license spectrum to multilateration **LMS systems**.¹²⁴ In the Notice of Proposed Rulemaking in PP Docket No. 93-253, we asked for comment on the appropriateness of awarding **LMS** licenses through competitive **bidding**.¹²⁵ Finally, after adopting the Notice in this docket, we sought specific comment on certain alternative licensing aspects, such as the use of Basic Trading Areas (**BTAs**) in defining the license service **area**.¹²⁶

51. Teletrac favors **BTAs** over **MSAs/RSAs** for **multilateration LMS** licensing “because the coverage area customers seek for tracking and emergency services extends

¹²¹ Licensees may not be authorized to operate on more than one of the multilateration bands in a given **MTA**, except **that** they will be permitted to aggregate Bands D and G and Bands E and F.

¹²² Mark IV has indicated that its non-multilateration systems can operate in the 912-918 MHz range. Comments of Mark IV dated June 29, 1993, at 8-10. **MFS/TI** has indicated **that** “it may be Possible for AVI (non-multilateration) technologies to operate in as little as 10 **MHz** of (contiguous) bandwidth.” Comments of **MFS/TI** dated August 12, 1994, at 8.

¹²³ See Amtech comments at 9. **Amtech** states that two-way data transmission between a moving vehicle and a fixed location will require large bandwidths. See also TI/MFS ex parte comments filed December 2, 1993, at 5 and Hughes comments at 6.

¹²⁴ See Notice of Proposed Rule Making, PR Docket No. 93-61, 8 FCC Rcd 2502 (1993) at paragraph 21.

¹²⁵ See, Notice of Proposed Rule Making, PP Docket No. 93-253, 8 FCC Rcd 7635, para 145, n. 153 (1993).

¹²⁶ See Public Notice, DA 94-129, PR Docket No. 93-61, 59 Fed.Reg. 7239 (February 15, 1994).

beyond city limits to the broader metropolitan area where people are likely to commute, conduct business, or routinely **drive.**"¹²⁷ SBMS favors **MSAs/RSAs** over **BTAs** because, it claims, (1) the Commission has had favorable experience with **MSAs/RSAs** in licensing cellular systems, (2) **BTAs** do not coincide with cellular service areas, to the detriment of **cellular** entities that are would-be **LMS** providers, (3) **MSAs/RSAs** are widely known and easily ascertainable, and (4) no private party or **entity** has ever attempted to control dissemination of maps or listings which depict or define these **areas.**¹²⁸ SBMS also argues that allowing existing licensees to expand to the borders of their **BTAs** could have **anti-competitive** implications.¹²⁹ Symbol Technologies believes that choosing **BTAs** for **LMS** would result in a congruency of service areas for **LMS** and PCS that would allow **LMS** providers to be de facto PCS providers and directly compete with PCS.¹³⁰

52. We generally agree with Teletrac's view that the geographic scope of LMS systems logically correlates to areas in which there are centers of consumption of durable goods. We also find, however, that LMS has the potential to serve larger areas; vehicle location and monitoring will be useful for the individual motorist and for fleets of vehicles, and for short-range travel as well as long-range travel. For this reason, we conclude that Major Trading Areas (**MTAs**) as defined in the 1993 Rand McNally Commercial Atlas and Marketing Guide¹³¹ and four additional MTA-like service **areas,**¹³² unlike the smaller **BTAs,** provide a more suitable regulatory construct for multilateration licensing. While it is clear that multilateration systems will benefit from being centered upon areas of commerce and trade, use of **MTAs** will give systems greater capacity to accommodate large numbers of prospective users of location services. This will promote competition, encourage the advancement of new technologies, and result in better and speedier service to the public. We will thus provide for one exclusive multilateration system license in each MTA in the sub-bands **identified** for exclusive assignments (i.e., Bands B and H, D and G, and E and **F**). Multilateration licensees on these exclusive assignments will be allowed to construct stations anywhere within their **MTAs,** subject to technical and operational considerations discussed in paragraph 87-98, infra.

¹²⁷ Comments of **PacTel** Teletrac dated **March 15, 1994,** at 8.

¹²⁸ Comments of SBMS dated **March 15, 1994,** at 5. SBMS makes reference to "**PCIA, Rand McNally Settle Out-of-Court On Use of BTA/MTA Listings,**" **Washington Telecom Week,** February 18, 1994, at 2-3.

¹²⁹ Comments of SBMS dated **March 15, 1994,** at 14-16.

¹³⁰ Comments of Symbol Technologies, Inc. in Response to the Public Notice of February 9, 1994, at 7-8 (note 9).

¹³¹ See footnote 23, supra.

¹³² See footnote 24, supra.

G. Competitive Bidding for Exclusive Multilateration LMS Licenses

53. In response to the Notice of Proposed Rule Making in PP Docket No. 93-253, we received comment on the issue of whether mutually exclusive applications for AVM systems should be resolved by competitive bidding.¹³³ Teletrac and SBMS oppose use of competitive bidding to license in this service. These parties contend that the statutory requirement that auctionable spectrum be exclusively assigned and principally used to serve paying subscribers is not met because LMS operations are secondary to ISM and Federal Government use of the band. Amtech and Pinpoint, who oppose competitive bidding for LMS licenses for other reasons, argue that LMS's secondary status does not in and of itself statutorily preclude competitive bidding.

54. In the Second Report and Order in PP Docket No. 93-253, we concluded that it was premature to authorize competitive bidding for AVM systems during the pendency of PR Docket No. 93-61, because "the likelihood of mutually exclusive applications" was unknown or was debated by the commenters.¹³⁴ However, in light of our decision to grant exclusive multilateration LMS licenses within three sub-bands, and because they will be used to offer for-profit, subscriber-based services, we conclude that competitive bidding should be used to grant exclusive licenses where mutually exclusive applications are accepted for filing. Use of competitive bidding in such cases meets the general statutory criteria for auctioning licenses set forth in Section 309(j)(2) of the Act.¹³⁵ The statute permits auctions where: (1) mutually exclusive applications for initial licenses or construction permits are accepted for filing by the Commission; (2) the principal use of the spectrum will involve, or is reasonably likely to involve, the receipt by the licensee of compensation from subscribers in return for enabling those subscribers to receive or transmit communications signals utilizing the licensed frequencies; and (3) the public interest objectives of Section 309(j) would be served by subjecting mutually-exclusive applications in the service to competitive bidding."

55. We conclude that the above requirements are satisfied, thus making competitive bidding available for licensing within certain band segments. First, in accordance with the statute, the licensing scheme we adopt herein allows for mutual exclusivity among applicants for initial licenses. Specifically, we have rejected the option of allowing multilateration LMS

¹³³ Several commenters to that proceeding oppose grant of non-multilateration licenses by competitive bidding. See, e.g., Comments of Hughes Transportation Management, Interagency Group and Amtech.

¹³⁴ See Second Report and Order, PP Docket No. 93-253, 9 FCC Rcd 2348, 2351-2, (1994).

¹³⁵ See 47 U.S.C. § 309(j)(2). See also H.R. Rep. 111, 103d Cong. 1st Sess. 254 (1993).

¹³⁶ A comprehensive discussion of these principles for determining whether licenses may be auctioned is set forth in the Second Report and Order in PP Docket No. 93-253, 9 FCC Rcd 2398 (1994) at paras. 11-67.

systems to operate in an unlimited shared use environment and have instead decided to grant only one licensee the use of each of three sub-bands for multilateration LMS in each MTA. (see paragraphs 4446, **Wera**) do not believe that the likely existence of some grandfathered AVM multilateration operations alters this conclusion. See **para. 61, infra**. **Because** no more than one multilateration licensee will be permitted in any single sub-band in an MTA (hereinafter “MTA licensee”), we anticipate that mutually exclusive applications will be filed. We also conclude that the use of the spectrum by other services does not preclude the applicability of the competitive bidding process. Shared spectrum for which we exclude competitive bidding is “where mutual exclusivity between applications cannot exist because channels must be shared by multiple licensees.. . . [W]e proposed to exclude these services from competitive bidding because there can be no mutual exclusivity.”¹³⁷ That is not the case here, where in all likelihood there will be mutually exclusive applications for each exclusive MTA license. The relevant statutory prerequisite, as set forth in Section 309(j) of the Budget Act, is that “mutually exclusive applications are accepted for filing.” This standard does not require that the relevant spectrum be completely unoccupied by other services.

56. Second, as the statute requires, the “principal use” of the spectrum is reasonably likely to involve MTA licensees receiving compensation from subscribers in return for those subscribers receiving or transmitting signals. We have concluded that this requirement allows us to evaluate classes of licenses, rather than individual licenses, in determining the “principal use” of spectrum.¹³⁸ Thus, while MTA licensees may be secondary in the band to government and ISM operations, the “principal use” test, as we have interpreted it, permits us to conclude that the principal uses of multilateration LMS are **primarily** subscriber-based offerings.¹³⁹

57. In addition, we believe that use of a competitive bidding procedure for the licensing of these services satisfies the public interest objectives for auctioning set forth in Section **309(j)(3)** of the Act. Specifically, use of competitive bidding to award MTA licenses, as compared to other licensing methods, will speed the development and deployment of new services to the public with minimal **administrative** or judicial delays, and encourages efficient use of the spectrum as **required** by Section 309(j)(A) and **(D)**. Furthermore, in accordance with Section **309(j)(3)(B)**, we believe that competitive bidding will promote access to multilateration services and technologies and **disseminate** licenses among a wide variety of applicants by encouraging participation by all interested or qualified bidders. Finally, we conclude that competitive bidding will recover for the public a portion of the value of the

¹³⁷ **In** the Matter of Implementation of Section **309(j)** of the **Communications Act – Competitive Bidding**, Second Report and Order, PP **Docket** No. **93-253**, 9 **FCC Rcd** 2348 at **para. 13** (1994).

¹³⁸ **See** Second Report and Order in PP Docket N. 93-253, FCC **94-61**, 9 **FCC Rcd** 2348 at **para. 34** (1994).

¹³⁹ Comments of Pinpoint at 5; Comments of SBMS at 4.

spectrum, as envisioned in Section 309@ (3)(C). Specific rules and procedures for competitive bidding for **this** spectrum, including rules and **procedures** for designated entities, will be established in a separate proceeding. We will not accept applications for multilateration LMS licenses until after these rules and **procedures** have been established.

H. Construction Period for LMS Systems

58. In the Notice, we proposed that LMS systems be constructed and placed in operation within eight months of the date a license is granted, which is the current **standard** for **AVM** licensees under Part 90.¹⁴⁰ The majority of **commenters** that addressed this issue support our proposal so long as provision is made for extended implementation periods for local governments or especially large and complex **systems**.¹⁴¹ **MobileVision** supports a five-year construction period with **construction benchmarks** for multilateration systems but states that eight months is appropriate for non-multilateration **systems**.¹⁴² **SBMS** supports a **12-month construction period**.¹⁴³

59. Most non-multilateration installations use relatively few transmitters in a limited number of locations. Accordingly, we shall retain the **current requirement** that these systems be constructed and placed in operation within eight months. We will consider a **non-multilateration LMS system** to be **constructed** and placed in operation if at least one base station has been constructed **and** the system is providing **service** to at least one mobile radio unit. As they may do currently, a local government entity **requiring** more than eight **months** to construct a non-multilateration LMS system because of the system's size and complexity can request **extended** implementation in accordance with Section 90.155(b) of our Rules.

60. We recognize that multilateration LMS systems, because they will be licensed on an MTA basis, will likely be larger and more complex than non-multilateration **LMS** systems. Rather than imposing benchmarks and reporting **requirements** on these systems for all or part of their license term, we will require a multilateration LMS licensee authorized to operate throughout an **MTA** to construct a **sufficient** number of base stations that utilize multilateration technology to provide multilateration location service to a **substantial** portion of at least one BTA in that MTA within twelve months after initial **authorization**.¹⁴⁴ LMS

¹⁴⁰ Notice at para. 26, 8 FCC Rcd. 2502, 2507 (1993). See 47 C.F.R. § 90.155.

¹⁴¹ **Hughes comments** at 15; **Amtech comments** at 35-36; **Mark IV comments** at 14; **IVHS America comments** at 19; **Interagency Group comments** at 10.

¹⁴² **MobileVision comments** at 46-49.

¹⁴³ **SBMS comments** at 22.

¹⁴⁴ **This requirement is comparable to the substantial service requirement for 10 MHz PCS licensees** set forth in Memorandum Opinion and Order, GEN Docket No. 90-314, 9 FCC Rcd 5108,

systems not constructed and placed in operation in a timely fashion (i.e., within 8 months for non-multilateration systems and within twelve months, as described above, for multilateration systems) will cancel automatically.

I. Grandfathering Provisions for Existing Multilateration AVM Licensees

61. As of February 3, 1995, we will no longer accept applications for the operation of multilateration LMS systems in the 904-912 and 918-926 MHz bands under our current rules. To ensure that our new licensing scheme does not impose undue hardship on existing, operating multilateration AVM systems, we will adopt certain grandfathering provisions which will allow them to continue to operate their systems under the current rules. We **will** also confer grandfathering provisions on multilateration AVM licensees who have not yet **constructed** their systems so that such licensees may construct and operate their licensed stations **under** our newly adopted rules.

62. A grandfathered multilateration AVM station will be considered constructed and placed in operation if it is built in accordance with its authorized parameters and is regularly interacting with one or more other stations to provide location service, using multilateration technology, to one or more mobile units. See 47 C.F.R. § 90.155. Specifically, LMS multilateration stations will only be considered **constructed** and placed in operation if they are part of a system that can interrogate a mobile, receive the response at 3 or more **sites**, compute the location from the time of arrival of the responses and transmit the location either back to the mobile or to a subscriber's **fixed** site. A grandfathered **multilateration** AVM station will receive no protection or exclusivity based upon mileage separation or service area criteria, but instead **will** operate on a **co-equal** shared basis with stations of any other grandfathered licensee or the exclusive MTA licensee operating in the same sub-band. We have concluded that sharing of **spectrum** among **unlimited** numbers of **multilateration** licensees is not technically feasible (see paragraph 44, supra), and thus we have not adopted rules that would permit the sharing of **spectrum** among multiple multilateration systems over an entire **MTA**. However, given the very small number of multilateration licensees **currently** authorized, in any given MTA **there will ultimately be, at most, one** or two **grandfathered licensees operating in the same spectrum as the eventual MTA licensee**. In such limited cases, we expect cooperative arrangements for sharing among these licensees to be reached. Where this is not possible or achieved, MTA licensees may build their systems in areas geographically removed **from** grandfathered stations, or may attempt to acquire existing systems from the **grandfathered** licensee(s) in their licensed area.

63. To attain grandfathered status, existing multilateration AVM licensees must **Ne**, within thirty days of the effective date of the rules adopted in this **&port and Order**, applications to **modify** their licenses to comply with the new band plan. These applications to modify must identify which new sub-band or sub-bands (i.e., Band B and H, Band D and

¶ 155 (1994).

G, or Band E and **F**) they intend to operate their licensed **multilateration** AVM stations in, once their applications to modify have been authorized. We will not restrict multilateration AVM licensees to selecting a particular sub-band or sub-bands for their modified **authorization**, but will permit these licensees to choose the spectrum band(s) -- not to exceed a total of 8 **MHz** -- that best meets with their future LMS requirements. The application to modify a license to comply with the new band plan may also include a **modification** to specify an alternate site, so long as the alternate site is 2 kilometers or less from the site specified in the original license.¹⁴⁵ Further, at the time that existing multilateration AVM licensees **file** these applications to **modify**, they **must** certify that either (1) their multilateration AVM system has been constructed and is operational as of February 3, 1995, or (2) that it is not constructed at that time. Multilateration AVM systems that **are** constructed and operational as described above will be given until April 1, 1998 to convert to the spectrum identified in their modified LMS system license. Such licensees may continue to operate their multilateration AVM systems under either the old rules or the new rules during the process of converting their systems during this period. Licensees of constructed and operational multilateration AVM systems that do not file applications to modify within this **30-day** period will be permitted to continue operations under the provisions of Section 90.239 **until** April 1, 1998 or the end of their original license term, whichever occurs first, at which time such licenses will cancel automatically and will not be renewed.

64. Multilateration AVM licensees for stations not constructed as of February 3, 1995 must construct and operate their modified LMS systems on the spectrum identified in their modified LMS system license by April 1, 1996. These licensees will not be allotted the lengthy transition period that licensees of constructed and operational systems are provided (i.e., until April 1, 1998) because they do not have an existing, operating **infrastructure** that will require this additional time for conversion. Licenses for stations not constructed under the old rules as of February 3, 1995 will terminate 30 days after the effective date of the new rules unless timely applications to **modify** are filed. Parties may file applications to modify those licenses that they plan to construct by April 1, 1996.¹⁴⁶ We have provided a transition period that we believe is appropriate for construction and operation for current licensees to attain grandfathered status. Because this spectrum will be subject to competitive bidding, we must balance our wish to accommodate the desired construction schedules of existing multilateration AVM licensees against the need for prospective bidders to be able to evaluate the likely **value** of the spectrum upon which they will be bidding.

¹⁴⁵ See **generally** Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory **Treatment** of Mobile Services, GN **Docket** No. 93-252, PR Docket No. 93-144, PR Docket No. 89-553, **Third** Report and Order, FCC 94-212, released Sept. 23, 1994, at **para.** 356.

¹⁴⁶ We note that **Airtouch** and Mobilevision have offered to limit the number of licenses they construct to 20 percent of the unbuilt licenses they hold. While we are not adopting this 20 percent limit, we expect all licensees to file modification applications only for those **unbuilt** licenses that realistically can be constructed by April 1, 1996. If the number of modification **applications** submitted **significantly** varies **from** the number built, we will consider appropriate measures.

J. Licensing of Non-Multilateration Systems

65. We proposed that non-multilateration systems be licensed in the **902-904**, 912-918, and 926-928 MHz bands.¹⁴⁷ Mark IV believes that 6 MHz of contiguous spectrum at 912-918 MHz is sufficient for its type of system.¹⁴⁸ MFS Network Technologies/Texas Instruments recommend 12 or 14 MHz of contiguous spectrum for non-multilateration systems, but indicate that 10 MHz may be **sufficient**.¹⁴⁹ **Amtech** states that a minimum of 12 MHz of contiguous spectrum is required for non-multilateration systems, because these **systems need 6 MHz** wide channels and two such channels are necessary for high-speed operation at most toll booth locations.”

66. We also proposed that non-multilateration systems be licensed on a shared basis with licensees responsible for coordinating use to avoid **interference**.¹⁵¹ Lockheed proposes licensing of non-multilateration systems based on a fixed mileage **separation**.¹⁵² Mark IV supports the use of frequency coordinators to coordinate the assignment of **spectrum**.¹⁵³ **NABER** proposes that it be designated as the frequency coordinator for non-multilateration **LMS systems**.¹⁵⁴ We are adopting our proposal to license non-multi&ration LMS systems on a shared basis because these systems generally cover relatively short distances, and licensing based on a **fixed** mileage separation would limit **re-use** of spectrum and thereby limit the potential uses of these systems. We also decline to designate a frequency coordinator for this service. Many non-multilateration licenses have been issued and many stations have been placed in operation without such a formal coordination process and there appear to be no negative consequences. Considering the limited coverage of these systems and the expanded amount of **spectrum** available under the allocation plan we have adopted, it should not be difficult for non-multilateration systems to share their sub-bands.

¹⁴⁷ Notice at **para. 25, 8 FCC Rcd. 2502, 2507** (1993).

¹⁴⁸ Comments of Mark IV M-IS Division dated June 29, 1993, at 8.

¹⁴⁹ Ex **Parte Comments** of MFS Network **Technologies/Texas Instruments** dated August 12, 1994.

¹⁵⁰ Ex Parte Comments of **Amtech** dated August 12, 1994.

¹⁵¹ Notice at **para. 25, 8 FCC Rcd. 2502, 2507** (1993).

¹⁵² Lockheed comments at 4. Mark IV supported a **fixed milage** separation in its comments but modified its support in reply comments. Mark IV comments at 8-9, reply comments at 8.

¹⁵³ Mark IV reply **comments** 8-10.

¹⁵⁴ NABER comments at 6-7.

67. The **Interagency** Group, with the support of Mark IV, proposes that local governments be able to obtain blanket licenses for non-multilateration **systems**.¹⁵⁵ We decline to adopt a blanket licensing scheme for non-multilateration systems. In a shared use environment, it is important that applicants and other co-channel users **know** exactly where systems are located if they are to avoid interference. If we issue blanket licenses, it will be difficult for the Commission or the public to ascertain the exact location of LMS transmitters.

68. Finally, we proposed that existing non-multilateration systems licensed to operate in spectrum allocated for use by multilateration systems be **required** to move their operations within three years of the effective date of any new **rules**.¹⁵⁶ SBMS and Location Services support this proposal.¹⁵⁷ Both Teletrac and **Amtech** favor grandfathering existing **non-multilateration** systems, although Teletrac would only do so for systems licensed prior to the initiation of this **proceeding**.¹⁵⁸

69. **As** discussed earlier, we have modified our proposal to provide for shared use of the 902.000-904.000 and **909.750-921.750** MHz bands by non-multilateration LMS systems, thus allocating a total of 14 MHz that will be available for non-multilateration operations. Although a non-multilateration licensee could be **required** to share 2 MHz of this **spectrum** (at **919.750-921.750** MHz) with an MTA multilateration licensee, we believe that the benefit to those non-multilateration systems **requiring** a minimum of 12 MHz of contiguous **spectrum to operate** remains **substantial** and warrants this overlap.

70. In addition, because we have concluded that sharing between multilateration and non-multilateration systems is generally inadvisable (see paragraph 46, **supra**), we are **requiring** that licenses for non-multilateration systems in spectrum other than the 902.000-904.000 and **909.750-921.750** MHz bands must be modified by April 1, 1998, to specify operation solely in those bands and to operate **consistent** with the rules we are adopting by this **Report and Order**. This is consistent with our decision to require multilateration systems to relocate their operations within the same time period. Similarly, authorizations not so modified within this period will cancel automatically.

¹⁵⁵ Comments of Interagency Group at 12; Reply Comments of Mark IV at 6-8.

¹⁵⁶ **Notice** at para. 16, 8 FCC Rcd. (1993).

¹⁵⁷ **SBMS** comments at 12; **Location Services** at 5.

¹⁵⁸ **Teletrac** comments at 22-23; **Amtech** comments at 36-38.

K. Multilateration System Operations

71. From review of the lengthy record in this proceeding, we have determined that multilateration systems have two distinct methods of operation. One type of **multilateration** system utilizes a low power, **wideband** location pulse originating from the mobile units and a high powered, narrowband interrogation and control signal emanating from the fixed/base stations. These systems also utilize **narrowband** transmissions, **within** the band that is used for the location pulse, for two-way voice and data communications between fixed/base stations and mobile units. Another kind of multilateration system operates in a **different** manner, utilizing **wideband transmissions** for: the location pulse from the mobiles, the interrogation and control signal from the fixed/base stations and the two-way messaging between the fixed/base stations and the mobile units. As we understand these two types of multilateration systems, there are three basic elements used to accomplish location and monitoring functions: forward link, reverse links and communication links. Forward links originate at the **fixed/base** site and are used to control and interrogate mobile units. In contrast, reverse links are signals transmitted from **the** mobile units or **fixed** station **to fixed/base** stations to determine the location of the mobiles or from fixed stations to other **fixed/base** stations for system synchronization and testing purposes. Communication links **connect** fixed/base stations and mobile units and are utilized for two-way messaging related to the location or monitoring functions of the system. In addition, multilateration systems use these three basic elements either in what we will refer to as the “narrowband” or the “broadband” portion of the **LMS** band. The narrowband portion we will **define** as the 250 **kHz** sub-bands (i.e., the sub-bands **927.250-927.500**, **927.500-927.750** and **927.750-928.000** MHz) and we will define the broadband portion as the **sub-bands** 904.000-909.750, 919.750-921.750 and **921.750-927.250** MHz. Each of the three basic elements are **discussed** below in accordance with their location in the narrowband or broadband portion of the LMS band, along with how they are considered in our overall regulation of multilateration systems.

Narrowband Segment

a) Narrowband Forward Links

72. In the **Notice**, we observed that many multilateration systems are designed using forward **links** to contact units to be located.¹⁵⁹ Consistent with existing systems, we proposed that multilateration licensees authorized to operate in the 904-912 **MHz** sub-band be licensed to operate their forward links in the 250 **kHz** of **spectrum** between 924.890 and 925.140 MHz and that multilateration licensees authorized to operate in the **918-926 MHz** sub-band be licensed to operate their forward links in the 250 **kHz** of **spectrum** between 904.375 and 904.625 **MHz**.¹⁶⁰

¹⁵⁹ **Notice** at **para.** 19, 8 FCC **Rcd** 2502, 2405 (1993).

¹⁶⁰ **Notice** at **para.** 19, 8 FCC **Rcd** 2502.2505 (1993).

73. Teletrac is the only **commenter** that supports the proposed location of the forward links, claiming that it will be adversely affected otherwise because its systems now employ forward links in the manner proposed in the **Notice**.¹⁶¹ **MobileVision** favors placing the forward links within a licensee's authorized sub-band rather than in the other multilateration **LMS** sub-band as proposed.¹⁶² Location Services proposes keeping the forward links in the opposite sub-band but would move the links to the edges of each **sub-band**.¹⁶³ SBMS prefers that the forward links be placed as far from **wideband** frequencies as practical and assigned exclusively.¹⁶⁴ Pinpoint prefers a **wideband** forward link that operates over an entire multilateration system sub-band.¹⁶⁵ **Amtech** recommends placement of the forward links at the edges of the **902-928** MHz band or make licensees use alternative spectrum for forward links, such as common carrier or private carrier paging **spectrum**.¹⁶⁶ Symbol, **ITRON** and **TIA** urge that multilateration LMS forward links be placed at the upper edge of the **902-928** MHz band if Part 15 devices are to be **accommodated**.¹⁶⁷ Other Part 15 wmmmenters expressed fear of being "drowned out" by high powered forward links, particularly **wideband** forward **links**.¹⁶⁸

74. Although there is no identification of forward links in our current rules, we will define a forward link as any signal transmitted **to** a mobile unit to be located by a multilateration LMS system.¹⁶⁹ We will also dedicate a portion of spectrum in the **902-928** MHz band where narrowband forward links may be used by the multilateration systems that require them for their operations. Thus, in accordance with our band plan for multilateration systems, multilateration licensees will be authorized to use only the following spectrum for **narrowband** forward links:

The **904.000-909.750** MHz band narrowband forward link is **927.750-928.000** MHz
The **919.750-921.750** MHz band narrowband forward link is **927.500-927.750** MHz

¹⁶¹ Teletrac Comments at 51, Reply Comments at 33-35.

¹⁶² **MobileVision** Comments at 43-44.

¹⁶³ Location Services Comments at 5-6.

¹⁶⁴ Ex Parte Comments of SBMS, dated August 12, 1994.

¹⁶⁵ Ex Parte Comments of Pinpoint dated September 19, 1994, Ex Parte Comments of Pinpoint dated September 15, 1994.

¹⁶⁶ **Amtech** Comments at 31-32.

¹⁶⁷ **Further Comments** of **ITRON**, Symbol and **TIA** dated August 12, 1994.

¹⁶⁸ **See Itron** comments, dated August 12, 1994.

¹⁶⁹ **See** Section 90.7 of our rules.

The **921.750-927.250** MHz band narrowband forward link is 927250427.500 MHz

The placement of narrowband forward links at the upper edge of the **902** to **928 MHz** band meets the requirements of the majority of the multilateration industry and also accommodates the needs of Part 15 **interests**.¹⁷⁰ We have provided the flexibility requested by these various commenters, with two of the narrowband forward links placed in spectrum apart from the licensee's multilateration sub-band (e.g., the 927.50X7.75 and **927.75-928** MHz forward links) and the third forward link (**927.25-927.50** MHz) placed adjacent to its related multilateration sub-band.

75. Based upon comments from entities that employ narrowband forward links, we believe that **250 kHz** for each multilateration system is a suitable amount of spectrum for narrowband forward **links**.¹⁷¹ Furthermore, because narrowband forward link **transmissions will** be situated in the uppermost portion of the **902-928 MHz** band -- and thus somewhat removed from the operations of other licensed and unlicensed services in the band -- a relatively greater power level for this use should be permitted. We therefore will allow narrowband forward links to operate with a maximum power of 300 watts **ERP**.

Broadband Segment

a) **Wideband Forward Links**

76. Pinpoint and Uniplex have expressed interest in employing a **wideband** forward link, which, like the narrowband **forward** link, would be used to communicate with mobile units. However, unlike the narrowband forward link, a **wideband** forward link would operate over a multilateration system's entire authorized **sub-band**.¹⁷² Part 15 users uniformly oppose this request on the grounds that such **transmissions** are likely to cause interference to Part 15 devices. **Itron**, for example, points out that the high powered **wideband** forward link could adversely affect the operations of Part 15 devices because it would "present an essentially constant signal at any particular geographic **location**."¹⁷³ Pinpoint, however, asserts that its

¹⁷⁰ Ex Parte Comments of **Teletrac** dated August 12, 1994; **Mobilevision Comments** at 4344; **Location Services Comments** at 5-6; Ex Parte **Comments** of Southwestern Bell dated August 12, 1994; **Amtech** Comments at 31-32; Further **Comments** of **ITRON**, Symbol and TIA dated August 12, 1994.

¹⁷¹ Ex Parte Comments of SBMS dated August 12, 1994, Ex Parte Comments of **Teletrac** dated August 12, 1994, Ex Parte **Comments** of **MobileVision** dated August 12, 1994.

¹⁷² **Ex Parte Comments** of Pinpoint dated September 19, 1994, Ex **Parte** Comments of **Uniplex** dated September 30, 1994.

¹⁷³ See e.g., Ex Parte Comments of **ITRON** Inc. at p. 3, dated August 12, 1994 and Symbol Technologies, dated August 12, 1994.

system, which is based on the use of the **wideband** forward link, would pose far less of an interference threat to users of the **902-928** MHz band than that caused by a certain, currently deployed Part 15 data distribution system.¹⁷⁴ We will permit the authorization of **wideband** forward links, but note that multilateration operations are wnditioned on further testing as described in paragraphs 81-82, **infra**.

b) Reverse Links

77. As **discussed** above, a multilateration signal transmitted **to** the **fixed/base stations** will be referred to as a "reverse link" and is utilized by both types of multilateration systems. These signals are **contained within** the broadband segment of the multilateration allotment and are primarily location pulses originating **from** mobile units **and** used for determination of the position of mobile units. Such **transmissions** may also originate from other **fixed/base** stations for the purpose of system synchronization or testing. **These transmissions** are likely to occur less **frequently** and more randomly than the above-mentioned forward links and are therefore less likely to cause interference to Part 15 operations. However, as pointed out by one wmmenter, reverse link **transmissions could** present significant problems to Part 15 operations depending on the power levels, duty cycles and density of mobile **units**.¹⁷⁵ Reverse links are an essential part of any multilateration LMS system and therefore must be accommodated. However, in order to limit the potential for interference from such **transmissions**, we will limit the **maximum** power level of reverse links to 30 watts ERP. This is a sufficient amount of power to enable mobile units to provide an adequate signal to fixed sites for location, synchronization **and** testing purposes.

c) Communication Links

78. As noted by multilateration service **providers**,¹⁷⁶ there is an additional **transmission** that multilateration systems **utilize** for two-way messaging that we will refer to as a "**communication** link." The communication link emanates from the **fixed/base** stations and mobile units ancillary to the location and monitoring function of the multilateration system and provides status and **instructional** information relating to the vehicle being located or the **occupant(s)** of the vehicle. Additionally, these links may be interconnected with the PSN to enable **emergency communications**.¹⁷⁷ Moreover, the method of **transmission** of the communication link differs between **multilateration** systems, the differences centering on the

¹⁷⁴ **See comments** filed by **Pinpoint Communications, Inc.**, dated Septunber 19, 1994.

¹⁷⁵ **See letter from Metricom, Inc., Alarm Industry Communications** committee, **Electronic Industries Association, Itron, Inc., Part 15 Coalition, Sensormatic Electronics Corporation, Southern California Edison, and Telecommunications Industry Association.**, dated August 12, 1994.

¹⁷⁶ **See e.g., Ex Parte Comments** of **MobileVision** dated December 14, 1994, at 1-2.

¹⁷⁷ **See** paragraphs 26 **and** 27, **supra**.

size of the channel(s) **being** used.

i) **Narrowband Communication Links**

79. Narrowband communication links are used in certain multilateration systems to provide voice and data communications within the broadband portion of their allocation of **spectrum**. Additionally, the narrowband communication link differs from a **wideband** communication link in that it uses small (e.g., 25 **kHz**) channels to accomplish its messaging **functions**. These narrowband **transmissions** are a valuable asset and may enhance the economic viability and flexibility of these particular multilateration **systems**.¹⁷⁸ However, as we did for reverse links in order to limit their **interference** potential, we will also limit the maximum power of narrowband communication links to 30 watts ERP. This limitation encompasses communication links that originate at fixed/base stations as well as mobiles. Due to the fact that these **transmissions** should only occur sporadically or in the event of an emergency, we believe that this power level should serve to limit interference to Part 15 operations. However, we note that multilateration licenses are conditioned on additional testing as discussed in paragraphs 81-82.

ii) **Wideband Communication Links**

80. Certain multilateration systems use **wideband** communication links, integrated with accompanying **wideband** forward links, to provide messaging within the broadband segment. This **wideband** link differs from narrowband communication **links** because it transmits a direct sequence spread spectrum signal across the entire sub-band (e.g. all of the 904.000-909.750 MHz sub-band) instead of signals on small channels within the **sub-band**. Although these links are perceived to represent greater **interference** potential to Part 15 **devices**,¹⁷⁹ we **conclude** that these **wideband links** should be authorized. As noted earlier, however, **multilateration** system licenses are conditioned on additional testing as discussed in paragraphs 81-82.

Testing of _____ M u _____

81. **In comments, a number of parties to this proceeding have expressed the desire** and need for additional testing to demonstrate the feasibility of multiple services coexisting in the **902-928** MHz band, in particular the multilateration LMS users and the operators of Part 15 devices. Our record contains a **significant** amount of information on the issue of mutual coexistence between these parties, which was submitted in the form of theoretical analyses, **demonstrations and testing (See Appendix B)**. **This record shows that certain aspects and elements of these various systems and services create a greater potential for interference than**

¹⁷⁸ **See Ex Parte Comments** of Mobilevision dated December 14, 1994, at 5.

¹⁷⁹ **See e.g., Ex Parte Comments** of Cellnet and KNOGO dated August 19, 1994, at 4.

others.¹⁸⁰ The band plan adopted in this item was crafted on the basis of this extensive record. In addition, these submissions were used to establish technical limitations or criteria on the operations of the various systems, to **minimize** the potential for interference and provide a more **conducive** environment for sharing of the band by the disparate services.

82. The record of this proceed@ **contains substantial** technical analysis supporting the band plan we now adopt. We are persuaded, however, that additional testing **could** provide users of the band with data that **could** contribute to "fine-tuning" system operations. Therefore, to ensure that the coexistence of the various services in the band is as successful as possible and to identify whether further refinements in our rules are necessary, we will condition grant of each MTA **multilateration** license on the licensee's ability to demonstrate through actual field tests that their systems do not cause unacceptable levels of interference to Part 15 devices. To provide such protection and to facilitate band sharing and **minimize** interference to Part 15 operations, multilateration licensees may employ any one of a number of technical refinements, i.e., limiting duty cycle, pulse duration power, etc. It is our expectation that such testing be accomplished through close cooperation between multilateration systems users and operators of Part 15 systems.

L. LMS Below 512 MHz

83. In the Notice, we proposed that the expanded **definition** of LMS would apply to below 512 **MHz** systems, but that licensees of such systems would not be permitted to provide service to individuals or to provide service on a private carrier basis. NABER is the only commenter that addressed **LMS** operation below 512 MHz. NABER requests **clarification** of several points **pertaining** to these systems, including coordination **requirements** and co-channel separation **requirements** between **LMS** systems and **non-LMS** systems used for voice operations.¹⁸¹ NABER also notes that proposed Section **90.105(b)(3)(i)** discusses loading criteria for systems operating with single frequencies, **two-frequency** mode, and pairs of frequencies, but that Section **90.105(b)(3)(ii)** only discusses separation criteria for operations using single **frequencies** or two frequencies. NABER suggests that because the loading criteria are the same, we apply the same separation criteria for single **frequency** operations to operations using pairs of frequencies.

84. Section 90.175 of our Rules provides that applicants for frequencies below 512 **MHz** must generally obtain a frequency recommendation from a frequency coordinator. We

¹⁸⁰ Many of these submissions have focused on concerns regarding the use of **wideband** forward links for multi-**rate** systems, the **location** of such links in the band, and the appropriate power levels for both forward and reverse link **transmissions**.

¹⁸¹ NABER **comments**. NABER also requests clarification as to the effect our "**Refarming**" proceeding (PR Docket 92-235, Notice of Proposed Rule Making, 7 FCC Rcd 8105 (1992)) will have on LMS systems. No final action has yet been taken in the **Refarming proceeding**. **Ultimately**, LMS **systems** below 512 MHz will have to adhere to any decisions reached in that proceed&

conclude that LMS applicants should be subject to these same coordination requirements when applying for these frequencies. Accordingly, applicants for LMS systems below 512 MHz must meet the coordination requirement of Section 90.175(a) of our Rules, 47 C.F.R. § 90.175(a). Applicants will use the frequency coordinator for the radio service in which they have established their eligibility. We will also require LMS systems **authorized** below 512 **MHz** to modify their licenses under the same conditions as other land mobile licensees. This means that a modification application will have to be **filed** for changes in the number of base, **fixed**, control, or mobile transmitters.”

85. Section **90.105(b)(3)(i)** only discusses using pairs of frequencies in the 470-512 **MHz** band. Because these frequencies are only available within **80** km (50 miles) of 13 major urban areas, applying a 120 km (75 miles) separation between **non-LMS** voice systems and LMS systems would severely restrict LMS use of this **spectrum**. Pairs of frequencies in the 470-512 **MHz** band will be assigned in accordance with the allocation plan for the band as described in Subpart L, 47 C.F.R. Part 90, Subpart L, except that the 200 mobile unit loading criteria will apply and an LMS system will not be authorized to share a channel utilized by a non-LMS licensee operating a voice system unless an agreement with the licensee is reached. Accordingly, the **co-channel** separation between **LMS** systems and **co-channel non-LMS** voice systems in the 470-512 **MHz** band will be 64 km (40 miles), except on Channel 15 in Chicago, Channel 20 in Philadelphia, and Channel 17 in **Washington** where the minimum co-channel separation is 32 km (20 miles). See 47 C.F.R. § 90.313.

86. We also adopt our proposal to extend the definition of LMS to below-512 **MHz** systems. We are not, however, expanding uses of **LMS** systems below 512 **MHz** to provide service to individuals or to provide service on a commercial basis. Such **commercial** uses of **LMS** would be inconsistent with the nature of the spectrum below 512 **MHz**, which is intended primarily for the use of private land mobile radio (**PLMR**) communications to enable private land mobile eligibles to provide for their own internal communications needs. Moreover, the frequency bands below 512 **MHz** on which LMS systems are licensed are shared **PLMR frequencies**. Many of these channels are already unacceptably crowded. We are **currently** considering rule changes to **increase** channel capacity and promote more efficient use of **PLMS frequencies** below 512 **MHz**.¹⁸³ Permitting LMS systems authorized below 512 **MHz** to provide service on a commercial basis, or to provide service to individuals, would only exacerbate this **spectrum** congestion.

M. Technical Issues

87. In the **Notice**, we proposed a number of technical **requirements** for LMS systems to **minimize** the possibility of both **co-channel** and adjacent-channel interference and we proposed that equipment be type accepted to ensure compliance with these **standards**. The

¹⁸² See 47 C.F.R. § 90.135(a).

¹⁸³ See Notice of Proposed Rule Making, PR **Docket** No. 92-235, 7 **FCC Rcd** 8105 (1992).

following technical **criteria** will be applied to licensees of LMS systems. Our proposals, commenters' responses, and our decisions are discussed below.

88. Type Acceptance. We proposed that LMS equipment be required to be type accepted.¹⁸⁴ This proposal was supported by Teletrac, **MobileVision**, SBMS, Mark IV, and Location **Services**.¹⁸⁵ Teletrac proposes that we require the equipment to be authorized through the notification process one-year **from** the adoption date of this **Report and Order** while SBMS suggests type acceptance after **18-months**.¹⁸⁶ Location **Services** suggests that licensees be permitted to operate new equipment on a wmmmercial basis for 18 months before such equipment must be type accepted.¹⁸⁷ We are adopting our proposal to require type acceptance. We decline to adopt Teletrac's proposal that we only require equipment **"notification."**¹⁸⁸ Considering the mobile nature of most LMS transmitters and that new, advanced technologies will be employed in this equipment, we find that the **stricter** regulatory oversight of having equipment type accepted rather than "notified" is justified. Accordingly, all LMS equipment imported or marketed after April **1, 1996**, must be type accepted for use under Part **90** of our Rules, 47 C.F.R. Part 90. This **includes** the "transmitting tags" used in certain **non-multilateration** systems. If, however, these units meet the requirements of Part 15 of our Rules, 47 C.F.R. Part **15**, they may be authorized under that Part. **By** delaying the requirement for type acceptance, we effectively adopt Location Services' proposal for a grace period in which to operate **LMS** equipment without authorization, albeit for a lesser period than 18 months. As **discussed** in the **Notice**,¹⁸⁹ licensees still in the developmental stages that do not wish to seek type acceptance may be licensed on a developmental basis in accordance with Subpart Q of Part **90**.¹⁹⁰

89. Emissions. We proposed that no restriction be placed on the type of emission that may be authorized for LMS operation in the 902-928 MHz **band**.¹⁹¹ **MobileVision and**

¹⁸⁴ **Notice** at **para. 29, 8 FCC Rcd 2502, 2507** (1993).

¹⁸⁵ Teletrac wmmments at 48; **MobileVision** wmmments at SO; SBMS wmmments 23; Mark **IV** wmmments at 13; and Location Services wmmments at 3.

¹⁸⁶ Teletrac wmmments at 48; SBMS **comments** at 23.

¹⁸⁷ Location Services comments at 3.

¹⁸⁸ Teletrac wmmments at 48.

¹⁸⁹ **Notice** at **para. 29, 8 FCC Rcd. 2502, 2507** (1993).

¹⁹⁰ 47 C.F.R. Part 90 Subpart Q.

¹⁹¹ **Notice** at **para. 30, 8 FCC Rcd 2502, 2507** (1993). **See** Section 2.201 of **the Rules**, 47 C.F.R. § 2.201, for a description of emission designators.

SBMS support this proposal.¹⁹² Teletrac supports this proposal only if multilateration systems are required to be physically **separated**.¹⁹³ Teletrac claims that, in the absence of geographic separation, stricter limits on emissions are **required** to prevent interference between **multilateration systems**.¹⁹⁴ We are adopting our proposal to place no limits on the type of emission that can be authorized for LMS systems. Allowing any types of emissions **will** enable any type of location or monitoring technology or ancillary service to develop without restrictions. We will limit the likelihood of **interference** through appropriate power, frequency tolerance and emission mask limitations. Moreover, exclusive licensing of multilateration systems in **MTAs** in each of the three respective sub bands should ameliorate **concerns** of co-channel **multilateration** LMS interference.

90. Bandwidth. We proposed to limit the bandwidth of **LMS** systems as follows:

for 904-912 and **918-926** MHz -- maximum 8 **MHz**
for **902-904** and **926-928** MHz -- maximum 2 **MHz**
for 912-918 MHz -- maximum 6 **MHz**¹⁹⁵

MobileVision supports the maximum bandwidths proposed while Pinpoint opposes limiting the maximum permissible bandwidth within the **902-928** MHz **band**.¹⁹⁶ In accordance with the band plan we have adopted, we are adopting maximum permissible bandwidths as follows:

For **Multilateration** systems:

for 904.000-909.750 MHz -- maximum 5.750 MHz
for **919.750-921.750** MHz -- maximum 2.000 **MHz**
for 921.750-927.300 **MHz** -- maximum 5.750 **MHz**¹⁹⁷
for **919.750-927.750** MHz -- maximum 8.000 **MHz**¹⁹⁸

¹⁹² **MobileVision** comments at 50; **SBMS** comments at 24.

¹⁹³ **Teletrac** comments at 49.

¹⁹⁴ **Id.**

¹⁹⁵ **Notice** at para. 30, 8 **FCC Rcd.** 2502, 2507 (1993).

¹⁹⁶ **MobileVision** Comments at 49; **Pinpoint** Comments at 23-26.

¹⁹⁷ **This includes** 5.5 **MHz multilateration** bandwidth and adjoining, associated 0.25 **MHz** forward link.

¹⁹⁸ This **bandwidth** capability only exists for **licensees** aggregating the ad.. 2 **MHz** and 5.5 **MHz multilateration** bands and **includes** the adjoining, associated forward link **bands**.

For Narrow Band Links:

for **927.250-927.500** MHz -- maximum 250 **kHz**
for **927.500-927.750** MHz -- maximum 250 **kHz**
for **927.750-928.000** MHz -- maximum 250 **kHz**

For Non-multilateration systems:

for 902.000-904.000 MHz -- maximum 2.000 **MHz**
for **909.750-921.750** MHz -- maximum 12.000 **MHz**

While we establish these maximum permissible bandwidths, applicants for non-multilateration LMS systems should request only the minimum amount of bandwidth necessary to meet their operational needs.

91. Frequency Tolerance. We proposed a frequency tolerance for transmitters in the 904-912 and 918-926 **MHz** bands of 0.0005 percent and proposed that no minimum **frequency tolerance** be established for transmitters in the **902-904**, 912-918, and 926-928 **MHz bands**.¹⁹⁹ The frequency tolerance for these systems would be specified on the station's authorization. **MobileVision**, SBMS, Mark TV, and Hughes support the proposed **frequency tolerance** of 0.0005 percent for multilateration systems and support having no specific **frequency tolerance** for non-multilateration systems.²⁰⁰ Teletrac argues that tighter frequency tolerances are required and recommends a tolerance of 0.00025 percent for both multilateration **and** non-multilateration **systems**.²⁰¹ We agree with Teletrac that tighter frequency tolerances **are** justified to help reduce the **potential** for interference to systems operating on adjacent **frequencies** and that this argument **extends** to non-multilateration as well as multilateration systems. Additionally, as Teletrac points out, the **frequency tolerance it has proposed is more liberal than that required for other services in the 900 MHz band**. Accordingly, we are adopting a frequency tolerance of 0.00025 percent for both multilateration and non-multilateration systems.

92. Effective Radiated Power. We proposed a maximum peak effective radiated power (**ERP**) for any **LMS** systems operating in the **902-928** **MHz** band of 300 **watts**.²⁰²

¹⁹⁹ **Notice** at **para. 30**, 8 **FCC Rcd. 2502, 2507** (1993).

²⁰⁰ **MobileVision** comments at 49; SBMS **comments** at 24; Mark **IV** **comments** at 13; Hughes comments at 13.

²⁰¹ Teletrac **comments** at 49.

²⁰² **Notice** at **para. 30**, 8 **FCC Rcd 2502, 2507** (1993). The current maximum power for multilateration systems is 1 **kW** peak envelope power (**PEP**) transmitter output **power**. **See** existing 47 C.F.R. § 90.239(e)(2)(i).

SBMS supports our proposed 300 watt peak **ERP**.²⁰³ **MobileVision** opposes any reduction in permissible power. AT&T and Hughes support a 30 watt ERP power limit for **non-multilateration** systems with 10 meter and 15 meter antenna height restrictions **respectively**.²⁰⁴ **Amtech** and Pinpoint support various power limits for different systems based a shared use of the entire **band**.²⁰⁵ Mark IV supports a field strength limit of 1 **mV/m** at 3000 meters with a maximum antenna height of 10 meters for non-multilateration systems rather than a limit on peak **ERP**.²⁰⁶

93. As discussed **earlier**,²⁰⁷ we will limit the maximum ERP of multilateration LMS system narrowband forward links, which operate between 927.250-928.000 MHz, to 300 watts. However, we will limit maximum power for **transmissions** of multilateration system base and mobile stations **outside** the **927.250-928.000** MHz sub-band to 30 watts maximum ERP. Limiting base and mobile stations' power levels will reduce the potential for interference between co-channel multilateration systems²⁰⁸ and **will** reduce the likelihood of interference to any other operations in the **902-928** MHz band. In addition, we are limiting the peak ERP of non-multilateration systems to 30 watts and limiting the antenna height above ground of these systems to 15 meters. Reducing the maximum power and antenna height of non-multilateration systems will allow non-multilateration systems to share spectrum more easily with other non-multilateration systems **and** with users of Part 15 **devices and will permit greater frequency reuse for these systems**.

94. currently, facilities authorized in the private radio services are categorically excluded from our rules **requiring** an environmental **assessment** to demonstrate that a facility complies with **standards concerning** human exposure to radiofrequency radiation. (**See Second Report and Order**, in Gen. Docket No. **79-144, 2 FCC Rcd** 2064 (1987); and **Erratum to FCC Rcd 2 526 (1987)** for **evaluating** the environmental effects of radiofrequency radiation, however, are **currently** under review in **ET** Docket No. 93-62 (**See Notice of Proposed Rule Making**, ET Docket No. **93-62, 8 FCC Rcd**, No. 93-62 (1993)). In that proceeding we note that some of the current categorical exclusions may be inconsistent with the **new guidelines** being **considered**. We wish to emphasize here that **LMS** systems will be **required** to **comply** with any **requirements** adopted in **ET Docket** No. 9342.

²⁰³ SBMS comments at 24.

²⁰⁴ AT&T **comments** at 7-8; Hughes **comments** at 7-9.

²⁰⁵ **Amtech** **comments** at 33-3s; Pinpoint **commas** at 31-34.

²⁰⁶ **Mark IV** **comments** at 13.

an **See** discussion of Forward Links, **paragraphs** 73-76.

²⁰⁸ We **contemplate** that this issue will have **significance** in **MTAs** where **exclusive** LMS licensees must co-exist with **grandfathered** LMS licensees.

95. **Interference Criteria for Co-Channel Multilateration Licensees.**

Exclusive MTA multilateration LMS licensees and co-channel grandfathered multilateration LMS licensees must not **interfere** with one another. Similarly, exclusive MTA multilateration **LMS** licensees must also ensure that they do not cause interference to exclusive co-channel **MTA licensees in adjacent MTAs**. To **help** reduce the likelihood for interference between adjacent MTA licensees, we will impose a 47 **dBuV/m** field strength limit at the MTA boundary on signals transmitted from the base stations of **MTA licensees**.²⁰⁹ If differences arise over whether interference has been caused, we will expect the particular licensees to cooperate with one another to resolve these disputes. Should the Commission have to become involved in any disagreements among licensees, we may employ a wide variety of tools to resolve such disputes.²¹⁰ These tools **could** include, but are not limited to, **requiring** use of a common controller or **mandating** a particular time sharing arrangement. If, however, we determine that an **LMS** licensee has not cooperated in developing a suitable **mechanism to minimize harmful** interference, or that a licensee's system design renders it **extraordinarily** sensitive to **interference**, we may authorize the other licensee to operate its LMS system regardless of **interference** caused to the **LMS** system that failed to cooperate or that has a system design highly susceptible to **interference**.

96. Emission Mask. We proposed that emissions anywhere within a licensee's authorized bandwidth not be **required** to be attenuated but that any emissions outside of the authorized bandwidth be attenuated by at least $55 + 10\log(P)$ **dB** where P is the highest emission (in watts) of the transmitter inside the authorized **bandwidth**.²¹¹ This requirement applies to both multilateration and non-multi&ration systems. We also requested comment on whether multilateration systems should be required to **distribute** power evenly throughout

²⁰⁹ We note that in adopting this 47 dBuV/m limit, we are not determining that this field strength will **necessarily** result in reliable service for all **multilateration** systems. It is merely a level that may not be exceeded by **MTA** licensees and **is** thus **established** for interference planning purposes only. (see Second Report and Order, Amendment of the Commission's Rules to Establish New Personal Communications Services, GEN Docket No. 90-314, FCC 93-451, released **October 22, 1993** at paragraph 177).

²¹⁰ Disputes over harmful interference (as descrii in **Section 90.173(b)** of our Rules) are typically resolved on a **case-by-case** basis. For these services, while absolute blocking of a licensee's **transmissions throughout a large region** would constitute the only clear-cut **case of** harmful interference (see Section 90.7 for definition of harmful **interference** under 47 C.F.R. Part 90), it is Possible that **lesser degrees** of interference could **diminish** the **accuracy** or reliability of certain **multilateration systems in a** limited portion of a system's area of operation. The degree to which such lesser **amounts of interference** would be considered harmful cannot be **determined** in advance, and there can be no **guarantee** that licensees will be **unconditionally protected** from interference of this type. Because of these unique **characteristics** of multilateration systems, we decline to specify what **will** be considered to **constitute** harmful interference to such systems.

²¹¹ Notice at para. 30, 8 FCC Rcd. 2507 (1993).

their authorized **band**.²¹²

97. Mark IV M-IS was the only **commenter** that supports a requirement that power be evenly distributed across a licensee's authorized bandwidth. Both Mark IV **IVHS** and Teletrac believe that only emissions outside of the **902-928 MHz** band (rather than any emissions outside of a licensee's authorized bandwidth) should be attenuated by $55 + 10\log(P)$ **dB**. Mark IV **IVHS** would require that frequencies outside of the licensee's authorized bandwidth only be attenuated by $30 + 10\log(P)$ **dB**, while Teletrac would just require that 99 percent of the power be within the licensee's **authorized** bandwidth. **MobileVision** would require that spurious spread spectrum emission should not exceed $100 + 10\log P$ **dBW/Hz** and the level of any spurious discrete emission could not exceed $55 + 10\log P$ **dBW**. **SBMS** would merely require that the first side-lobe be **20 dB** below main lobe and each following side-lobe be progressively reduced by **10 dB** out to the third lobe. **Amtech** and Pinpoint provide recommendations for various power, height and emissions limits for different systems and supports establishment of robustness and sharing requirements.

98. We will require licensees to attenuate their emissions by $55 + 10\log(P)$ **dB** at the edges of the specified **LMS** subbands. The licensed **frequency** band edges for multilateration systems for which emissions must be attenuated are 904, 909.75, 919.75, 921.75, 927.50, **927.75 and 928 MHz**. If the 919.75-921.75 **and 921.75-927.25 MHz subbands** are aggregated by a single licensee, the emission mask limitations at the band edges at 921.75 and 927.50 **MHz** may be ignored. The licensed **frequency** band edges for non-multilateration systems for which emissions must be attenuated are 902, **904**, 909.75 and 921.75 **MHz**. These emission limitations will assure that multilateration and non-multi&ration systems will not interfere with each other and that operations below **902 MHz** and above **928 MHz** are protected.

IV. CONCLUSION

99. Given the plethora of diverse users that share the **902-928 MHz** band, this has been an especially difficult proceeding. While we strongly support and wish to encourage the continued development **and** deployment of an **LMS industry**, we also recognize the valuable services being provided by other users of this **spectrum**. We believe that the rules we have adopted herein fairly balance these diverse interests. While we have not been able to satisfy **all of the concerns** of **all** of the parties in this proceeding, we reviewed extensive **comments and replies to the Notice as well as a very large number of ex parte filings in this docket and serious** consideration was given to each position. Given the diverse and often mutually exclusive **interests** of the many parties that participated, our decisions were the best that could be achieved. The rules **will** allow for the continued growth of **LMS services and**

²¹² **Id.**

advance Congress' goal of developing an intelligent transportation system infrastructure. At the same time, we have attempted to ensure that other users of the band, including Amateur operators and users of Part 15 devices, will be able to co-exist with LMS.

100. We have taken the long-term beneficial action of creating the Transportation **Infrastructure** Radio Service. By creating this new **service** at this early date in ITS development, we will be able to take an organized approach to regulating spectrum and services related to ITS and transportation infrastructure in general.

V. FINAL REGULATORY FLEXIBILITY ANALYSIS

101. Pursuant to the Regulatory Flexibility Act of 1980, the Commission's final analysis is as follows:

Need and Purpose of the Action

102. The rules adopted herein will enhance use of the **902-928** MHz band for location and monitoring systems. These rules replace the existing interim rules that govern automatic vehicle monitoring systems. The new rules create a more stable environment for **LMS** system licensees and provides much needed flexibility for operators of such systems.

Issues Raised in Response to the Initial Regulatory Flexibility Analysis

103. **There** were no comments submitted in response to the Initial Regulatory Flexibility Analysis.

Significant Alternatives Considered and Rejected

104. All significant alternatives are **discussed** in this Report and Order.

VI. PAPERWORK REDUCTION

105. The proposal contained herein has been analyzed with respect to the Paperwork Reduction Act of 1980 and found to contain no new or modified form, information collection and/or record keeping, labeling, disclosure, or record retention requirements; and will not increase or decrease burden hours imposed on the public.

VI. ORDERING CLAUSES

106. Accordingly, IT IS ORDERED that, pursuant to the authority of Sections 4(i), 302, 303(r), and 332(a)(2) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 302, 303(r), and 332(a), Parts 2 and 90 of the Commission's Rules, 47 C.F.R. Parts 2 and 90, ARE AMENDED as set forth in Appendix A below, effective [thirty days after publication in the Federal Register].

107. The Petition for Rule Making filed on January 13, 1994 by the American Radio Relay League IS DENIED.

108. For further information concerning this Report and Order, contact Thomas S. Dombrowsky, Martin D. Liebman or John J. Rorkowski of the Wireless Telecommunications Bureau at (202) 418-0620.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

Appendix A

Parts 2 and 90 of Chapter I of Title 47 of the Code of Federal Regulations are amended as follows:

PART 2 - FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

1. The authority citation for Part 2 continues to read as follows:

Authority: Sec. **4, 302, 303, and 307** of the Communications Act of 1934, as amended, 47 U.S.C. Sections **154, 154(i), 302,303,303(r), and 307**, unless otherwise noted.

2. Section 2.106 is amended by adding "Private Land Mobile (90)" to the FCC use designators in the entry for **902-928** MHz in the table and by revising footnotes US218 and US275 to read as follows:

§ 2.106 Table of Frequency A&cations

* * * * *

International table	United States table	FCC use designators
* * *	Government Non-Government	R&part(s) Special-use frequencies
* * * * *		
* * *	902-928 RADIOLOCATION 707 US215 US218 US267 US275 G11 G59	902-928 Private Land 915 ± 13 MHz Mobile (90) Industrial, Amateur (97) scientific, and medical frequency.

* * * * *

US218 The band 902-928 MHz is available for Location and Monitoring Service (**LMS**) systems subject to not causing harmful interference to the operation of all Government Stations authorized in these bands. These systems must tolerate interference **from** the

F.¹²¹

49. The plan also accommodates the needs of non-multilateration systems by providing a total of 14 MHz for such systems rather than the 10 MHz of spectrum proposed in the Notice (see footnote 98, supra). Of this 14 MHz, 10 MHz is contiguous spectrum at 909.750-919.750 MHz that is not shared with multilateration systems, which should address the spectrum requirements of most non-multilateration systems.” In addition, non-multilateration systems may obtain up to a 12 MHz block of contiguous spectrum by also using the 2 MHz of spectrum at 919.750-921.750 MHz (Band D). Although this 2 MHz block will be shared on a co-equal basis with multilateration systems, it will nonetheless provide opportunities for non-multilateration systems that require additional spectrum to operate effectively.¹²³

F. Geographic Areas for Exclusive Licenses

50. In the Notice, we sought comment on how to license spectrum to multilateration LMS systems.¹²⁴ In the Notice of Proposed Rulemaking in PP Docket No. 93-253, we asked for comment on the appropriateness of awarding LMS licenses through competitive bidding.¹²⁵ Finally, after adopting the Notice in this docket, we sought specific comment on certain alternative licensing aspects, such as the use of Basic Trading Areas (BTAs) in defining the license service area.¹²⁶

51. Teletrac favors BTAs over MSAs/RSAs for multilateration LMS licensing “because the coverage area customers seek for tracking and emergency services extends

¹²¹ Licensees may not be authorized to operate on more than one of the multilateration bands in a given MTA, except that they will be permitted to aggregate Bands D and G and Bands E and F.

¹²² Mark IV has indicated that its non-multilateration systems can operate in the 912-918 MHz range. Comments of Mark IV dated June 29, 1993, at 8-10. MFS/TI has indicated that “it may be possible for AVI (non-multilateration) technologies to operate in as little as 10 MHz of (contiguous) bandwidth.” Comments of MFS/TI dated August 12, 1994, at 8.

¹²³ See Amtech comments at 9. Amtech states that two-way data transmission between a moving vehicle and a fixed location will require large bandwidths. See also TI/MFS ex parte comments filed December 2, 1993, at 5 and Hughes comments at 6.

¹²⁴ See Notice of Proposed Rule Making, PR Docket No. 93-61, 8 FCC Rcd 2502 (1993) at paragraph 21.

¹²⁵ See, Notice of Proposed Rule Making, PP Docket No. 93-253, 8 FCC Rcd 7635, para 145, n. 153 (1993).

¹²⁶ See Public Notice, DA 94-129, PR Docket No. 93-61, 59 Fed.Reg. 7239 (February 15, 1994).

beyond city limits to the broader metropolitan area where people are likely to commute, conduct business, or routinely drive."¹²⁷ SBMS favors **MSAs/RSAs** over **BTAs** because, it claims, (1) the Commission has had favorable experience with **MSAs/RSAs** in licensing cellular systems, (2) **BTAs** do not coincide with cellular service areas, to the detriment of cellular entities that are would-be LMS providers, (3) **MSAs/RSAs** are widely known and easily ascertainable, and (4) no private party or entity has ever attempted to control dissemination of maps or listings which depict or define these **areas**.¹²⁸ SBMS also argues that allowing existing licensees to expand to the borders of their **BTAs** could have **anti-competitive** implications.¹²⁹ Symbol Technologies believes that choosing **BTAs** for **LMS** would result in a congruency of service areas for LMS and PCS that would allow LMS providers to be de facto PCS providers and directly compete with **PCS**.¹³⁰

52. We generally agree with Teletrac's view that the geographic scope of **LMS** systems logically correlates to areas in which there are centers of consumption of durable goods. We also find, however, that LMS has the potential to serve larger areas; vehicle location and monitoring will be useful for the individual motorist and for fleets of vehicles, and for short-range travel as well as long-range travel. For this reason, we conclude that Major Trading Areas (**MTAs**) as defined in the 1993 Rand McNally Commercial Atlas and Marketing Guide¹³¹ and four additional MTA-like service **areas**,¹³² unlike the smaller **BTAs**, provide a more suitable regulatory construct for multilateration licensing. While it is clear that multilateration systems will benefit from being centered upon areas of commerce and trade, use of **MTAs** will give systems greater capacity to accommodate large numbers of prospective users of location services. This will promote competition, encourage the advancement of new technologies, and result in better and speedier service to the public. We will thus provide for one exclusive multilateration system license in each MTA in the sub-bands identified for exclusive assignments (i.e., Bands B and H, D and G, and E and F). Multilateration licensees on these exclusive assignments will be allowed to construct stations anywhere within their **MTAs**, subject to technical and operational considerations discussed in paragraph 87-98, infra.

¹²⁷ Comments of **PacTel Teletrac** dated March 15, 1994, at 8.

¹²⁸ Comments of SBMS dated March 15, 1994, at 5. SBMS makes reference to "**PCIA**, Rand McNally Settle **Out-of-Court** On Use of **BTA/MTA** Listings," **Washington Telecom** Week, February 18, 1994, at 2-3.

¹²⁹ **Comments** of SBMS dated March 15, 1994, at 14-16.

¹³⁰ **Comments** of Symbol Technologies, Inc. in Response to the Public Notice of February 9, 1994, at 7-8 (note 9).

¹³¹ See footnote 23, supra.

¹³² See footnote 24, supra.

G. Competitive Bidding for Exclusive Multilateration LMS Licenses

53. In response to the Notice of Proposed Rule Making in PP Docket No. 93-253, we received comment on the issue of whether mutually exclusive applications for AVM systems should be resolved by competitive **bidding**.¹³³ Teletrac and SBMS oppose use of competitive bidding to license in this service. These parties contend that the statutory requirement that auctionable spectrum be exclusively assigned and principally used to serve paying subscribers is not met because LMS operations are secondary to ISM and Federal Government use of the band. **Amtech** and Pinpoint, who oppose competitive bidding for **LMS** licenses for other reasons, argue that **LMS's** secondary status does not in and of itself statutorily preclude competitive bidding.

54. In the Second Report and Order in PP Docket No. 93-253, we concluded that it was premature to authorize competitive bidding for AVM systems during the **pendency** of PR Docket No. **93-61**, because "the likelihood of mutually exclusive applications" was unknown or was debated by the commenters.¹³⁴ However, in light of our decision to grant exclusive multilateration LMS licenses within three sub-bands, and because they will be used to offer for-profit, subscriber-based services, we conclude that competitive bidding should be used to grant exclusive licenses where mutually exclusive applications are accepted for filing. Use of competitive bidding in such cases meets the general statutory criteria for auctioning licenses set forth in Section **309(j)(2)** of the Act.¹³⁵ The statute permits auctions where: (1) mutually exclusive **applications** for initial licenses or construction permits are accepted for filing by the Commission; (2) the principal use of the **spectrum** will involve, or is reasonably likely to involve, the receipt by the licensee of compensation **from** subscribers in return for enabling those subscribers to receive or transmit communications signals utilizing the licensed frequencies; and (3) the public **interest** objectives of Section **309(j)** would be served by subjecting mutually-exclusive applications in the service to competitive **bidding**.¹³⁶

55. We conclude that the above **requirements** are satisfied, thus making competitive bidding available for licensing within certain band segments. First, in accordance with the statute, the licensing scheme we adopt herein allows for mutual exclusivity among applicants for initial licenses. Specifically, we have rejected the option of allowing multilateration LMS

¹³³ Several **commenters** to that **proceeding** oppose grant of non-multi&ration licenses by competitive bidding. See, e.g., Comments of Hughes Transportation Management, Interagency Group and **Amtech**.

¹³⁴ See **Second Report and Order**, PP Docket No. **93-253**, 9 FCC **Rcd** 2348, 2351-2, (1994).

¹³⁵ See 47 U.S.C. § **309(j)(2)**. See also H.R. Rep. 111, 103d **Cong.** 1st **Sess.** 254 (1993).

¹³⁶ A comprehensive discussion of these principles for **determining** whether licenses may be auctioned is set forth in the Second Report and Order in PP Docket No. **93-253**, 9 FCC **Rcd** 2398 (1994) at **paras. 11-67**.

systems to operate in an unlimited shared use environment and have instead decided to grant only one licensee the use of each of three sub-bands for **multilateration** LMS in each MTA. (see paragraphs 44-46, supra) do not believe that the likely existence of some grandfathered AVM multilateration operations alters this conclusion. See **para. 61, infra**. Because no more than one multilateration licensee will be permitted in any single sub-band in an MTA (hereinafter “MTA licensee”), we anticipate that mutually exclusive applications will be **filed**. We also conclude that the use of the spectrum by other services does not preclude the applicability of the competitive bidding process. Shared spectrum for which we exclude competitive bidding is “where mutual exclusivity between applications **cannot** exist because channels must be shared by multiple licensees. . . . [W]e proposed to exclude these services from competitive bidding because there can be no mutual exclusivity.”¹³⁷ That is not the case here, where in all likelihood there will be mutually exclusive applications for each exclusive MTA license. The relevant statutory prerequisite, as set forth in Section **309(j)** of the Budget Act, is that “mutually exclusive applications are accepted for filing.” This standard does not require that the relevant spectrum be completely unoccupied by other services.

56. Second, as the statute requires, the “principal use” of the spectrum is reasonably likely to involve MTA licensees receiving compensation from subscribers in return for those subscribers receiving or transmitting signals. We have concluded that this requirement allows us to evaluate classes of licenses, rather than individual licenses, in **determining** the “principal use” of spectrum.¹³⁸ Thus, while MTA licensees may be secondary in the band to government and ISM operations, the “principal use” test, as we have interpreted it, permits us to conclude that the principal uses of **multilateration** LMS are primarily subscriber-based offerings.¹³⁹

57. In addition, we believe that use of a competitive bidding procedure for the licensing of these services satisfies the public interest objectives for auctioning set forth in Section **309(j)(3)** of the Act. Specifically, use of competitive bidding to award MTA licenses, as compared to other licensing methods, will speed the development and deployment of new services to the public with minimal **administrative** or judicial delays, and encourages efficient use of the spectrum as **required** by Section 309(j)(A) and **(D)**. Furthermore, in accordance with Section **309(j)(3)(B)**, we believe that competitive bidding will promote access to multilateration services and technologies and disseminate licenses among a wide variety of applicants by encouraging participation by all interested or qualified bidders. Finally, we conclude that competitive bidding will recover for the public a portion of the value of the

¹³⁷ In the Matter of Implementation of Section 309(j) of the Communications Act – Competitive Bidding, Second Report and Order, PP **Docket** No. 93-253, 9 FCC **Rcd** 2348 at **para.** 13 (1994).

¹³⁸ **See** Second Report and Order in PP Docket N. 93-253, FCC **94-61**, 9 FCC **Rcd** 2348 at **para.** 34 (1994).

¹³⁹ Comments of Pinpoint at 5; Comments of SBMS at 4.

spectrum, as envisioned in Section 309(j)(3)(C). Specific rules and procedures for competitive bidding for this spectrum, including rules and procedures for designated entities, will be established in a separate proceeding. We will not accept applications for multilateration **LMS** licenses until after these rules and **procedures** have been established.

H. Construction Period for LMS Systems

58. In the Notice, we proposed that LMS systems be **constructed** and placed in operation within eight months of the date a license is granted, which is the current **standard** for AVM licensees under Part 90.¹⁴⁰ The majority of commenters that addressed this issue support our proposal so long as provision is made for extended implementation periods for local governments or especially large and complex **systems**.¹⁴¹ **MobileVision** supports a **five-year** construction period with **construction** benchmarks for multilateration systems but states that eight months is appropriate for non-multilateration **systems**.¹⁴² **SBMS** supports a **12-month construction period**.¹⁴³

59. Most non-multilateration **installations** use relatively few transmitters in a limited number of locations. Accordingly, we shall retain the current **requirement** that these systems be **constructed** and placed in operation within eight months. We will consider a **non-multilateration** LMS system to be **constructed** and placed in operation if at least one base station has been constructed and the system is providing service to at least one mobile radio **unit**. As they may do **currently**, a local government entity **requiring** more than eight months to construct a non-multilateration LMS system because of the system's **size** and complexity can request extended implementation in accordance with Section 90.155(b) of our Rules.

60. We **recognize** that multilateration LMS systems, because they will be **licensed** on an MTA basis, will likely be larger and more complex **than** non-multilateration LMS systems. Rather than imposing benchmarks and reporting **requirements** on these systems for all or part of their license term, we will require a multilateration LMS licensee **authorized** to operate throughout an MTA to construct a sufficient number of base stations that utilize multilateration technology to provide multilateration location service to a **substantial** portion of at least one BTA in that MTA within twelve months after initial **authorization**.¹⁴⁴ LMS

¹⁴⁰ Notice at para. 26, 8 FCC Rcd. 2502, 2507 (1993). See 47 C.F.R. § 90.155.

¹⁴¹ **Hughes comments** at 15; **Amtech comments** at 35-36; **Mark IV comments** at 14; **IVHS America comments** at 19; **Interagency Group comments** at 10.

¹⁴² **MobileVision** comments at 4649.

¹⁴³ **SBMS** comments at 22.

¹⁴⁴ **This requirement** is comparable to the **substantial service requirement** for 10 MHz PCS licensees set forth in Memorandum Opinion and Order, GEN Docket No. 90-314, 9 FCC Rcd 5108,

systems not constructed and placed in operation in a timely fashion (*i.e.*, within 8 months for non-multilateration systems and within twelve months, as described above, for **multilateration** systems) will cancel automatically.

I. Grandfathering Provisions for Existing Multilateration AVM Licensees

61. As of February 3, 1995, we will no longer accept applications for the operation of multilateration **LMS** systems in the **904-912** and 918-926 MHz bands under our current rules. To ensure that our new licensing scheme does not impose undue hardship on existing, operating multilateration AVM systems, we will adopt certain grandfathering provisions which will allow them to continue to operate their systems under the current rules. We will also confer grandfathering provisions on **multilateration** AVM licensees who have not yet constructed their systems so that such licensees may construct and operate their licensed stations **under** our newly adopted rules.

62. A grandfathered multilateration AVM station will be considered constructed and placed in operation if it is built in accordance with its authorized parameters and is regularly interacting with one or more other stations to provide location service, using multilateration technology, to one or more mobile units. See 47 C.F.R. § 90.155. Specifically, **LMS** multilateration stations will only be considered **constructed** and placed in operation if they are part of a system that can interrogate a mobile, receive the response at 3 or more sites, compute the location from the time of arrival of the responses and transmit the location either back to the mobile or to a subscriber's fixed site. A **grandfathered multilateration** AVM station will receive no protection or exclusivity based upon mileage separation or service area criteria, but instead will operate on a **co-equal** shared basis with stations of any other grandfathered licensee or the exclusive MTA licensee operating in the same sub-band. We have concluded that sharing of **spectrum** among **unlimited** numbers of multilateration licensees is not technically feasible (*see* paragraph 44, *supra*), and thus we have not adopted rules that would permit the sharing of **spectrum** among multiple multilateration systems over an entire **MTA**. However, given the very small number of multilateration licensees **currently** authorized, in any given MTA there will ultimately be, at most, one or two **grandfathered licensees operating in the same spectrum as the eventual MTA licensee**. In such limited cases, we expect cooperative arrangements for sharing among these licensees to be reached. Where this is not possible or achieved, MTA licensees may build their systems in areas **geographically** removed from grandfathered stations, or may attempt to acquire existing systems **from** the grandfathered **licensee(s)** in their licensed area.

63. To attain grandfathered status, existing multilateration AVM licensees must **file**, within thirty days of the effective date of the rules adopted in this **Report and Order**, applications to modify their licenses to comply with the new band plan. These applications to modify must **identify** which new sub-band or sub-bands (*i.e.*, Band B and H, Band D and

¶ 155 (1994).

G, or Band E and F) they intend to operate their licensed multilateration AVM stations in, once their applications to modify have been authorized. We will not restrict multilateration AVM licensees to selecting a particular sub-band or sub-bands for their modified authorization, but will permit these licensees to choose the **spectrum** band(s) -- not to exceed a total of 8 MHz -- that best meets with their future **LMS** requirements. The application to modify a license to comply with the new band plan may also include a modification to specify an alternate site, so long as the alternate site is 2 kilometers or less from the site **specified** in the original license.¹⁴⁵ Further, at the time that existing multilateration AVM licensees **file** these applications to modify, they **must** certify that either (1) their multilateration AVM system has been constructed and is operational as of February 3, 1995, or (2) that it is not constructed at that time. Multilateration AVM systems that **are** constructed and operational as described above will be given until April 1, 1998 to convert to the spectrum identified in their modified LMS system license. Such licensees may continue to operate their multilateration AVM systems under either the old rules or the new rules during the process of converting their systems during this period. Licensees of constructed and operational multilateration AVM systems that do not file applications to modify within **this 30-day** period will be permitted to continue operations under the provisions of Section 90.239 **until April 1, 1998** or the end of their original license term, whichever occurs first, at which time such licenses **will** cancel **automatically** and will not be renewed.

64. Multilateration AVM licensees for stations not constructed as of February 3, 1995 must construct and operate their modified LMS systems on the spectrum identified in their modified **LMS** system license by April 1, 1996. These licensees will not be allotted the lengthy transition period that licensees of constructed and operational systems are provided (i.e., until April 1, 1998) because they do not have an existing, operating **infrastructure** that will require this additional time for conversion. Licenses for stations not constructed under the old rules as of February 3, 1995 will terminate 30 days after the effective date of the new rules unless timely applications to modify are **filed**. Parties may **file** applications to modify those licenses that they plan to construct by April 1, 1996.¹⁴⁶ We have provided a transition period that we believe is appropriate for construction and operation for current licensees to attain grandfathered status. Because this spectrum will be subject to competitive bidding, we must balance our wish to accommodate the desired construction schedules of existing **multilateration** AVM licensees against the need for prospective bidders to be able to evaluate the likely value of the spectrum upon which they will be bidding.

¹⁴⁵ See generally **Implementation** of Sections 3(n) and 332 of the Communications Act, **Regulatory Treatment** of Mobile Services, GN Docket No. 93-252, PR Docket No. 93-144, PR Docket No. 89-553, Third Report and Order, FCC 94-212, released Sept. 23, 1994, at **para.** 356.

¹⁴⁶ We note that **Airtouch** and **Mob&vision** have offered to limit the number of licenses they **construct** to 20 percent of the **unbuilt** licenses they hold. **While** we are not adopting this 20 percent limit, we expect **all** licensees to **file** modification applications only for those **unbuilt** licenses that **realistically can be constructed** by April 1, 1996. If the number of modification applications submitted **significantly** varies from the number **built**, we **will** consider appropriate **measures**.

J. Licensing of Non-Multilateration Systems

65. We proposed that non-multilateration systems be licensed in the **902-904**, 912-918, and 926928 MHz bands.” Mark IV believes that 6 MHz of contiguous spectrum at 912-918 MHz is sufficient for its type of system.¹⁴⁸ MFS Network Technologies/Texas Instruments recommend 12 or 14 MHz of contiguous spectrum for non-multilateration systems, but indicate that 10 MHz may be **sufficient**.¹⁴⁹ **Amtech** states that a minimum of 12 MHz of contiguous spectrum is required for non-multilateration systems, because these systems need 6 MHz wide channels and two such channels are necessary for high-speed operation at most toll booth locations.”

66. We also proposed that non-multilateration systems be licensed on a shared basis with licensees responsible for coordinating use to avoid **interference**.¹⁵¹ Lockheed proposes licensing of non-multilateration systems based on a fixed mileage **separation**.¹⁵² Mark IV supports the use of frequency coordinators to coordinate the assignment of **spectrum**.¹⁵³ **NABER** proposes that it be designated as the frequency coordinator for non-multilateration LMS **systems**.¹⁵⁴ We are adopting our proposal to license non-multilateration LMS systems on a shared basis because these systems generally cover relatively short distances, and licensing based on a **fixed** mileage separation would limit **re-use** of spectrum and thereby limit the potential uses of these systems. We also decline to designate a frequency coordinator for this service. Many non-multilateration licenses have been issued and many stations have been placed in operation without such a formal coordination process and there appear to be no negative consequences. Considering the limited coverage of these systems and the expanded amount of spectrum available under the allocation plan we have adopted, it should not be difficult for non-multilateration systems to share their sub-bands.

¹⁴⁷ **Notice at para. 25, 8 FCC Rcd. 2502, 2507 (1993).**

¹⁴⁸ **Comments of Mark IV M-IS Division dated June 29, 1993, at 8.**

¹⁴⁹ **Ex Parte comments of MFS Network Technologies/Texas Instruments dated August 12, 1994.**

¹⁵⁰ **Ex Parte Comments of Amtech dated August 12, 1994.**

¹⁵¹ **Notice at para. 25, 8 FCC Rcd. 2502, 2507 (1993).**

¹⁵² Lockheed comments at 4. Mark IV supported a **fixed milage** separation in its comments but modified its support in reply comments. Mark IV comments at 8-9, reply comments at 8.

¹⁵³ **Mark IV reply comments 8-10.**

¹⁵⁴ **NABER comments at 6-7.**

67. The Interagency Group, with the support of Mark IV, proposes that local governments be able to obtain blanket licenses for non-multilateration **systems**.¹⁵⁵ We decline to adopt a blanket licensing scheme for non-multilateration systems. In a shared use environment, it is important that applicants and other co-channel users know exactly where systems are located if they are to avoid interference. If we issue blanket licenses, it will be difficult for the Commission or the public to ascertain the exact location of LMS transmitters.

68. Finally, we proposed that existing non-multilateration systems licensed to operate in spectrum allocated for use by multilateration systems be required to move their operations within three years of the effective date of any new **rules**.¹⁵⁶ SBMS and Location Services support this proposal.¹⁵⁷ Both Teletrac and **Amtech** favor grandfathering existing **non-multilateration** systems, although Teletrac would only do so for systems licensed prior to the initiation of this **proceeding**.¹⁵⁸

69. As discussed earlier, we have modified our proposal to provide for shared use of the 902.000-904.000 and **909.750-921.750** MHz bands by non-multilateration LMS systems, thus allocating a total of 14 MHz that will be available for non-multilateration operations. Although a non-multilateration licensee could be **required** to share 2 MHz of this **spectrum** (at 919.750-9X.750 MHz) with an MTA multilateration licensee, we believe that the benefit to those non-multilateration systems **requiring** a minimum of 12 MHz of contiguous **spectrum to operate remains substantial and warrants** this overlap.

70. In addition, because we have concluded that sharing between multilateration and non-multilateration systems is generally inadvisable (see paragraph 46, **supra**), we are **requiring** that licenses for non-multilateration systems in **spectrum** other than the **902.000-904.000** and **909.750-9X.750** MHz bands must be modified by April 1, 1998, to specify operation solely in those bands and to operate consistent with the rules we are adopting by this **Report and Order**. This is consistent with our decision to require multilateration systems to relocate their operations within the same time period. Similarly, authorizations not so **modified** within this period will cancel automatically.

¹⁵⁵ Comments of Interagency Group at 12; Reply Comments of Mark IV at 6-8.

¹⁵⁶ **Notice** at para. 16, 8 FCC **Rcd.** (1993).

¹⁵⁷ **SBMS** comments at 12; Location Services at 5.

¹⁵⁸ Teletrac comments at 22-23; **Amtech** comments at 3638.

K. Multilateration System Operations

71. From review of the lengthy record in this proceeding, we have determined that multilateration systems have two distinct methods of operation. One type of multilateration system utilizes a low power, **wideband** location pulse originating from the mobile units and a high powered, narrowband interrogation and control signal emanating from the **fixed/base** stations. These systems also utilize narrowband transmissions, within the band that is used for the location pulse, for two-way voice and data communications between fixed/base stations and mobile units. Another kind of multilateration system operates in a different manner, utilizing **wideband transmissions** for: the location pulse from the mobiles, the interrogation and control signal from the fixed/base stations and the two-way messaging between the fixed/base stations and the mobile units. As we understand these two types of multilateration systems, there are three basic elements used to accomplish location and monitoring functions: forward links, reverse links and communication links. Forward links originate at the **fixed/base** site and are used to control and interrogate mobile units. In contrast, reverse links are signals transmitted from the mobile units or **fixed** station **to fixed/base** stations to determine the location of the mobiles or from fixed stations to other fixed/base stations for system synchronization and testing purposes. Communication links **connect** fixed/base stations and mobile units and are utilized for two-way messaging related to the location or monitoring functions of the system. In addition, multilateration systems use these three basic elements either in what we will refer to as the “narrowband” or the “broadband” portion of the **LMS** band. The narrowband portion we will define as the 250 **kHz** sub-bands (i.e., the sub-bands **927.250-927.500**, **927.500-927.750** and **927.750-928.000** MHz) and we will define the broadband portion as the **sub-bands 904.000-909.750**, **919.750-921.750** and **921.750-927.250** MHz. Each of the three basic elements are discussed below in accordance with their location in the **narrowband** or broadband portion of the LMS band, along with how they are considered in our overall regulation of multilateration systems.

Narrowband Segment

a) Narrowband Forward Links

72. In the **Notice**, we observed that many multilateration systems are designed using forward links to contact **units** to be located.¹⁵⁹ Consistent with existing systems, we proposed that multilateration licensees authorized to operate in the **904-912** MHz sub-band be licensed to operate their forward links in the 250 **kHz** of **spectrum** between 924.890 and 925.140 MHz and that multilateration licensees authorized to operate in the 918-926 MHz **sub-band** be licensed to operate their forward links in the 250 **kHz** of **spectrum** between 904.375 and 904.625 **MHz**.¹⁶⁰

¹⁵⁹ Notice at **para.** 19, 8 FCC **Rcd** 2502, 2405 (1993).

¹⁶⁰ Notice at **para.** 19, 8 FCC **Rcd** 2502.2505 (1993).

73. Teletrac is the only **commenter** that supports the proposed location of the forward links, claiming that it will be adversely affected otherwise because its systems now employ forward links in the manner proposed in the **MobileVision** favors placing the forward links within a licensee's authorized sub-band rather than in the other multilateration **LMS** sub-band as proposed.¹⁶² Location Services proposes keeping the forward links in the opposite sub-band but would move the links to the edges of each **sub-band**.¹⁶³ SBMS prefers that the forward links be placed as far from **wideband** frequencies as practical and assigned exclusively.¹⁶⁴ Pinpoint prefers a **wideband** forward link that operates over an entire multilateration system sub-band.¹⁶⁵ **Amtech** recommends placement of the forward links at the edges of the **902-928** MHz band or make licensees use alternative spectrum for forward links, such as common carrier or private carrier paging **spectrum**.¹⁶⁶ Symbol, **ITRON** and **TIA** urge that multilateration **LMS** forward **links** be placed at the upper edge of the **902-928** MHz band if Part 15 devices are to be **accommodated**.¹⁶⁷ Other Part 15 commenters expressed fear of being "drowned out" by high powered forward links, particularly **wideband** forward **links**.¹⁶⁸

74. Although there is no identification of forward links in our current rules, we will define a forward link as any signal transmitted to a mobile unit to be located by a multilateration **LMS** system.¹⁶⁹ We will also dedicate a portion of spectrum in the **902-928** MHz band where narrowband forward links may be used by the multilateration systems that require them for their operations. Thus, in accordance with our band plan for multilateration systems, multilateration licensees will be authorized to use only the following spectrum for narrowband forward **links**:

The 904.000-909.750 MHz band narrowband forward link is **927.750-928.000** MHz
The **919.750-921.750** MHz band **narrowband** forward link is **927.500-927.750** MHz

¹⁶¹ Teletrac Comments at 51, Reply Comments at 33-35.

¹⁶² **MobileVision** Comments at 43-44.

¹⁶³ Location Services Comments at 5-6.

¹⁶⁴ **Ex Parte Comments** of **SBMS**, dated August 12, 1994.

¹⁶⁵ **Ex Parte** Comments of Pinpoint dated September 19, 1994, **Ex Parte** comments of Pinpoint dated September 15, 1994.

¹⁶⁶ **Amtech Comments** at 31-32.

¹⁶⁷ **Further Comments** of **ITRON**, Symbol and **TIA** dated August 12, 1994.

¹⁶⁸ **See Itron** comments, dated August 12, 1994.

¹⁶⁹ **See** Section 99.7 of our rules.

The **921.750-927.250** MHz band narrowband forward link is **927.250-927.500** MHz

The placement of narrowband forward links at the upper edge of the **902** to 928 MHz band meets the requirements of the **majority** of the multilateration industry and also accommodates the needs of Part 15 **interests**.¹⁷⁰ We have provided the flexibility requested by these various commenters, with two of the **narrowband** forward links placed in spectrum apart from the **licensee's** multilateration sub-band (e.g., the 927.50-927.75 and 927.75-928 **MHz** forward links) and the third forward **link** (927.25X7.50 MHz) placed adjacent to its related multilateration sub-band.

75. Based upon comments from entities that employ narrowband forward links, we believe that 250 **kHz** for each multilateration system is a suitable amount of spectrum for narrowband forward **links**.¹⁷¹ Furthermore, because narrowband forward **link transmissions** will be situated in the uppermost portion of the 902-928 MHz band -- and thus somewhat removed from the operations of other licensed and unlicensed services in the band -- a relatively greater power level for this use should be permitted. We therefore will allow narrowband forward links to operate with a maximum power of 300 watts ERP.

Broadband Segment

a) **Wideband** Forward Links

76. Pinpoint and Uniplex have expressed interest in employing a **wideband** forward link, which, like the narrowband forward link, would be used to communicate with mobile **units**. However, unlike the narrowband forward link, a **wideband** forward link could operate over a multilateration system's entire authorized **sub-band**.¹⁷² Part 15 users uniformly oppose this request on the grounds that such **transmissions** are likely to cause interference to Part 15 devices. **Itron**, for example, points out that the high powered **wideband** forward link could adversely affect the operations of Part 15 devices because it would "present an essentially constant signal at any particular geographic location."¹⁷³ Pinpoint, however, asserts that its

¹⁷⁰ Ex **Parte** Comments of **Teletrac** dated August 12, 1994; Mobilevision Comments at 4344; Location Services Comments at 5-6; Ex **Parte** Comments of Southwestern Bell dated August 12, 1994; **Amtech** Comments at 31-32; **Further Comments** of **ITRON**, Symbol and **TIA** dated August 12, 1994.

¹⁷¹ Ex **Parte** Comments of SBMS dated August 12, 1994, Ex **Parte** Comments of **Teletrac** dated August 12, 1994, Ex **Parte** Comments of **MobileVision** dated August 12, 1994.

¹⁷² Ex **Parte** Comments of Pinpoint dated September 19, 1994, Ex **Parte** Comments of Uniplex dated September 30, 1994.

¹⁷³ See e.g., Ex **Parte** Comments of **ITRON** Inc. at p. 3, dated August 12, 1994 and Symbol Technologies, dated August 12, 1994.

system, which is based on the use of the **wideband** forward link, would pose far less of an interference **threat** to users of the **902-928** MHz band than that caused by a certain, **currently** deployed Part 15 data distribution system.¹⁷⁴ We will permit the authorization of **wideband** forward links, but note that multilateration operations are conditioned on further testing as described in paragraphs 81-82, **infra**.

b) Reverse Links

77. As discussed above, a multilateration signal transmitted **to** the fixed/base stations will be referred to as a "reverse link" and is utilized by both types of multilateration systems. These signals are contained within the broadband segment of the multilateration allotment and are primarily location pulses originating from mobile units **and** used for determination of the position of mobile units. Such **transmissions** may also originate from other fixed/base stations for the purpose of system **synchronization** or testing. These **transmissions** are likely to occur less **frequently** and more randomly than the **above-mentioned** forward links and are therefore less likely to cause interference to Part 15 operations. However, as pointed out by one **commenter**, reverse **link transmissions** could present significant problems to Part 15 operations depending on the power levels, duty cycles and density of mobile **units**.¹⁷⁵ Reverse links are an essential part of any multilateration LMS system and therefore must be **accommodated**. However, in order to limit the potential for interference from such **transmissions**, we will limit the **maximum** power level of reverse links to 30 watts ERP. This is a sufficient amount of power to enable mobile units to provide an adequate signal to fixed sites for location, synchronization **and** testing purposes.

c) Communication Links

78. As noted by multilateration service **providers**,¹⁷⁶ there is an additional **transmission** that multilateration systems **utilize** for two-way messaging that we will refer to as a "communication link" The communication link emanates from the fixed/base stations and mobile units ancillary to the location and monitoring function of the multilateration system and provides status **and instructional** information relating to the vehicle beii located or the **occupant(s)** of the vehicle. Additionally, these links may be interconnected with the PSN to enable emergency **communications**.¹⁷⁷ Moreover, the method of **transmission** of the communication link differs **between** multilatention systems, the **differences** centering on the

¹⁷⁴ **See comments** filed by Pinpoint Communications, Inc., dated September 19, 1994.

¹⁷⁵ **See letter from** Metricom, Inc., Alarm Industry Communications committee, Electronic Industries Association, Itron, Inc., Part 15 Coalition, Sensormatic Electronics Corporation, Southern California Edison, and Telecommunications Industry Association., dated August 12, 1994.

¹⁷⁶ **See e.g., Ex Parte Comments** of MobileVision dated December 14, 1994, at 1-2.

¹⁷⁷ **See paragraphs 26 and 27, supra.**

size of the channel(s) being used.

i) Narrowband Communication Links

79. Narrowband communication links are used in certain multilateration systems to provide voice and data communications within the broadband portion of their allocation of **spectrum**. Additionally, the narrowband communication link differs from a **wideband** communication link in that it uses small (e.g., 25 **kHz**) channels to accomplish its messaging **functions**. These narrowband **transmissions** are a **valuable** asset and may enhance the economic viability and flexibility of these particular multilateration **systems**.¹⁷⁸ However, as we did for reverse links in order to limit their interference potential, we will also limit the **maximum** power of narrowband communication links to 30 watts **ERP**. This limitation encompasses communication links that originate at fixed/base stations as well as mobiles. Due to the fact that these **transmissions** should only occur sporadically or in the event of an emergency, we believe that this power level should serve to limit interference to Part 15 operations. However, we note that multilateration licenses are conditioned on additional testing as discussed in paragraphs 81-82.

ii) **Wideband** Communication Links

80. Certain multilateration systems use **wideband** communication links, integrated with accompanying **wideband** forward links, to provide messaging within the broadband segment. This **wideband** link differs from narrowband communication links because it transmits a direct sequence spread spectrum signal across the entire sub-band (e.g. all of the 904.000-909.750 MHz sub-band) instead of signals on small channels within the sub-band. Although these links are perceived to represent greater interference potential to Part 15 **devices**,¹⁷⁹ we conclude that these **wideband** links should be authorized. As noted earlier, however, multilateration system licenses are **conditioned** on additional testing as discussed in paragraphs 81-82.

Testing of Multilateration Systems

81. **In comments, a number of parties to this proceeding have expressed the desire** and need for additional testing to demonstrate the feasibility of multiple services coexisting in the **902-928** MHz band, in particular the multilateration **LMS** users and the operators of Part 15 devices. Our record contains a **significant** amount of information on the issue of mutual **coexistence** between these parties, which was submitted in the form of theoretical analyses, **demonstrations and testing (See Appendix B)**. **This record shows that certain aspects and** elements of these various systems and services create a greater potential for **interference** than

¹⁷⁸ **See Ex Parte Comments** of Mobilevision dated **December** 14, 1994, at 5.

¹⁷⁹ **See e.g., Ex Parte Comments** of **Cellnet** and **KNOGO** dated August 19, 1994, at 4.

others.¹⁸⁰ The band plan adopted in this item was crafted on the basis of this extensive record. In addition, these submissions were used to establish technical limitations or criteria on the operations of the various systems, to **minimize** the potential for interference and provide a more conducive environment for sharing of the band by the disparate services.

82. The record of this proceed@ contains **substantial** technical analysis supporting the band plan we now adopt. We are persuaded, however, that additional testing could provide users of the band with data that **could** contribute to "fine-tuning" system operations. Therefore, to ensure that the coexistence of the various services in the band is as successful as possible and to identify whether further **refinements** in our rules are necessary, we will condition grant of each MTA multilateration license on the licensee's ability to demonstrate through actual field tests that their systems do not cause unacceptable levels of interference to Part 15 devices. To provide such protection and to facilitate band sharing and **minimize** interference to Part 15 operations, multilateration licensees may employ any one of a number of technical refinements, i.e., limiting duty cycle, pulse duration power, etc. It is our expectation that such testing be accomplished through close cooperation between multilateration systems users and operators of Part 15 systems.

L. LMS Below 512 MHz

83. In the Notice, we proposed that the expanded **definition** of **LMS** would apply to below 512 MHz systems, but that licensees of such systems would not be permitted to provide service to individuals or to provide service on a private carrier basis. NABER is the only commenter that addressed LMS operation below 512 MHz. NABER requests clarification of several points **pertaining** to these systems, including coordination **requirements** and co-channel separation **requirements** between LMS systems and **non-LMS** systems used for voice operations.¹⁸¹ NABER also notes that proposed Section **90.105(b)(3)(i)** discusses loading criteria for systems operating with single frequencies, two-frequency mode, and pairs of frequencies, but that Section **90.105(b)(3)(ii)** only discusses separation criteria for operations using single **frequencies** or two frequencies. NABER suggests that because the loading criteria are the same, we apply the same separation criteria for single frequency operations to operations using pairs of frequencies.

84. Section 90.175 of our Rules provides that applicants for frequencies below 512 MHz must generally obtain a **frequency** recommendation from a frequency coordinator. We

¹⁸⁰ Many of these submissions have **focused** on **concerns** regarding the use of **wideband** forward links for multilateration systems, the location of such links in the band, and the **appropriate power levels for both forward and reverse link transmissions**.

¹⁸¹ NABER **comments**. NABER also requests clarification as to the effect our "**Refarming**" proceeding (PR Docket 92-235, Notice of Proposed Rule Making, 7 FCC Rcd 8105 (1992)) will have on LMS systems. No final action has yet been taken in the **Refarming proceeding**. **Ultimately**, LMS systems below 512 MHz will have to adhere to any decisions reached in that **proceeding**.

conclude that LMS applicants should be subject to these same coordination **requirements** when applying for these frequencies. Accordingly, applicants for **LMS** systems below 512 MHz must meet the coordination requirement of Section 90.175(a) of our Rules, 47 C.F.R. § 90.175(a). Applicants will use the frequency coordinator for the radio service in which they have established their eligibility. We will also require LMS systems authorized below 512 MHz to modify their licenses under the same conditions as other land mobile licensees. This means that a modification application will have to be **filed** for changes in the number of base, **fixed**, control, or mobile transmitters.”

85. Section **90.105(b)(3)(i)** only discusses using pairs of frequencies in the 470-512 MHz band. Because these **frequencies** are only available within **80 km** (50 miles) of 13 major urban areas, applying a 120 km (75 miles) separation **between non-LMS** voice systems and LMS systems would severely restrict **LMS** use of this **spectrum**. Pairs of frequencies in the 470-512 MHz band will be assigned in accordance with the allocation plan for the band as described in Subpart L, 47 C.F.R. Part 90, Subpart L, except that the 200 mobile unit loading criteria will apply and an LMS system will not be authorized to share a channel utilized by a **non-LMS** licensee operating a voice system unless an agreement with the **licensee** is reached. Accordingly, the **co-channel** separation between **LMS** systems and **co-channel non-LMS** voice systems in the 470-512 MHz band will be 64 km (40 miles), except on Channel 15 in Chicago, Channel 20 in Philadelphia, and Channel 17 in Wash&ton where the minimum co-channel separation is 32 km (20 miles). See 47 C.F.R. § 90.313.

86. We also adopt our proposal to extend the definition of **LMS** to below-512 MHz systems. We are not, however, expanding uses of LMS systems below 512 MHz to provide service to individuals or to provide service on a wmmercial basis. Such commercial uses of **LMS** would be inconsistent with the nature of the spectrum below 512 MHz, which is intended primarily for the use of private **land** mobile radio (**PLMR**) wmmunications to enable private land mobile eligibles to provide for their own internal wmmunications needs. **Moreover**, the frequency bands below 512 MHz on which LMS systems are licensed are shared **PLMR** frequencies. Many of these channels are already unacceptably crowded. We are currently wnsidering rule changes to **increase** channel capacity and promote more efficient use of **PLMS frequencies** below 512 MHz.¹⁸³ Permitting LMS systems authorized below 512 MHz to provide service on a **commercial** basis, or to provide service to individuals, would only exacerbate this **spectrum congestion**.

M. Technical Issues

87. In the Notice, we proposed a number of technical **requirements** for LMS systems to **minimize** the possibility of both **co-channel** and adjacent-charmel interference and we proposed that equipment be type accepted to ensure compliance with these **standards**. The

¹⁸² See 47 C.F.R. § 90.135(a).

¹⁸³ See Notice of Proposed Rule Making, PR Docket No. **92-235**, 7 FCC Rcd 8105 (1992).

following technical criteria will be applied to licensees of LMS systems. Our **proposals**, commenters' responses, and our decisions are discussed below.

88. Type Acceptance. We proposed that **LMS** equipment be required to be type **accepted**.¹⁸⁴ This proposal was supported by Teletrac, **MobileVision**, SBMS, Mark IV, and Location **Services**.¹⁸⁵ Teletrac proposes that we require the equipment to be authorized through the notification process one-year from the adoption date of this **Report and Order**, while SBMS suggests type acceptance after **18-months**.¹⁸⁶ Location Services suggests that licensees be permitted to operate new equipment on a **commercial** basis for 18 months before such equipment must be type accepted.¹⁸⁷ We are adopting our proposal to require type acceptance. We decline to adopt Teletrac's proposal that we only require equipment "notification."¹⁸⁸ Considering the mobile nature of most **LMS** transmitters and that new, advanced technologies will be employed in this equipment, we find that the stricter regulatory oversight of having equipment type accepted rather than "notified" is justified. Accordingly, all LMS equipment imported or marketed after April 1, 1996, must be type accepted for use under Part 90 of our Rules, 47 C.F.R. Part 90. This includes the "transmitting tags" used in certain non-multilateration systems. If, however, these units meet the requirements of Part 15 of our Rules, 47 C.F.R. Part 15, they may be authorized under that Part. **By** delaying the **requirement** for type acceptance, we effectively adopt Location Services' proposal for a grace period in which to operate LMS equipment without authorization, albeit for a lesser period than 18 months. As **discussed** in the **Notice**,¹⁸⁹ licensees still in the developmental stages that do not wish to seek type acceptance may be licensed on a developmental basis in accordance with Subpart Q of Part 90.¹⁹⁰

89. Emissions. We proposed that no restriction be placed on the type of emission that may be authorized for LMS operation in the **902-928 MHz band**.¹⁹¹ **MobileVision and**

¹⁸⁴ **Notice** at **para. 29**, 8 FCC **Rcd** 2502.2507 (1993).

¹⁸⁵ Teletrac **comments** at 48; **MobileVision comments** at 50; SBMS **comments** 23; Mark IV **wmmments** at 13; and Location **Services comments** at 3.

¹⁸⁶ Teletrac **comments** at 48; SBMS **comments** at 23.

¹⁸⁷ Location **Services comments** at 3.

¹⁸⁸ Teletrac **comments** at 48.

¹⁸⁹ **Notice** at **para. 29**, 8 FCC **Rcd.** 2502, 2507 (1993).

¹⁹⁰ 47 C.F.R. Part 90 Subpart Q.

¹⁹¹ **Notice** at **para. 30**, 8 FCC **Rcd** 2502, 2507 (1993). **See** Section 2.201 of **the Rules**, 47 C.F.R. § 2.201, for a description of emission designators.

SBMS support this **proposal**.¹⁹² Teletrac supports this proposal only if multilateration systems are required to be physically separated? Teletrac claims that, in the absence of geographic separation, stricter limits on **emissions are required** to prevent interference between multilateration **systems**.¹⁹⁴ We are adopting our proposal to place no limits on the type of emission that can be authorized for **LMS** systems. Allowing any types of emissions will enable any type of location or monitoring technology or **ancillary** service to develop without restrictions. We will limit the likelihood of interference through appropriate power, frequency tolerance and emission mask limitations. Moreover, exclusive licensing of multilateration systems in **MTAs** in each of the three respective **sub-bands** should ameliorate concerns of co-channel multilateration **LMS** interference.

90. **Bandwidth.** We proposed to limit the bandwidth of LMS systems as follows:

for 904-912 and 918-926 MHz -- maximum 8 MHz
for **902-904 and 926-928 MHz -- maximum 2 MHz**
for 912-918 MHz -- **maximum 6 MHz**¹⁹⁵

MobileVision supports the maximum bandwidths proposed while **Pinpoint** opposes limiting the maximum permissible bandwidth within the **902-928 MHz band**.¹⁹⁶ In accordance with the band plan we have adopted, we are adopting maximum permissible bandwidths as follows:

For Multilateration systems:

for **904.000-909.750 MHz -- maximum 5.750 MHz**
for **919.750-921.750 MHz -- maximum 2.000 MHz**
for **921.750-927.500 MHz -- maximum 5.750 MHz**¹⁹⁷
for **919.750-927.750 MHz -- maximum 8.000 MHz**¹⁹⁸

¹⁹² **MobileVision** comments at 50; **SBMS** comments at 24.

¹⁹³ Teletrac comments at 49.

¹⁹⁴ **Id.**

¹⁹⁵ **Notice** at para. 30, 8 FCC Rcd. 2502, 2507 (1993).

¹⁹⁶ **MobileVision** Comments at 49; **Pinpoint** Comments at 23-26.

¹⁹⁷ This includes 5.5 MHz multilateration bandwidth and adjoining, associated 0.25 MHz forward link.

¹⁹⁸ This bandwidth capability only exists for licensees aggregating the adjacent 2 MHz and 5.5 MHz multilateration bands and includes the adjoining, associated forward link bands.

For Narrow Band Links:

for **927.250-927.500** MHz -- maximum 250 **kHz**
for 927.500-927.750 MHz -- maximum 250 **kHz**
for **927.750-928.000** MHz -- maximum 250 **kHz**

For Non-multilateration systems:

for 902.000-904.000 MHz -- maximum 2.000 MHz
for **909.750-921.750** MHz -- maximum 12.000 MHz

While we establish these maximum permissible bandwidths, applicants for non-multilateration LMS systems should request only the minimum amount of bandwidth necessary to meet their operational needs.

91. **Frequency Tolerance.** We proposed a frequency tolerance for **transmitters** in the **904-912** and 918-926 MHz bands of 0.0005 **percent** and proposed that no minimum **frequency** tolerance be established for transmitters in the **902-904**, 912-918, and **926-928** MHz **bands**.¹⁹⁹ The frequency tolerance for these systems would be specified on the station's authorization. **MobileVision**, SBMS, Mark IV, and Hughes support the proposed frequency tolerance of 0.0005 percent for multilateration systems and support having no specific **frequency** tolerance for non-multilateration systems.²⁰⁰ Teletrac argues that tighter frequency tolerances are required and recommends a tolerance of 0.00025 percent for both multilateration and non-multilateration **systems**.²⁰¹ We agree with Teletrac that tighter frequency tolerances are justified to help reduce the potential for interference to systems operating on adjacent **frequencies** and that this argument **extends** to non-multilateration as well as multilateration systems. Additionally, as Telctrac points out, the **frequency** tolerance **it has proposed is more liberal than that required for other services in the 900 MHz band**. Accordingly, we are adopting a **frequency** tolerance of 0.00025 percent for both multilateration and non-multilateration systems.

92. **Effective Radiated Power.** We proposed a maximum peak effective radiated power (**ERP**) for any LMS systems operating in the **902-928** MHz band of 300 **watts**.²⁰²

¹⁹⁹ **Notice** at para. 30, 8 FCC Rcd. 2502, 2507 (1993).

²⁰⁰ **MobileVision** comments at 49; SBMS comments at 24; Mark IV comments at 13; Hughes comments at 13.

²⁰¹ Teletrac comments at 49.

²⁰² **Notice** at para. 30, 8 FCC Rcd 2502, 2507 (1993). The current **maximum** power for **multilateration** systems is 1 **kW** peak envelope power (PEP) transmitter output **power**. See existing 47 C.F.R. § 90.239(e)(2)(i).

SBMS supports our proposed 300 watt peak ERP.²⁰³ **MobileVision** opposes any reduction in permissible power. AT&T and Hughes support a **30 watt ERP** power limit for **non-multilateration** systems with 10 meter and 15 meter antenna height restrictions **respectively**.²⁰⁴ **Amtech** and Pinpoint support various power limits for different systems based a shared use of the entire **band**.²⁰⁵ Mark IV supports a field **strength** limit of **1 mV/m** at 3000 meters with a maximum antenna height of 10 meters for non-multilateration systems rather than a limit on peak **ERP**.²⁰⁶

93. **As discussed earlier,**²⁰⁷ we will limit the maximum ERP of multilateration **LMS** system narrowband forward links, which operate between 927.250-928.000 MHz, to 300 watts. However, we will limit maximum power for **transmissions** of multilateration system base and mobile stations outside the **927.250-928.000 MHz** sub-band to 30 watts maximum ERP. Limiting base and mobile stations' power levels will reduce the potential for interference between co-channel multilateration systems²⁰⁸ and **will** reduce the likelihood of interference to any other operations in the **902-928 MHz** band. In addition, we are limiting the peak ERP of non-multilateration systems to 30 watts and limiting the antenna height above ground of these systems to 15 meters. Reducing the maximum power and **antenna** height of non-multilateration systems will allow non-multilateration systems to share spectrum more easily with other **non-multilateration** systems **and** with users of Part 15 **devices and will permit greater frequency reuse for these systems**.

94. **Currently,** facilities authorized in the private radio **services** are categorically excluded from our rules **requiring** an environmental assessment to demonstrate that a facility complies with **standards concerning** human exposure to **radiofrequency** radiation. (See Second Report and Order, in Gen. Docket No. **79-144, 2 FCC Rcd** 2064 (1987); and Erratum to FCC Rcd 2526 (1987).d for **evaluating the environmental** effects of radiofrequency radiation, however, are **currently** under review in ET Docket No. 93-62 (See Notice of Proposed Rule Making, ET Docket No. **93-62, 8 FCC Rcd**, No. 9362 (1993)). In that **proceeding** we note that some of the current categorical exclusions may be inconsistent with the new guidelines being **considered**. We wish to emphasize here that **LMS** systems will be **required to comply** with any **requirements** adopted in ET **Docket** No. 93-62.

²⁰³ SBMS comments at 24.

²⁰⁴ AT&T comments at 7-8; Hughes comments at 7-9.

²⁰⁵ **Amtech** comments at 33-35; Pinpoint comments at 31-34.

²⁰⁶ **Mark IV** comments at 13.

²⁰⁷ See discussion of Forward Links, **paragraphs** 73-76.

²⁰⁸ We **contemplate** that this issue will have significance in **MTAs** where **exclusive LMS** licensees must co-exist with **grandfathered LMS** licensees.

95. Interference, Criteria for Co-Channel Multilateration Licensees.

Exclusive MTA multilateration LMS licensees and co-channel grandfathered multilateration LMS licensees must not interfere with **one** another. Similarly, exclusive MTA multilateration LMS licensees must also ensure that they do not cause interference to exclusive co-channel MTA licensees in adjacent MTAs. To help reduce the likelihood for interference between adjacent MTA licensees, we will impose a 47 dBuV/m field strength limit at the MTA boundary on signals transmitted from the base stations of MTA licensees.²⁰⁹ If differences arise over whether interference has been caused, we will expect the particular licensees to cooperate with one **another** to resolve these disputes. Should the Commission have to become involved in any disagreements among licensees, we may employ a wide variety of tools to resolve such disputes.²¹⁰ These tools could include, but are not limited to, requiring use of a common controller or mandating a particular time sharing arrangement. If, however, we determine that an LMS licensee has not cooperated in developing a suitable mechanism to minimize harmful interference, or that a licensee's system design renders it extraordinarily sensitive to interference, we may authorize the other licensee to operate its LMS system regardless of interference caused to the LMS system that failed to cooperate or that has a system design highly susceptible to interference.

96. Emission Mask. We proposed that emissions anywhere within a licensee's authorized bandwidth not be required to be attenuated but that any emissions outside of the authorized bandwidth be attenuated by at least $55 + 10\log(P)$ dB where P is the highest emission (in watts) of the transmitter inside the authorized bandwidth.²¹¹ This requirement applies to both multilateration and non-multilateration systems. We also requested comment on whether multilateration systems should be required to distribute power evenly throughout

²⁰⁹ We note that in adopting this 47 dBuV/m limit, we are not determining that this field strength will necessarily result in reliable service for all multilateration systems. It is merely a level that may not be exceeded by MTA licensees and is thus established for interference planning purposes only. (see Second Report and Order, Amendment of the Commission's Rules to Establish New Personal Communications Services, GEN Docket No. 90-314, FCC 93451, released October 22, 1993 at paragraph 177).

²¹⁰ Disputes over harmful interference (as described in Section 90.173(b) of our Rules) are typically resolved on a case-by-case basis. For these services, while absolute blocking of a licensee's transmissions throughout a large region would constitute the only clear-cut case of harmful interference (see Section 90.7 for definition of harmful interference under 47 C.F.R. Part 90), it is possible that lesser degrees of interference could diminish the accuracy or reliability of certain multilateration systems in a limited portion of a system's area of operation. The degree to which such lesser amounts of interference would be considered harmful cannot be determined in advance, and there can be no guarantee that licensees will be unconditionally protected from interference of this type. Because of these unique characteristics of multilateration systems, we decline to specify what will be considered to constitute harmful interference to such systems.

²¹¹ Notice at para. 30, 8 FCC Rcd. 2507 (1993).

their authorized **band**.²¹²

97. Mark IV M-IS was the only **commenter** that supports a requirement that power be evenly distributed across a licensee's authorized bandwidth. **Both Mark IV IVHS and Teletrac** believe that only emissions outside of the **902-928 MHz** band (rather than any emissions outside of a licensee's authorized bandwidth) should be attenuated by $55 + 10\log(P)$ dB. Mark IV IVHS would require that frequencies outside of the licensee's authorized bandwidth only be attenuated by $30 + 10\log(P)$ dB, while Teletrac would just require that 99 percent of the power be within the licensee's authorized bandwidth. **MobileVision** would require that spurious spread spectrum emission should not exceed $100 + 10\log P$ dBW/Hz and the level of any spurious discrete emission could not exceed $55 + 10\log P$ dBW. SBMS would merely require that the first side-lobe be 20 dB below main lobe and each following side-lobe be progressively reduced by 10 dB out to the third lobe. **Amtech** and Pinpoint provide recommendations for various power, height and emissions limits for different systems and supports establishment of robustness and sharing requirements.

98. We will require licensees to attenuate their emissions by $55 + 10\log(P)$ dB at the edges of the specified LMS subbands. The licensed **frequency** band edges for multilateration systems for which emissions must be attenuated are 904, 909.75, 919.75, 921.75, 927.50, 927.75 and 928 MHz. If the 919.75-921.75 and **921.75-927.25 MHz subbands** are aggregated by a single licensee, the emission mask limitations at the band edges at 921.75 and 927.50 MHz may be ignored. The licensed frequency band edges for **non-multilateration** systems for which emissions must be attenuated are **902, 904, 909.75** and 921.75 MHz. These emission limitations will assure that **multilateration and non-multi&ration** systems will not **interfere** with each other and that operations below 902 MHz and above 928 MHz are protected.

IV. CONCLUSION

99. Given the plethora of diverse users that share the 902-928 MHz band, this has been an especially difficult proceed&. While we strongly support and wish to encourage the continued development and deployment of an **LMS industry**, we also recognize the **valuable** services being provided by other users of this **spectrum**. We believe that the rules we have adopted herein fairly balance these diverse interests. While we have not been able to **satisfy all of the concerns of all of the parties in this proceeding**, we reviewed extensive **comments and replies to the Notice as well as a very large number of ex parte filings in this docket** and **serious** consideration was given to each position. Given the diverse and often mutually **exclusive interests** of the many parties that participated, our decisions were the best that could be achieved. **The** rules will allow for the continued growth of LMS services and

²¹² IQ.

advance Congress' goal of developing an intelligent transportation system infrastructure. At the same time, we have attempted to ensure that other users of the band, including Amateur operators and users of Part 15 devices, will be able to co-exist with LMS.

100. We have taken the long-term beneficial action of creating the Transportation Infrastructure Radio Service. By creating this new service at this early date in ITS development, we will be able to take an organized approach to regulating spectrum and services related to ITS and transportation infrastructure in general.

V. FINAL REGULATORY FLEXIBILITY ANALYSIS

101. Pursuant to the Regulatory Flexibility Act of 1980, the Commission's final analysis is as follows:

Need and Purpose of the Action

102. The rules adopted herein will enhance use of the **902-928 MHz** band for location and monitoring systems. These rules replace the existing interim rules that govern automatic vehicle monitoring systems. The new rules create a more stable environment for LMS system licensees and provides much needed flexibility for operators of such systems.

Issues Raised in Response to the Initial Regulatory Flexibility Analysis

103. **There were** no comments submitted in response to the Initial Regulatory Flexibility Analysis.

Significant Alternatives Considered and Rejected

104. **All** significant alternatives are **discussed** in this Report and Order.

VI. PAPERWORK REDUCTION

105. The proposal contained herein has been analyzed with respect to the Paperwork Reduction Act of 1980 and found to contain no new or modified form, information collection and/or record keeping, labeling, disclosure, or record retention **requirements**; and will not increase or decrease burden hours imposed on the public.

VI. ORDERING CLAUSES

106. Accordingly, IT IS ORDERED that, **pursuant** to the authority of Sections 4(i), 302, 303(r), and 332(a)(2) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 302, 303(r), and 332(a), Parts 2 and 90 of the Commission's Rules, 47 C.F.R. Parts 2 and 90, ARE AMENDED as set forth in Appendix A below, effective [thirty days after publication in the Federal Register].

107. The Petition for Rule Making filed on January 13, 1994 by the American Radio Relay League IS DENIED.

108. For further **information concerning** this **Report and Order**, contact Thomas S. Dombrowsky, Martin D. Liebman or John J. Borkowski of the Wireless Telecommunications Bureau at **(202) 418-0620**.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

FCC 96-115

In the Matter of)
)
Amendment of Part 90 of the) PR Docket No. 93-61
Commission's Rules to Adopt)
Regulations for Automatic Vehicle)
Monitoring Systems)

ORDER ON RECONSIDERATION

Adopted: March 18, 1996;

Released: March 21, 1996

By the Commission: Commissioner Barrett concurring in part, dissenting in part and issuing a statement

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I. INTRODUCTION AND BACKGROUND

1. In this *Order on Reconsideration*, we address several issues raised by petitions for reconsideration of our *Report and Order* in PR Docket No. 93-61¹, which established rules governing the licensing of the Location and Monitoring Service (LMS) in the 902-928 MHz band. Specifically, we modify and clarify certain aspects of our LMS rules in order to facilitate the expeditious construction and operation of LMS systems that must meet the April 1, 1996, deadline to attain grandfathered status.²

2. LMS encompasses both the Automatic Vehicle Monitoring (AVM) service established in 1974 and future advanced transportation-related services.³ Existing AVM systems were authorized in the 903-912 and 918-927 MHz bands, as well as in several bands below 512 MHz. Existing LMS systems in these bands generally fall into one of two broad technological categories: multilateration systems and non-multilateration systems.⁴ Multilateration systems use spread-spectrum technology to locate vehicles (and other moving objects) with great accuracy throughout a wide geographic area. Non-multilateration systems typically use narrowband

¹ Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Report and Order*, PR Docket No. 93-61, 10 FCC Rcd 4695 (1995) (*LMS Report and Order*).

² Other issues raised by petitioners will be addressed in a forthcoming reconsideration order.

³ *LMS Report and Order*, 10 FCC Rcd at 4696, ¶ 1.

⁴ Under the Commission's Rules, a "multilateration LMS system" is defined as "a system that is designed to locate vehicles or other objects by measuring the difference of time of arrival, or difference in phase, of signals transmitted from a unit to a number of fixed points or from a number of fixed points to the unit to be located." 47 C.F.R. § 90.7. A "non-multilateration LMS system" is defined generally as "a system that employs any of a number of non-multilateration technologies to transmit information to and/or from vehicular units." *Id.*

technology to transmit data to and from vehicles passing through a particular location.⁵

3. In the *LMS Report and Order*, we stated our expectation that in the future both types of LMS systems will play an integral role in the development and implementation of a variety of advanced transportation-related services, known as "Intelligent Vehicle Highway Systems" (IVHS) or "Intelligent Transportation Systems" (ITS).⁶ In fact, the underlying purpose for creating a new subpart for Transportation Infrastructure Radio Services (TIRS) in Part 90 of the Commission's Rules was the Commission's recognition of ITS's expected growth.⁷ LMS, which we authorized to use the 902-928 MHz band, constitutes the first service contained within the TIRS category.

4. LMS systems, both multilateration and non-multilateration, and Part 15 devices will play an important role in providing many valuable services to the public in the future. In the *LMS Report and Order*, we developed a spectrum plan that is designed to accommodate these service providers' requirements to the extent possible. Aspects of the spectrum plan include: 1) continuing to permit secondary operations by unlicensed Part 15 devices across the entire band; 2) providing a "safe harbor" in which Part 15 devices may operate, along with a testing requirement to determine questions of interference from multilateration systems; 3) authorizing additional spectrum in the 902-928 MHz band in order to enable non-multilateration LMS systems to operate on spectrum separate from multilateration systems; and 4) permitting only one new multilateration provider in each sub-band of spectrum allocated for multilateration operations.⁸

5. In the *LMS Report and Order*, we decided to stop accepting applications for the operation of multilateration LMS systems in the 904-912 and 918-926 MHz bands under our current rules as of February 3, 1995.⁹ In addition, we adopted certain grandfathering provisions that allowed existing, operating multilateration LMS systems until April 1, 1998, to complete the transition to the rules adopted in the *LMS Report and Order*.¹⁰ These grandfathering provisions were adopted to prevent any undue hardship on existing, operating multilateration LMS systems. We also conferred grandfathered status on multilateration LMS licensees who had not

⁵ *LMS Report and Order*, 10 FCC Rcd at 4697, ¶ 4.

⁶ *Id.* at 4698, ¶ 5. The term "Intelligent Vehicle Highway System" refers to the collection of advanced radio technologies that, among other things, are intended to improve the efficiency and safety of our nation's highways. Recently, both government and industry entities have begun referring to these technologies by the term "Intelligent Transportation System".

⁷ *Id.*

⁸ In some instances, a newly-licensed multilateration provider may have to share parts of its allotted spectrum with a pre-existing "grandfathered" multilateration licensee.

⁹ *LMS Report and Order*, 10 FCC Rcd at 4728, ¶ 61.

¹⁰ *Id.*

constructed their systems so that such licensees may construct and operate their licensed stations under the rules adopted in the *LMS Report and Order*. We concluded, however, that such systems must be constructed and operational by April 1, 1996, and must comply with the rules adopted in the *LMS Report and Order* by that date. The *LMS Report and Order* directed existing licensees to file applications to modify their licenses to reflect operations consistent with the new band plan for multilateration systems.¹¹

6. In addition to adopting a new spectrum plan and grandfathering provisions, the Commission resolved other technical issues in the *LMS Report and Order*. We established conditions under which Part 15 operations would not be considered to cause interference to multilateration licensees.¹² We allowed multilateration licensees to commence operations only after demonstrating efforts to minimize interference with Part 15 operations.¹³

7. In this *Order on Reconsideration*, we clarify our decision in the *LMS Report and Order* regarding the treatment of grandfathered LMS systems with respect to Part 15 interference testing. In addition, we clarify that the rule regarding non-interference by Part 15 devices set out in §90.361 applies to grandfathered LMS licensees that did not construct as of February 3, 1995, as well as future LMS licensees. We also consider modification of various technical rules, including emission mask specification, frequency tolerance, and site relocation, and we clarify our rules regarding type acceptance of LMS equipment. Any remaining issues raised in the petitions for reconsideration will be addressed in a later *Memorandum Opinion and Order*.¹⁴

8. It has been informally brought to our attention that some unbuilt LMS providers are concerned that they will not be able to complete construction by the April 1, 1996, deadline because they have delayed construction pending our resolution of the petitions for reconsideration. Moreover, the release of this *Order on Reconsideration* has been delayed because the Commission was closed due to the government shutdown that began in mid-December and due to the inclement weather that immediately followed. Accordingly, we believe that it would be appropriate to extend the build-out deadline by five months, to September 1, 1996. We recognize that because the 902-928 MHz frequency band is shared with federal government users, LMS operators are required to coordinate with the Interdepartmental Radio Advisory Committee (IRAC) concerning any proposed modifications to their systems. We are concerned that if existing licensees must await the completion of such frequency coordination

¹¹ *Id.* at 4728-29, ¶¶ 61-64.

¹² *LMS Report and Order*, 10 FCC Rcd at 4714-15, ¶¶ 35-36.

¹³ *Id.* at 4736-37, ¶¶ 81-82.

¹⁴ While we do not address here specific issues raised by petitioners regarding interconnection to the public switched network, we remind grandfathered operators that we do not intend that LMS be used for general messaging purposes. See *LMS Report and Order*, 10 FCC Rcd at 4709, ¶ 26. The forthcoming *Memorandum Opinion and Order* will consider the issues regarding interconnection to the public switched network. It also will be accompanied by a *Notice of Proposed Rulemaking* proposing competitive bidding rules for LMS.

process before commencing modifications to their systems, licensees may not have sufficient time to complete their system modifications by the build-out deadline. As a result, we conclude that these licensees should be permitted to begin modifications to their systems provided they have initiated the frequency coordination process with IRAC and on the condition that the Commission's final approval of such modifications will be contingent upon the successful completion of such frequency coordination.¹⁵ This procedure is consistent with our general approach for temporary and conditional operations under Part 90 of our Rules.¹⁶

9. In addition, On May 22, 1995, Southwestern Bell Mobile Systems (SBMS) filed a request for waiver of Section 90.363 of the Commission's Rules to grandfather SBMS applications that were pending as of the date the *LMS Report and Order* was adopted. SBMS contends that if its applications had been processed in 113 days as had been estimated by the Commission, its licenses would have been granted before the *LMS Report and Order* came out and would thus be eligible for grandfathering. Further, SBMS submits that it has been judicious in not applying for more licenses than needed for its LMS operations, while other applicants have warehoused spectrum by receiving licenses for systems that have remained unconstructed. SBMS notes that the Commission granted protected status to pending SMR applications based in part on the fact that there were processing delays at the Commission.¹⁷

10. We are not persuaded by SBMS that pending LMS applications should be eligible for grandfathering.¹⁸ Our stated purpose in adopting grandfathering provisions was "[t]o ensure that our new licensing scheme does not impose undue hardship on existing, operating multilateration [LMS] systems," and to allow already-licensed systems the opportunity to construct and operate pursuant to the LMS rules adopted in the *LMS Report and Order*.¹⁹ If some licensees are warehousing spectrum, as alleged by SBMS, then they will likely not construct in the time allotted so as to attain grandfathered status. That spectrum will then be available for competitive bidding by all prospective licensees, including SBMS if they so choose.

11. Further, the SMR example referred to by SBMS is distinguishable from the LMS situation. In the SMR context, the Commission adopted a grandfathering provision awarding

¹⁵ We note, however, that LMS operators are not required to notify IRAC of commencement of construction.

¹⁶ See 47 C.F.R. §90.159. While IRAC coordination is required before the Commission will grant a construction permit for some services, we note that construction permits are not issued for LMS facilities.

¹⁷ See Amendment of Parts 2 and 90 of the Commission's Rules to Provide for the Use of 200 Channels Outside the Designated Filing Areas in the 896-901 MHz and the 935-940 MHz Bands Allotted to the Specialized Mobile Radio Pool, *Second Report and Order and Second Further Notice of Proposed Rule Making*, PR Docket No. 89-553, PP Docket No. 93-253 and GN Docket No. 93-252, 10 FCC Rcd 6885, 6902-04 (1995) (*SMR Second Report and Order*).

¹⁸ We note that a number of LMS applications were pending at the time the *LMS Report and Order* was adopted, although SBMS is the only applicant that has specifically requested waiver of the grandfathering rules.

¹⁹ *LMS Report and Order* at 4728, ¶ 61.

certain secondary sites in the 900 MHz SMR service primary status so as to entitle them to full interference protection. On reconsideration, the Commission decided to grandfather pending applications for these secondary sites, concluding that this would promote service to the public, that the additional amount of protected spectrum would be *de minimis* and that such action would be equitable in light of processing delays.²⁰ A notable difference is that the 900 MHz SMR secondary sites were extensions of primary sites that were already licensed and constructed, while the LMS facilities at issue are unbuilt. Thus, it is questionable how service to the public would be facilitated by extending grandfathered status to sites that have not even been licensed, much less constructed. Moreover, grant of the pending applications could materially alter the LMS landscape by adding a number of additional sites and would thus not be a *de minimis* change. Accordingly, we decline SBMS's request and clarify that LMS applications filed prior to February 3, 1995, will not be eligible for grandfathering. SBMS also asks for an extension of the construction deadline for its pending applications. Because we are not affording SBMS grandfathered status with respect to these applications, this issue is moot. In addition, SBMS seeks a waiver of our rules to permit relocation of grandfathered sites by more than two kilometers and to add sites within a 75-mile radius. This same suggestion was made by petitioners for reconsideration and, for the reasons discussed *infra* in Section II-C-4, we deny SBMS's request.

II. DISCUSSION

A. Multilateration System Operations (Part 15 Testing)

12. Background. In the *LMS Report and Order*, the Commission adopted a spectrum band plan and established technical criteria for the operators of the various systems designed to minimize the potential for interference and provide a more conducive environment for sharing of the band by disparate services. Although this plan was crafted on the basis of an extensive record, we nonetheless recognized that additional testing would be beneficial. Thus, in an effort to ensure that the coexistence of the various services in the band would be as successful as possible, we decided to condition the grant of each MTA multilateration license on the licensee's ability to demonstrate through actual field tests that their systems do not cause unacceptable levels of interference to Part 15 devices. We noted that multilateration licensees may be able to employ technical refinements to minimize interference with Part 15 operations. We further expected that multilateration system users and Part 15 system operators would cooperate closely in designing and implementing testing procedures.²¹

13. Pleadings. Part 15 users request that grandfathered multilateration LMS systems be required to demonstrate through testing that their systems will not cause unacceptable

²⁰ *SMR Second Report and Order* at 6904, ¶ 53.

²¹ *LMS Report and Order*, 10 FCC Rcd at 4737, ¶ 82.

interference to Part 15 devices. Specifically, Metricom/SCE seeks clarification that all new rule sections adopted in the *LMS Report and Order* apply to all grandfathered LMS systems upon the issuance of a final order.²² Further, some Part 15 petitioners suggest that the Commission establish guidelines for the testing of LMS systems and the demonstration of non-interference to Part 15 devices.²³ They argue that the test parameters should be uniform and that the testing should cover a reliable sample of the applicable technologies available in the area, to ensure that the tests are developed in a comprehensive and fair manner.²⁴

14. However, some LMS providers contend that such testing of LMS systems is not necessary.²⁵ For example, Pinpoint contends that adopting a requirement to test a vague "standard" after spectrum has been auctioned and systems built is of questionable utility.²⁶ SBMS contends that because the probability of interference to Part 15 devices is de minimis, testing is not necessary.²⁷ In addition, some parties contend that the testing requirement violated the Administrative Procedure Act (APA) because testing procedures were not contemplated in the *Notice of Proposed Rule Making* in this proceeding and/or because testing requirements materially alter the Part 15 rules, which was not previously proposed.²⁸ Other parties believe that the testing requirement was a logical outgrowth of the proposals in the Notice and therefore does not exceed the Commission's discretion under the APA.²⁹

15. Discussion. The *LMS Report and Order* stated that interference testing will be a condition precedent to receiving a multilateration LMS license. We hereby clarify that as a condition of grandfathering, we will also require all multilateration LMS operators who did not construct stations prior to February 3, 1995, to demonstrate through testing that their LMS

²² Metricom/SCE Petition at 16. See Appendix A for a list of the acronyms used to cite parties filing petitions for reconsideration of the *LMS Report and Order*, oppositions thereto, and other associated pleadings.

²³ CellNet Petition at 7-8; Metricom/SCE Petition at 8-9; Ad Hoc Gas Petition at 18; Part 15 Coalition Petition at 15.

²⁴ Part 15 Coalition Petition at 15; Ad Hoc Gas Petition at 18-19; CellNet Petition at 7; Metricom/SCE Petition at 9-10.

²⁵ We note that Teletrac, MobileVision, Pinpoint, and Uniplex (collectively referred to as "The LMS Providers") filed an *ex parte* letter to reiterate their concerns regarding certain grandfathering and certain technical issues. See Letter from The LMS Providers to Rosalind K. Allen, Chief of Commercial Wireless Division, Wireless Telecommunications Bureau, Federal Communications Commission (FCC), dated August 22, 1995 (LMS Providers 8/22/95 Letter). We also note that SBMS filed an *ex parte* letter to support the concerns expressed in the LMS Providers 8/22/95 Letter. See Letter from SBMS to William F. Caton, Acting Secretary, FCC, dated September 21, 1995.

²⁶ Pinpoint Petition at 7.

²⁷ SBMS Petition at 8.

²⁸ See, e.g., SBMS Petition at 7-8; Airtouch/Teletrac Opposition at 3.

²⁹ See, e.g., Ad Hoc Comments at 11; EIA/CEG Comments at 5.

systems will not cause unacceptable interference to Part 15 devices. As we stated in the *LMS Report and Order*, we believe that testing may provide users of the band with data that could contribute to "fine-tuning" system operations.³⁰ We reiterate that multilateration licensees may employ any one of a number of technical refinements, *i.e.*, limiting duty cycle, pulse duration power, *etc.*, to facilitate band sharing and minimize interference to Part 15 operations. Further, the Commission seeks to ensure not only that Part 15 operators refrain from causing harmful interference to LMS systems, but also that LMS systems are not operated in such a manner as to degrade, obstruct or interrupt Part 15 devices to such an extent that Part 15 operations will be negatively affected. Of course, if a Part 15 operator agrees to accept interference from a multilateration LMS provider, the LMS operator need not make further efforts to reduce interference.

16. We, however, deny petitioners' request to establish specific guidelines for Part 15 testing at this time. We recognize that LMS systems employ different methods to provide location and monitoring that are constantly changing to keep up with consumer demand. Moreover, the Part 15 industry has an even greater array of technologies that fluctuate in response to the needs of the public. It would be inappropriate to apply uniform testing parameters to those varied technologies, as no one testing method would adequately address the needs of either LMS or Part 15 operations. Instead, we believe that the more prudent course of action would be for LMS and Part 15 operators to work closely together to reach consensus on testing guidelines that satisfy their respective requirements.

17. We do not agree that our adoption of the testing requirement violated the APA. The APA requires an agency to provide the public with "either the terms or the substance of a proposed rule or a description of the subject and issues involved."³¹ The APA, however, "does not require an agency to publish in advance every precise proposal which it may ultimately adopt as a rule."³² Rather, the notice is sufficient if the final rule is a "logical outgrowth of the underlying proposal."³³ We believe that the testing requirement was a logical outgrowth of the Notice of Proposed Rule Making in this proceeding, which sought comment on ways to accommodate the various users of the 902-928 MHz band.³⁴ Moreover, the rules adopted in the *LMS Report and Order* do not modify our Part 15 rules by elevating the status of Part 15 providers, as alleged by some petitioners. Part 15 operation remain secondary; the testing requirement is merely an

³⁰ *LMS Report and Order*, 10 FCC Rcd at 4737, ¶ 82.

³¹ 5 U.S.C. § 553 (B)(3).

³² *California Citizens Band Association v. United States*, 375 F.2d 43, 48 (9th Cir. 1967); *see also Spartan Radiocasting Co. v. FCC*, 619 F.2d 314 (4th Cir. 1980); *MCI v. FCC*, 57 F.3d 1136 (D.C. Cir. 1995).

³³ *United Steelworkers v. Marshall*, 647 F.2d 1189, 1221 (D.C. Cir. 1980); *see also Fertilizer Institute v. EPA*, 935 F.2d 1303 (D.C. Cir. 1991).

³⁴ Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems, *Notice of Proposed Rule Making*, PR Docket No. 93-61, 8 FCC Rcd 2502, 2507 (1993).

attempt to achieve the most efficient coexistence possible among the various users of the band.

B. Accommodation of Secondary Users in the 902-928 MHz Band

18. Background. In the *LMS Report and Order*, we attempted to balance the equities and interests of each use of the 902-928 MHz band, including multilateration LMS systems and Part 15 users, without undermining the established relationship between unlicensed operations and licensed services. In this connection, we affirmed that unlicensed Part 15 devices in the 902-928 MHz band are secondary and, as in other bands, may not cause harmful interference to and must accept interference from all other operations in the band.³⁵ To accommodate the concerns of Part 15 users about their secondary status in light of multilateration LMS and our authorizing LMS to use the additional 8 MHz of the band (902-903, 912-918 and 927-928 MHz), however, we adopted rules that describe a "safe harbor" within which a Part 15 operation would be deemed not to cause interference to a multilateration LMS system.³⁶

³⁵ *LMS Report and Order* at 4714, ¶ 34 (citing 47 C.F.R. § 15.5(b)).

³⁶ See *LMS Report and Order* at 4715, ¶. A Part 15 system will not be considered to be causing interference to a multilateration LMS system if it is otherwise operating in accordance with the provisions of 47 C.F.R. § 15.1 *et seq.* and it meets at least one of the following conditions:

- (a) it is a Part 15 field disturbance sensor operating under Section 15.245 of the rules and it is not operating in the 904-909.750 or 919.750-928.00 MHz sub-bands; or
- (b) it does not employ an outdoor antenna; or
- (c) if it does employ an outdoor antenna, then if

- (1) the directional gain of the antenna does not exceed 6dBi, or if the directional gain of the antenna exceeds 6dBi, it reduces its transmitter output power below 1 watt by the proportional amount that the directional gain of the

19. Pleadings. Many petitioners agree that a safe harbor provision is necessary to provide Part 15 technologies protection against claims of interference from existing LMS licensees.³⁷ The Part 15 petitioners contend that the "safe harbor" provision as stated in the *LMS Report and Order* will shield them from interference complaints. They argue that this is the most appropriate way to facilitate the Commission's band sharing plan because LMS systems are highly susceptible to interference.³⁸ On the other hand, most LMS petitioners argue that they should be able to rebut any presumption of non-interference by Part 15 operators.³⁹ If not, they argue, a large class of Part 15 devices will be immune from complaints of interference to multilateration licensees. They also contend that such result would be contrary to the secondary status of Part 15 devices.⁴⁰

20. Discussion. We hereby clarify that if Part 15 devices operate within the "safe harbor" provision they will be deemed not to cause harmful interference to LMS operators. In addition, this provision applies to all LMS licensees, including existing and grandfathered licensees. In the *LMS Report and Order*, we stated that a definition of what shall constitute harmful interference from amateur operations or unlicensed Part 15 devices to multilateration LMS systems would promote the cooperative use of the 902-928 MHz band.⁴¹ We noted that this "safe harbor" approach would promote effective use of the 902-928 MHz band by the various services through

antenna
exceeds
6dBi;
and

(2) either

(A) the antenna is 5 meters or less in height above ground; or
(B) the antenna is more than 5 meters in height above ground but less than or equal to 15 meters in height above ground and either:

(i) adjusts its transmitter output power below 1 watt by $20 \log(h/5)$ dB, where h is the height above ground of the antenna in meters;
or
(ii) is providing the final link for communications of entities eligible under Subparts B or C of Part 90 of the rules.

³⁷ CellNet Petition at 3; Part 15 Coalition Petition at 12-13; MobileVision Petition at 13; Pinpoint Petition at 23; Uniplex Opposition at 2.

³⁸ Metricom/SCE Opposition at 7; CellNet Opposition at 5-7; ATA Opposition at 5-6; Connectivity for Higher Learning Opposition at 4-6.

³⁹ MobileVision Petition at 13; Pinpoint Petition at 23; SBMS Petition at 9; Teletrac Petition at 6.

⁴⁰ Pinpoint Petition at 7; SBMS Petition at 11; Teletrac Opposition at 4; MobileVision Opposition at 9-10.

⁴¹ *LMS Report and Order*, 10 FCC Rcd at 4715, ¶ 36.

establishing the parameters under which such devices may operate without risk of receiving complaints of interference from service providers with a higher allocation status. Based on the technical diversity of the numerous existing LMS systems and the multiplicity of Part 15 devices that eventually will be placed in operation, we previously concluded that some interference problems would remain unresolved under our rules.⁴² As a result, we determined that by providing multilateration LMS system operators a means of recourse by way of complaint to the Commission only when a Part 15 device is not operating in the "safe harbor," the vast majority of equipment and services would be able to operate successfully in this band. Although the multilateration LMS system operators will not be able to file a complaint with the Commission where the Part 15 user has satisfied the "safe harbor" provisions, the Commission encourages LMS operators to resolve the interference by modifying their systems or by obtaining the voluntary cooperation of the Part 15 user. We disagree that such a result is inconsistent with the secondary status of Part 15 devices under our Rules. Rather, we believe our approach will assure the efficient and equitable use of the 902-928 MHz band.

C. Technical Issues

1. Emission Mask Specification

21. Background. In the *LMS Report and Order*, we required that licensees' emissions be attenuated by at least $55 + 10 \log(P)$ dB at the edges of the specified LMS subbands.⁴³ The band edges for multilateration systems where emissions must be attenuated are 904, 909.75, 919.75, 921.75, 927.50, 927.75 and 928 MHz. If the 919.75-921.75 and 921.75-927.25 MHz subbands were aggregated by a single licensee, the emission mask limitations at the band edges at 921.75 and 927.50 MHz may be ignored. The band edges for non-multilateration systems where emissions must be attenuated are 902, 904, 909.75 and 921.75 MHz. These emission limitations were designed to assure that multilateration and non-multilateration systems will not interfere with each other and that operations below 902 MHz and above 928 MHz are protected.⁴⁴

22. Pleadings. The LMS Providers contend that the emission mask adopted in the *LMS Report and Order* is "flawed and makes multilateration LMS impractical and economically unattractive."⁴⁵ MobileVision argues that "the inability to meet the specification is not a technical deficiency of a specific provider but is a consequence of the physical laws governing the processes involved in multilateration LMS systems."⁴⁶ The LMS Providers propose a modification of the

⁴² *Id.* at 4716, ¶ 37.

⁴³ *Id.* at 4744, ¶ 98. This rule is reflected in new rule §90.209(m).

⁴⁴ *Id.* at 4695, ¶ 98.

⁴⁵ LMS Providers 8/22/95 Letter.

⁴⁶ MobileVision Petition at 10.

present emission mask specification that they believe strikes an appropriate compromise.⁴⁷ They assert that their proposed emission mask should not inhibit the operation of non-multilateration systems, and the emission levels outside of the multilateration LMS sub-bands would be below the field strength levels permitted under Part 15 of the Commission's Rules for operation within the 902-928 MHz band.⁴⁸ The proposed emission mask specification is as follows:

For LMS wideband emissions, operating in the 902-928 MHz band, in any 100 kHz band, the center frequency of which is removed from the center of authorized sub-band(s) by more than 50 percent up to and including 250 percent of the authorized bandwidth: The mean power of emissions shall be attenuated below the maximum permitted output power, as specified by the following equation but in no case less than 31dB:

$$A = 16 + 0.4 (P-50) + 10\log B \text{ (attenuation greater than 66dB is not required)}$$

where A= attenuation (in decibels) below the maximum permitted output power level

P= percent removed from the center of the authorized sub-band(s)

B= authorized bandwidth in megahertz

23. On the other hand, CellNet, a Part 15 operator, objects to the relaxation of the emission mask specification, contending that the potential for interference to Part 15 devices will be increased if the emission mask requirements are relaxed.⁴⁹ Hughes contends that the attenuation used in the formula proposed by the LMS Providers would be insufficient to protect adequately against interference in the portion of the spectrum band set aside for non-

⁴⁷ LMS Providers 8/22/95 Letter. The LMS Providers also propose to modify LMS narrowband forward link emissions as follows:

The power of any emission shall be attenuated below the transmitter power (P), in accordance with following schedule:

- on any frequency outside the authorized sub-band and removed from the edge of the authorized sub-band by a displacement frequency (fd in kHz): at least $116 \log_{10} ((fd + 10)/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 70 decibels, whichever is the lesser attenuation. A minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used when showing compliance.

⁴⁸ Letter from Teletrac, MobileVision, PentaPage, and Pinpoint to William F. Caton, Acting Secretary, FCC, dated July 26, 1995.

⁴⁹ CellNet Opposition at 4.

multilateration systems.⁵⁰ Thus, Hughes proposes a variation of the LMS multilateration parties' formula that requires greater attenuation. Hughes argues that this is necessary to avoid significant risk of interference in the non-multilateration band.⁵¹ The Part 15 Coalition contends that there is no justification for relaxing the emission mask standard.⁵² TIA opposes the justification used by the LMS Providers to modify the emission mask specification.⁵³ TIA points out that the LMS Providers' proposal is very similar to Sections 21.106(a)(2) and 94.71(c)(2) of our rules, which specify emission limits for the Domestic Public Fixed Radio Services and Private Operational Fixed Microwave Service, respectively.⁵⁴ Further, TIA contends that in fixed services, the emission is but one of several ways to prevent interference, while in mobile services emission masks and power limits are the primary forms of interference control.⁵⁵ It contends that while it may be appropriate to base the limits of LMS wideband emissions on the limits that apply to high-speed digital microwave transmissions, "it is not reasonable that the LMS specification should be less stringent than the fixed microwave specification."⁵⁶

24. Discussion. We find that the LMS Providers have shown that the single emission mask we adopted in the *Report and Order* to cover all LMS operations in the 902-928 MHz band is not appropriate for multilateration LMS systems. In fact, the LMS Providers have stated that none of their various multilateration systems, either existing or proposed, can comply with the existing mask and still achieve a commercially marketable level of locating accuracy.⁵⁷ Additionally, the LMS providers have persuaded us that an emission mask similar to the one applicable to narrowband PCS channels is more appropriate for narrowband forward link equipment operating in the spectrum between 927.250 MHz and 928 MHz.

25. Therefore, we will not apply the existing mask to equipment used for wideband multilateration links, either forward or reverse, in the three subbands 904-909.75 MHz, 921.75-927.25 MHz and 919.75-921.75 MHz, or to equipment used for narrowband forward links in the spectrum between 927.25 and 928 MHz. Instead we will adopt two additional emission masks, both essentially the same as proposed by the LMS Providers, that will apply to

⁵⁰ Hughes Opposition at 12, Figure 1.

⁵¹ *Id.* at 13, Figure 2.

⁵² Part 15 Coalition Opposition at 16.

⁵³ TIA Comments at 8.

⁵⁴ *Id.* at 7. See 47 C.F.R. §§ 21.106(a)(2) and 94.71(c)(2).

⁵⁵ *Id.* at 8.

⁵⁶ TIA Comments at 8.

⁵⁷In order to comply with the existing mask, multilateration equipment would have to operate at a lower "chipping rate," which would significantly reduce the accuracy of multilateration systems.

this equipment.⁵⁸ All other equipment to operate in the LMS will remain subject to the emission mask we adopted in the *Report and Order*. We emphasize that this modification of the emission mask is based on the band plan and Part 15 interference criteria specified in the *Report and Order*. Petitions for reconsideration of the band plan and Part 15 interference criteria will be addressed in a future reconsideration order. Our decision to rely on current rules for purposes of resolving the emission mask issue is not to be taken as an indication that we will not consider modifications to the band plan or Part 15 interference criteria on reconsideration.

26. Although these new emission masks are less stringent than the one we adopted in the *Report and Order*, they do require a greater attenuation of out-of-band emissions than was considered to be required for multilateration systems operating under the interim rules. We further believe that these masks are adequate to prevent interference to non-multilateration systems. While TIA is correct that these new masks are less stringent than those for fixed microwave links, we do not agree with TIA that the masks for LMS multilateration systems must necessarily be more strict than for fixed microwave links.⁵⁹ These two services are very different and the expectations of potential interference must also be considerably different -- one is a highly coordinated fixed microwave service in exclusively allocated spectrum and the other is a mobile multilateration system operating in spectrum shared with a multitude of other users. Also, we are not persuaded that the refinement suggested by Hughes (increasing the slope of the wideband mask) is necessary to prevent interference, and we are concerned that to adopt it might unnecessarily preclude the use of some technologies or favor one type of system over another.

2. Frequency Tolerance

27. Background. In the *LMS Report and Order* we adopted a frequency tolerance of 0.00025 percent (2.5 parts per million (ppm)) for both multilateration and non-multilateration systems. We noted that tighter frequency tolerances were justified to help reduce the potential for interference to systems operating on adjacent frequencies.⁶⁰

28. Pleadings. Hughes, TI/MFS, and AMTECH request that the Commission relax the

⁵⁸We are modifying the language the LMS Providers submitted slightly as follows: (1) to require that all measurements be made using peak power, which is more appropriate for wideband pulse emissions, rather than mean power; (2) to require appropriate instrumentation resolution bandwidths, to facilitate measurements; and (3) to drop the reference to a 250% limit on the displacement frequency factor, which has no effect on the attenuation slope, but might be misconstrued to imply that harmonic emission attenuation beyond 250% of the authorized bandwidth is not required. We have also made other non-substantive modifications to the LMS Providers' language for purposes of administrative consistency.

⁵⁹The emission mask we are adopting for LMS wideband emissions is similar in format to a mask contained in § 21.106 of our rules governing the fixed microwave service, for digital microwave emissions, in that both have an attenuation factor based on authorized bandwidth.

⁶⁰ *LMS Report and Order*, 10 FCC Rcd at 4741, ¶ 91.

frequency tolerance.⁶¹ Hughes argues that the 0.00025 percent frequency tolerance is overly restrictive for non-multilateration systems.⁶² It contends that a frequency tolerance of 2.5 ppm does not add significantly to existing means of avoiding interference between non-multilateration systems within designated subbands.⁶³ Hughes submits that since non-multilateration systems operate over relatively short ranges, the instances of coverage overlap between facilities on adjacent channels will be rare.⁶⁴

29. Hughes further alleges that the present frequency tolerance level would necessitate a significant and expensive design modification for their Vehicle to Roadside Communications (VRC) system readers. In addition, they contend that equipment changes required to conform their VRC mobile transponders to the present frequency tolerance level would be economically prohibitive.⁶⁵ If the Commission decides to maintain the present frequency tolerance level for non-multilateration systems, Hughes requests that the Commission apply the frequency tolerance level only to the reader transmitters and not to the mobile transponders, which are designed to transmit with extremely low power and only while passing in close proximity to a reader.⁶⁶

30. According to TI/MFS there are no current LMS non-multilateration systems in operation that conform to the 2.5 ppm frequency tolerance. They note that most of the non-multilateration technology operates at frequency tolerance levels no greater than 50 ppm. TI/MFS believes that the imposition of the present frequency tolerance level will have the negative effect of decreasing both available technology and potential players in the market.⁶⁷

31. Discussion. In response to the concerns raised by the non-multilateration system operators, we will impose the present frequency tolerance level of 2.5 ppm on high power fixed reader transmitters operating near the band edges, but not on mobile transponders or hand-held portable readers. We are persuaded that the significant cost of tightening the frequency tolerance for mobile transponders and hand-held readers could severely raise the cost of the devices beyond the realm of economic feasibility. Thus, Section 90.213 of our Rules will be modified accordingly.⁶⁸ We are not changing the tolerance requirement for other non-multilateration LMS

⁶¹ Hughes Petition at 9-11; TI/MFS Petition at 5-6; AMTECH Petition at 13.

⁶² Hughes Petition at 1.

⁶³ *Id.* at 11.

⁶⁴ *Id.* at 11.

⁶⁵ *Id.* at 8.

⁶⁶ *Id.* at 13.

⁶⁷ TI/MFS Petition at 5-6.

⁶⁸ *See* Appendix C.

systems or for multilateration LMS systems.

3. Type Acceptance

32. Background. In the *LMS Report and Order*, we determined that the mobile nature of most LMS transmitters and the new advanced technology that will be employed by this equipment justified strict regulatory oversight of having equipment type accepted rather than continuing to use the notification procedure. Therefore, we decided that all LMS equipment imported or marketed after April 1, 1996, including the "transmitting tags" used in certain non-multilateration systems, must be type accepted for use under Part 90 of our Rules. If, however, these units met the requirements under Part 15 of our Rules, they may have been authorized under that part and do not need to be type accepted.⁶⁹

33. Pleadings. The LMS Providers insist that because their initial emphasis under the new rules is on the preservation of grandfathered status through the construction of systems that meet the FCC's technical requirements, formal compliance with type acceptance should assume a lower priority. They request that for systems constructed after February 3, 1995, that the type acceptance requirement for multilateration LMS be extended from the current date of April 1, 1996, until 12 months after any rule on reconsideration concerning the emission mask (the "1996 Effective Date").⁷⁰ The LMS Providers also request that all LMS transmitters imported or manufactured domestically prior to the 1996 Effective Date be exempt from type acceptance regardless of whether they are used before or after the 1996 Effective Date. In addition, they ask the Commission to clarify that LMS providers may indefinitely continue to use equipment deployed prior to the 1996 Effective Date provided that it is not marketed after that date (whether the deadline is April 1, 1996 or a later date), unless the equipment is first type accepted.⁷¹

34. The LMS Providers further request that for systems constructed before February 3, 1995, the installation of non-type accepted multilateration LMS transmitters imported or manufactured domestically on or before the 1996 Effective Date should be permitted through April 1, 1998. They urge that such equipment need not be type-accepted at any time unless such a step is necessary in order to resolve interference problems that cannot otherwise be accommodated, but that such equipment must comply with the emission mask requirements by April 1, 1998. In addition, for systems constructed and placed into operation before February 3, 1995, LMS Providers would mandate that transmitters imported or manufactured after the 1996 Effective Date must be type accepted.⁷² Similarly, AMTECH believes that because some or all of the technical requirements adopted in the *LMS Report and Order* will change, presumably due to

⁶⁹ *LMS Report and Order*, 10 FCC Rcd at 4739, ¶ 88.

⁷⁰ LMS Providers 8/22/95 Letter.

⁷¹ *Id.*

⁷² *Id.*

pending petitions for reconsideration, its efforts to comply with those rules may turn out to be unnecessary. In light of this, AMTECH requests that the Commission delay the type-acceptance date at least until 12 months after final technical requirements have been adopted.⁷³

35. Discussion. We believe that the type acceptance requirements we have adopted are necessary to ensure efficient deployment of LMS to the public without causing significant interference. We recognize the concern of multilateration LMS operators that they may experience difficulty in meeting the construction deadline if they must comply with type acceptance requirements. To alleviate this concern, the Office of Engineering and Technology has committed to process type acceptance applications within 40 days of receipt. Further, we have in this item extended the construction deadline.⁷⁴ Thus, we conclude that compliance with these type acceptance requirements should not impede a licensee's efforts to meet the build-out deadline. We note that constructed multilateration LMS systems must also meet type acceptance requirements after September 1, 1996.

36. With respect to non-multilateration systems, we recognize that these systems contain a substantial amount of embedded equipment with numerous users, particularly state and local governments. Thus, non-multilateration system operators will be able to continue operation of current equipment until replacement is needed. However, if non-multilateration system operators decide either to build new systems or replace existing equipment on or after September 1, 1996, the new equipment must comply with type acceptance by April 1, 1998.⁷⁵ Because non-multilateration LMS systems do not present a significant potential for interference, we believe that this decision will minimize the disruption, if any, to existing operations.

4. Site Relocation

37. Background. In the *LMS Report and Order*, we allowed LMS licensees to modify their applications to comply with the new band plan. In this connection, we stated that an alternate site must be within two kilometers (km) of the site specified in the original license.⁷⁶

38. Pleadings. The LMS Providers contend that the two kilometer restriction is unworkable due to the upcoming April 1, 1996, deadline for preserving grandfathered status. They argue that competition for wireless facilities has caused many sites to become unavailable or unsuitable for LMS use. They also note that site surveys and negotiations are time-consuming and in many cases replacements within the 2 km radius either do not exist or are unavailable.

⁷³ AMTECH Petition at 15-16.

⁷⁴ See *supra* ¶ 8.

⁷⁵ To the extent that this decision is inconsistent with March 22, 1995, letter sent by Rosalind K. Allen, Chief of the Commercial Wireless Division, Wireless Telecommunications Bureau, FCC, in response to Mark IV Industries', February 15, 1995, request to clarify some type acceptance issues, that letter is hereby overruled.

⁷⁶ See *LMS Report and Order*, 10 FCC Rcd 4728 at ¶ 63.

Thus, the LMS Providers propose that the Commission instead allow replacement sites within a ten-mile radius.⁷⁷

39. Discussion. We are unpersuaded by the argument of the LMS Providers. In the *Third Report and Order* in GN Docket No. 93-252,⁷⁸ we utilized two kilometers as the benchmark for determining whether an application for a site change of a CMRS facility is to be treated as a modification application or an "initial" application for the purpose of determining eligibility for competitive bidding procedures.⁷⁹ The LMS Providers have failed to demonstrate adequately that a different benchmark should apply in the LMS context. Thus, we will continue to place a 2 km restriction on replacement sites for LMS systems. We reiterate, however, that our decision here to use a 2 km replacement site restriction does not indicate that we have determined the regulatory status of multilateration LMS systems (*i.e.*, whether LMS is a Commercial Mobile Radio Service (CMRS)). We will review the regulatory status of multilateration LMS systems in our forthcoming *Memorandum Opinion and Order*.

III. CONCLUSION

40. We believe that the clarifications and modifications adopted in this Order will facilitate the timely construction of LMS systems. We have strived to fairly balance the diverse interests of the parties involved, keeping in mind our objective of allowing for the continued growth of LMS services and advancing Congress' goal of developing an intelligent transportation system infrastructure. At the same time, we have attempted to ensure that amateur operators and Part 15 users will be able to share this band with LMS providers without substantial disruption to their operations.

IV. PROCEDURAL MATTERS AND ORDERING CLAUSES

41. The Final Regulatory Flexibility Analysis, as required by Section 604 of the Regulatory Flexibility Act of 1980,⁸⁰ is set forth in Appendix B.

42. IT IS ORDERED that, pursuant to the authority of Sections 4(i), 302, 303(r), and 332(a)(2) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 302, 303(r), and 332(a), the rule changes specified in Appendix C are adopted.

43. IT IS FURTHER ORDERED that the rule changes set forth in Appendix C WILL

⁷⁷ LMS Providers 8/22/95 Letter, *supra*, n.25.

⁷⁸ See Implementation of Sections 3(n) and 332 of the Communications Act- Regulatory Treatment of Mobile Services, *Third Report and Order*, GN Docket No. 93-252, 9 FCC Rcd 7988 (1994) (*CMRS Third Report and Order*).

⁷⁹ *Id.* at 8415, ¶356.

⁸⁰ 5 U.S.C. §604.

BECOME EFFECTIVE 30 days after publication in the Federal Register, except for Sections 90.203(b)(7) and 90.363(d). Sections 90.203(b)(7) and 90.363(d) ARE EFFECTIVE upon adoption of this Order on Reconsideration.⁸¹

44. IT IS FURTHER ORDERED THAT the petitions for reconsideration filed by the parties listed in Appendix A ARE GRANTED to the extent discussed herein, and DENIED to the extent discussed herein. Those issues not resolved by this *Order on Reconsideration* will be addressed in a future *Memorandum Opinion and Order*.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

⁸¹Sections 90.203(b)(7) and 90.363(d) extend the type acceptance and construction deadlines, respectively, from April 1, 1996, to September 1, 1996. As such, these rules relieve a restriction and are not subject to the 30 days' notice requirement of the Administrative Procedure Act (APA). *See* 5 U.S.C. § 553(d)(1). Moreover, the Commission finds good cause to make these rules effective on less than 30 days' notice to prevent the former type acceptance and construction deadline of April 1, 1996, from taking effect. *See* 5 U.S.C. § 553(d)(3).

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

FCC 95-41

In the matter of)
)
Amendment of Part 90 of the) PR Docket No. 93-61
Commission's Rules to Adopt)
Regulations for Automatic)
Vehicle Monitoring Systems)

REPORT AND ORDER

Adopted: February 3, 1995

Released: February 6, 1995

By the Commission: Commissioner **Quello** concurring and issuing a statement;
Commissioner Barrett dissenting and issuing a statement; Commissioners Ness and Chong
issuing separate statements.

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I. INTRODUCTION

1. In this Report and Order, we adopt rules for the future licensing and continued development of a number of services and equipment using the 902-928 MHz band. In recent years, Automatic Vehicle Monitoring (**AVM**) systems and unlicensed Part 15 devices have developed and proliferated in this band and are providing services that are valuable and in the public interest. These services range from licensed vehicle location and automatic toll collection systems to unlicensed devices used for utility meter reading and inventory control. Our allocation plan for the **902-928** MHz band includes 8 MHz of additional spectrum for AVM services and establishes new provisions for governing the interference obligations of Part 15 and amateur operations in this band. This plan balances the differing operational needs of these varied types of uses so that most AVM systems and Part 15 devices will be able to achieve their service objectives without impeding each other's use of the spectrum. We also modify and eliminate outdated regulations that have not kept pace with the technological evolution of AVM and establish a new service, the Location and Monitoring Service (**LMS**), that both encompasses the old AVM service and future advanced transportation-related services.

2. A key feature of our new spectrum allocation plan is the establishment of separate sub-bands for licensed LMS uses. We have provided three sub-bands for exclusive licensing of **wideband** "multilateration" LMS systems in addition to two sub-bands for the sharing of narrowband "non-multilateration" LMS systems. Subject to grandfathering certain existing AVM licensees, mutually exclusive applications for multilateration LMS licenses in the three sub-bands will be resolved through competitive bidding. We also clarify the status of licensed systems in the **902-928** MHz band in relation to other uses of the band, with distinctions made for amateur radio and unlicensed Part 15 users operating under certain, specified parameters. The new band plan, combined with the provisions for continued amateur and unlicensed Part 15 operation, will allow efficient and competitive use of the spectrum. Our decisions herein also provide certainty for all users of the band so they can invest in the equipment and facilities necessary to bring quality, low cost services to consumers.

II. BACKGROUND AND EXECUTIVE SUMMARY

3. The Commission initiated the AVM service in 1974, when it adopted its **Report and Order** in Docket No. **18302**.¹ In the **1974 Order**, we found that AVM had the potential to accommodate a number of important functions, such as tracking and monitoring large fleets of vehicles and providing information to allow more **efficient** use of vehicles through better dispatch and routing information.² **We also noted that AVM systems had already been**

¹ Report and Order, Docket No. **18302**, 30 RR **2d** 1665 (1974) (**1974 Order**).

² **Id.**

operating for several years on an experimental and developmental basis, allowing us to gain valuable information regarding advances in AVM **technology**.³ While recognizing the technological progress made by **AVM**, we concluded that development of new vehicle monitoring technologies was also likely in the future, making it inadvisable to adopt permanent rules until more information was available regarding the viability of such new technologies. **Accordingly**, we decided to provide for the licensing of AVM systems on both a permanent and a developmental basis under "interim" rules.⁴ These rules have remained in effect until now.

4. Our 1974 AVM rules provide for licensing of AVM systems in the 903-912 and **918-927** MHz bands, as well as in several bands below 512 MHz. While little licensing of AVM has **occurred** below 512 MHz, there has been significant AVM use of the 900 MHz bands in recent years. Existing AVM systems in these bands generally fall into one of two broad technological categories: multilateration systems and non-multilateration systems. Multilateration systems use spread-spectrum technology to locate vehicles (and other moving objects) with great accuracy throughout a wide geographic area. This technology is used, for example, by trucking companies to locate and track their vehicle fleets, by municipal governments to pinpoint the location of their buses,⁵ and by entrepreneurs who are developing subscriber-based, stolen vehicle recovery **systems**.⁶ Non-multilateration systems use narrowband technology to transmit data to and from vehicles passing through a particular location. This technology is now providing valuable services to state and local governments operating various types of automated toll collection systems -- with an estimated 500,000 cars currently served by such systems⁷ -- and by the railroad industry in the monitoring of their

³ The Commission first licensed **AVM** on a developmental basis in **1968**. In 1972, the Commission sought additional information on the development of AVM since its **original inquiry** and proposed to adopt rules for **permanent** licensing. **See** Further Notice of Inquiry and Notice of Proposed Rule Making, Docket No. 18302, 35 FCC 2d 692 (1972).

⁴ **1974 Report and Order** at para. 5.

⁵ **See** Joe Dysart, *Bus 54, Where are You? Automatic Vehicle Locator System Used by Baltimore Mass Transit Administration*, Mass Transit (July 1991).

⁶ **See** Teletrac petition at 614.

⁷ Moshe Ben-Akiva *et al*, *The Case for Smart Highways; Intelligent Vehicle-Highway Systems*, Technology Review (July 1992) (noting that electronic toll collection devices have already been **implemented** in Dallas, Oklahoma and Louisiana); Terry Sweeney, *Wireless Net to Keep Traffic, Tolls Flowing*, Communications Week (Feb. 8, 1993) (describing plans for a California toll collection system, which is expected to reduce traffic, fuel costs and air pollution). Drivers simply purchase an electronically encoded tag that allows them to drive at a normal speed through the toll station. Electronic readers transmit a radio signal to passing cars, debit@ the tag or recording the identification of the tag for monthly billing. **Id.**; *For Whom the Card Tolls*, Electronics (July 25, 1994) at 9 (noting that 500,000 cars take advantage of automated toll systems).

systems' railway cars.⁸

5. It is expected that in the coming years both types of LMS systems will play an integral role in the development and implementation of the variety of radio advanced transportation-related services, known as "Intelligent Vehicle Highway Systems" (M-IS) or "Intelligent Transportation Systems" (ITS).⁹ The ITS is a collection of advanced radio technologies that promise to improve the efficiency and safety of our nation's highways, reduce harmful automobile emissions, promote more efficient energy use, and increase national productivity.¹⁰ For example, it is anticipated that ITS systems will increase traffic mobility and efficiency by notifying motorists of traffic delays and recommending alternate routes, adjusting the settings of traffic signals to prevent anticipated traffic jams, and providing navigational assistance to direct a car to its destination according to the most efficient route. ITS warning systems can also be used to notify drivers of impending collisions (or even take control of the vehicle to avoid a collision), and display electronic traffic and safety signals on a car's windshield when poor weather conditions impair drivers' vision of road-side signs. It is estimated that ITS will help reduce air pollution caused by automobiles and will cut wasteful fuel consumption. Traffic congestion, which costs the United States \$100 billion annually in lost productivity, will also be minimized by innovative ITS traffic management technologies. Finally, ITS is expected to create new economic and employment opportunities. Not all of these services, however, require or rely on the use of the 902-928 MHz band.

6. To recognize the expected growth of ITS, this **Report and Order** creates a new subpart in Part 90 for Transportation Infrastructure Radio Services (**TIRS**). The Location and Monitoring Service (**LMS**), which uses the **902-928** MHz band, constitutes the first service contained within the **TIRS** category. As we allocate additional spectrum or create new services intended to further the efficiency of the nation's transportation **infrastructure**,

⁸ See also, comments of **Amtech** Corporation (**Amtech**) at 3-5; Mark IV **IVHS** Division (Mark IV) at 1; and Hughes Aircraft Company (Hughes) at 4.

⁹ The term "Intelligent Vehicle Highway System (**IVHS**)" refers to the collection of advanced radio technologies that, among other things, is intended to improve the efficiency and safety of our nation's highways. Recently, both government and industry entities have begun referring to these technologies by the term "Intelligent Transportation System (**ITS**)."

¹⁰ See **Intermodal** Surface Transportation Efficiency Act of 1991, Pub. L. No. **102-240**, § **6052(b)**, **105 Stat. 1914, 2189** (1991) (**ISTEA**); H.R. Rep. No. **171(I), 102d** Cong., 1st **Sess.** 11 (1991), *reprinted in* 1991 U.S. Code Cong. & Admin. News 1537; **IVHS** America, Strategic Plan for Intelligent Vehicle-Highway Systems **III-31-III-35** (May 1992) (**IVHS** Strategic Plan). **ISTEA** calls for the development of a national **IVHS** program employing advanced traffic management systems, advanced traveler information systems, advanced vehicle control systems, commercial vehicle operations and advanced public transportation systems. **ISTEA** at §§ 6053-58. Congress also imposed reporting requirements to monitor the progress made in developing and implementing the **IVHS** program. *Id.*

these new services will likely be regulated under the **TIRS**.¹¹ The **TIRS** will thus further Congress's goal of encouraging ITS by providing an organized and unified approach towards regulating spectrum for ITS-related services. Today's creation of the **TIRS** clearly demonstrates this agency's commitment to the continued integration of radio-based technologies into the nation's transportation infrastructure and our commitment to the development and implementation of the nation's intelligent transportation systems of the future.

7. AVM systems share their portion of the 902-928 MHz band with other **users**.¹² The band is allocated on a primary basis for use by Government radiolocation systems and Industrial, Scientific, and Medical (**ISM**) equipment, with Government fixed and mobile operations secondary to these users.¹³ Amateur Radio Service licensees operate in the entire band, but on a secondary basis to the ISM, Government and **AVM** users. Part 15 uses are permitted in this band, but are secondary to all other uses, including **AVM** and amateur operations.

8. In 1989 and 1990, we also modified our rules to permit enhanced operation of spread spectrum-based radio devices throughout the **902-928** MHz band on an unlicensed basis, pursuant to Part 15 of our Rules.¹⁴ Since modifying our rules to provide for enhanced Part 15 operations, a large number of equipment manufacturers and entrepreneurial companies have developed radio devices and implemented radio systems employing **spread-spectrum** technology in the 902-928 MHz band. It is estimated that several million Part 15 devices have been sold and are being used every day to provide a wide variety of valuable services to the American public. For example, consumers are now able to purchase cordless telephones operating in the band offering high quality voice **operations**,¹⁵ wireless local area networks are being implemented in offices and buildings to enable tetherless voice and data

¹¹ We recently adopted two proceedings that suggest potential spectrum allocations for **ITS-type** operations. In the Notice of Proposed Rule Making in ET Docket No. 94-32, we suggest the possible allocation of the 2390-2400 MHz or the 2300-2310 MHz bands for short range **ITS** services **and in** ET Docket No. 94-124, we suggest providing 3.2 GHz of spectrum (47.2 - 47.4 GHz, 76-77 GHz, 94.7-95.7 GHz, and 139 -140 GHz) for ITS-related automobile radar technologies.

¹² AVM services are allocated the 903-912 and 918-927 MHz portions of the **902-928** MHz band and are licensed on a shared basis.

¹³ For additional information on Federal Government use in this band see Federal Government Spectrum Usage in the 902-928, 2400-2500, and 5725-5875 MHz Bands. This document is available from the National Technical Information Service, Springfield, VA, 22161, NTIS No. PB 93176739.

¹⁴ See *Report and Order*, **Gen.** Docket No. 87-389, 4 FCC **Rcd** 3493 (1989) and *Report and Order*, **Gen.** Docket No. 89-354, 5 FCC **Rcd** 4125 (1990)).

¹⁵ See Comments of the Consumer Electronics Group at 4.

transmission,¹⁶ and utility companies are now able to read residential utility meters from the street or remote locations using Part 15 radio devices.¹⁷ In addition to the enormous benefits to both businesses and consumers that will result from the continued growth in the use of the Part 15 industry, our nation's economy also benefits due to the continued development of **these** new, advanced radio technologies by American **companies**.¹⁸

9. On May 28, 1992, North American Teletrac and Location Technologies (Teletrac) filed a Petition for Rule Making requesting that we adopt permanent rules for licensing AVM systems.¹⁹ On March 11, 1993, in response to Teletrac's petition, we adopted the **Notice of Proposed Rule Making (Notice)** in this proceeding to examine the future licensing and continued development of AVM systems.²⁰ In the **Notice**, we proposed to replace the existing interim rules for AVM with permanent rules. We also proposed to expand the technical parameters of the service to permit locating and monitoring of people and objects, as well as vehicles, and therefore proposed to rename the service as the Location and Monitoring Service (**LMS**). Additionally, we proposed to allocate the entire **902-928** MHz band for **LMS**, with separate allocations for multilateration LMS systems and **non-**multilateration LMS systems. We proposed that all LMS systems operate on a shared basis.

10. **In response to our Notice**, we received numerous comments and reply comments from LMS service providers, LMS licensees that use **LMS** systems to meet their own internal needs (such as railroad companies and local government entities), LMS users, manufacturers and users of Part 15 equipment, and Amateur operators. We solicited further comments and reply comments in response to **ex parte communications we received**.²¹ Commenters offered a wide array of suggestions on the many complex issues raised in the **Notice**. Although we are adopting many of the proposals set forth in our **Notice**, the comprehensive record developed in this **proceeding** has led us to modify some of our proposals, especially as they concern the spectrum available for the different types of LMS systems, the licensing procedures for the band, and the general obligations of various users of the band.

¹⁶ **See e.g.**, Comments of **Cylink**.

¹⁷ **See** Ex Parte Comments of **Cellnet** dated March 15, 1994, at 2.

¹⁸ **See** Comments of Symbol Technologies at 34.

¹⁹ RM-8013, filed May 28, 1992, and placed on Public Notice June 23, 1992, Report No. 1897. Teletrac's request was primarily **directed** at the tentative nature of "interim" rules as well as the exclusivity of AVM licenses.

²⁰ Notice of Proposed Rule Making, PR Docket No. **93-61**, **8 FCC Rcd.** 2502 (1993).

²¹ **See** Public Notice, DA 94-129, PR Docket No. 9361, 59 Fed.Reg. 7239 (February 15, 1994).

11. Multilateration and non-multilateration **LMS** systems, amateur operations, and Part 15 devices will all play an important role in providing **valuable** services to the American public **in** the coming years. We believe that our decisions in this proceeding recognize this importance and **will enable all** of these services to make continued use of this spectrum. As detailed in our later discussion, commenters representing each of these services indicate the need for varying amounts of spectrum and varying degrees of interference protection from each other's operations in the band. We have therefore developed a spectrum plan that attempts to accommodate all of these users' requirements. The plan: 1) continues to permit secondary operations by unlicensed Part 15 and amateurs across the entire band, but affords users in these services a greater degree of protection to their operations; 2) enables **non-multilateration** LMS systems to operate on **spectrum** separate from multilateration systems; and 3) allocates spectrum on an exclusive basis for multilateration LMS licensees.

12. **In this Report and Order** we have therefore made the following decisions:

- Change the name of this service from the Automatic Vehicle Monitoring (**AVM**) to the Location and Monitoring Service (**LMS**) (see paragraph 1).

- Change the terminology used to refer to the two general categories of **LMS** technologies from "wideband" and "narrowband" to "multilateration" and "**non-multilateration**," respectively, (see paragraph 14).

- Permit multilateration LMS systems to locate any object -- animate or inanimate -- ancillary to their primary vehicular location and monitoring services (see paragraph 24).

- Permit LMS systems to transmit **and** receive status and instructional information, both non-voice and voice, related to the location and monitoring of a mobile unit and permit LMS systems to interconnect with the Public Switched Network (**PSN**) on a restricted basis (see paragraphs 26-27).

- Expand LMS license eligibility to all entities eligible to be licensed under Part 90 of our Rules and allow service in the **902-928** MHz band to be provided by LMS licensees to both individuals and the Federal Government on a commercial basis to paying subscribers. (see paragraph 28).

- **Clarify** what constitutes harmful interference to multilateration licensees by **unlicensed** Part 15 devices and amateur operations (see paragraphs 35-36).

- **Allocate an additional 8 MHz of spectrum in the 902-928 MHz band for LMS** use, permitting the entire band to be used for this purpose. Adopt a spectrum allocation scheme for the **902-928** MHz band that assigns separate sub-bands for multilateration and non-multilateration operations as follows (see paragraphs 46-49):

<u>Band (MHz)</u>	<u>System License</u>
902.000 - 904.000	Non-multilateration
904.000 - 909.750	Multilateration
909.750 - 919.750	Non-multilateration
919.750 - 921.750	Multilateration and Non-Multilateration
921.750 - 927.250	Multilateration
927.250 - 928.000	Multilateration²² .

■ License exclusive multilateration LMS systems within each Major Trading Area (MTA)²³ and four additional MTA-like service area? in the three sub-bands designated above, and resolve mutually exclusive applications through competitive bidding (see paragraphs 50-57).

■ Grandfather base stations of multilateration system licensees authorized as of February 3, 1995 and constructed and in operation by April 1, 1996 (see paragraphs 61-64).

■ License non-multilateration systems on a shared basis in the three sub-bands designated above (see paragraphs 69-70).

■ Allow multilateration licensees to commence operations only after demonstrating interference with Part 15 operations is **minimized** (see paragraphs 81-82).

²² This is not considered a separate sub-band. Each licensee in the 904.000-909.75 MHz, 919.750-921.750 MHz and **921.750-927.250** MHz sub-bands will obtain a narrowband assignment at the top of the **902-928** MHz band for forward link operations, as follows: 927.250-927.500 MHz for the 921.750-927.250 MHz band; **927.500-927.750** MHz for the **919.750-921.750** band; and **927.750-928.000 MHz** for the 904-909.750 band.

²³ Rand McNally organizes the 50 states and the District of Columbia into 47 **MTAs**. See Rand-McNally Commercial Atlas and Marketing Guide, 3639, (123d ed. 1992). **PCIA** and Rand McNally have recently entered into an **agreement regarding** the use of Rand McNally's market area designations (i.e., Basic Trading Areas (**BTAs**) and Major Trading Areas (**MTAs**) for the licensing of various mobile radio services. LMS is not covered by this agreement. The listings of the Major Trading Areas, **including** the counties, **parishes and** census divisions that comprise each **MTA**, are available for public **inspection** in the Office of Engineering and Technology's Technical Information Center, 2nd **Floor, 2000** M Street, N.W., **Washington, D.C.**

²⁴ The four additional regions are: (1) Guam and the Northern **Mariana** Islands; (2) the Commonwealth of Puerto Rico **and** the U.S. Virgin Islands; (3) **American** Samoa; and (4) Alaska will be treated as a single area **separate** from the Seattle MTA. This is consistent with our MTA-based service area definitions for **broadband** PCS (see 47 C.F.R. § 24.102) **and** for the Commercial Mobile Radio Services.

III. DISCUSSION

A. Definitions

13. In the Notice, we characterized **LMS** systems as “wideband” and “**narrowband**.” A number of commenters, including Mark **IV**, Hughes, **Amtech**, and Pinpoint, suggest that **LMS** systems should be categorized as either “wide-area” or “local-area” rather than as “wideband” or “narrowband.”²⁵ These commenters state that because some “narrowband” systems require a bandwidth in excess of 2 MHz it would be inappropriate to categorize these systems as narrowband. Teletrac opposes such a change in terminology, claiming that it would be difficult to distinguish wide-area/local-area systems without reference to a specific coverage **standard**.²⁶

14. While we agree that the **wideband/narrowband** terminology used in the Notice is imprecise and could be misleading, we believe that **characterizing** systems as “wide-area” or “local-area” could also lead to confusion because not all LMS systems have predetermined service contours. Therefore, to address commenters’ concerns, we shall refer to “wideband” pulse ranging systems as “multilateration” systems, and we shall refer to “narrowband” systems as “non-multilateration” systems. We define **multilateration** systems as systems that are designed to locate vehicles or other objects by **measuring** the difference of time of arrival, or difference in phase, of signals transmitted from a unit to a number of fixed points or **from** a number of fixed points to the unit to be located. We define non-multilateration systems as systems that employ any technology other than multilateration technology to transmit information to and from vehicles. Unlike a multilateration AVM system, which determines the location of a vehicle or object somewhere over a wide area, a typical **non-multilateration** AVM system uses an electronic device placed in a vehicle to transfer information to and/or from that vehicle. When the vehicle passes near one of the system’s stations, the station transmits an interrogating signal. The interrogating signal is then either modulated with **unit-specific** information and reflected back to the station’s receiver or the tag transmits its own signal in response to the interrogation. By dividing LMS into the broad multilateration and non-multilateration categories, we adopt a definitional framework that is flexible enough to accommodate all operational modes LMS is anticipated to evolve towards.

²⁵ See Mark **IV** comments at n.2; Hughes **comments** at 6-7; **Amtech** comments at n.3; **Pinpoint** comments at n. 3.

²⁶ Teletrac reply comments at 31-33.

B. Permanent LMS Operation in the 902-928 MHz Band

15. In addition to the current allocation within the 902-928 MHz band for AVM, this band is currently allocated for Industrial, Scientific, and Medical (ISM) equipment,²⁷ radiolocation, fixed and mobile by the Federal Government,²⁸ amateur operations,²⁹ and unlicensed operation of devices under Part 15 of the Rules.³⁰ In addition, we have initiated a proceeding exploring the possibility of making the middle portion of the 902-928 MHz band available for non-government wind profiler radar systems.³¹ Because of the diversity of services that share this band, many commenters observe that changes in the rules that relate to one group of users could affect the other users of the band. A number of commenters further argue that it is premature to adopt permanent rules for LMS systems because many LMS system operators, Part 15 users, and amateur operators are implementing new technologies.³² Other commenters urge us to take additional time to study the relative merits of the various services, devices, and technologies; still others argue that changes in the rules should be delayed to permit creation of a technical committee to study the sharing of the band among its various users.³³ Relatedly, the American Radio Relay League (ARRL) filed a petition for rule making, dated January 13, 1994, requesting a primary allocation of 902-904 and 912-918 MHz for the Amateur Radio Service.³⁴

16. Notwithstanding these concerns, we believe that delaying implementation of permanent rules for LMS systems could jeopardize the continued development of this service. Although a number of companies have already developed LMS systems and are on the verge

²⁷ See 47 C.F.R. § 18.305.

²⁸ See 47 C.F.R. § 2.106.

²⁹ See 47 C.F.R. § 97.301.

³⁰ See 47 C.F.R. §§ 15.243, 15.245, 15.247 and 15.249.

³¹ See Notice of Proposed Rule Making and Notice of Inquiry, Amendment of section 2.106 of the Commission's Rules to Allocate Spectrum for Wind Profiler Radar Systems, (NPRM/NOI), ET Docket 93-59, 8 FCC Rcd 2546 (1993).

³² See generally comments of the Telecommunications Industry Association (TIA); the Part 15 Coalition (Coalition); Spectralink, the North American Telecommunications Association (NATA); the Domestic Automation Company (DAC); Itron, Inc. (Itron); Symbol Technologies, Inc. (Symbol); Telxon Corporation (Telxon); Thomson Consumer Electronics (Thomson); Norand Corporation (Norand); and American Radio Relay League, Inc. (ARRL).

³³ Coalition comments at 12; Interdigital comments at 6-7; Spectralink comments at 5; Uniplex comments at 2; and TIA comments at 5.

³⁴ The Petition for Rule Making filed by the American Radio Relay League because it involves matters that are under consideration in this docket, was accepted as Comments in this proceeding.

of making services widely available, they argue that uncertainty about possible changes in our rules has deterred or prevented them from committing greater capital or obtaining **financing**.³⁵ In addition, LMS equipment manufacturers, state and local government entities, toll road operators, and Part 15 manufacturers and users require regulatory certainty. Further postponement of final decisions regarding our LMS rules would make it **difficult** for users of the band to plan the long-term development of their products or **services**.³⁶ Establishing permanent rules for LMS will also provide opportunities for new entrants into location and monitoring businesses. Accordingly, we find that it is in the public interest and consistent with Commission precedent to adopt permanent rules for location and monitoring services.

17. A number of other commenters argue that even if permanent rules are adopted, the Commission should find a permanent home for some or all LMS systems in another frequency band. For example, Lockheed, a manufacturer of narrowband LMS equipment, **argues that the 902-928 MHz band is an inappropriate place for LMS systems and proposes use of the 5.8 GHz band.** Saab requests an exclusive allocation in the 24502470 MHz band for an Electronic Toll and **Traffic Management (ETTM) Service** claiming that this is neither a narrow-band nor a wide-band LMS service.³⁷ The Part 15 Coalition also suggests that **LMS services be moved to the 2390-2400 MHz band that is part of the 50 MHz transferred to the FCC by NTIA.**³⁸ Other commenters suggest that we should restrict or eliminate multilateration LMS systems in the **902-928 MHz band** and instead promote alternative location technologies such as Global Positioning Satellite (GPS), **LORAN**, dead reckoning, or cellular **systems**.³⁹

18. We conclude not only that the **902-928 MHz band** should continue to be made available for LMS services, but that the 8 MHz within the band not previously allocated to AVM should also now available for LMS. Although prior AVM operation in the band has **occurred** under interim rules, we have always regarded the band as a permanent home for

³⁵ **See**, for example, Ex **Parte** Comments of **MobileVision** dated August 12, 1994 at 2.

³⁶ Teletrac **comments** at 4; **MobileVision** reply comments at 3.

³⁷ SCG **comments** at 3-5; **Sensormatic** comments at 17-20; Part 15 Coalition comments at 13-15; **Saab-Scania Combitech** (Saab) comments at 11; and Lockheed comments a 4. **ETTM** systems do fall into the "non-multilateration" LMS category (**see para. 14 supra.**) and as such are adequately **accommodated** in our **licensing** plan.

³⁸ Comments of the Part 15 Coalition at 8-9; Further Comments of the Part 15 Coalition.

³⁹ AT&T comments; **TIA** comments at 24; and **NATA** comments at 11-13.

AVM.⁴⁰ The 903-912 and **918-927** MHz segments of this band are currently the only spectrum specifically allocated for AVM use and there exists no other low-cost, **consumer-oriented** spectrum where AVM service providers operate their systems without facing concerns similar to those present in this band. The **902-928** MHz band is ideally suited for location services due to the propagation characteristics of the band that permit widespread coverage of a market area without the use of an inordinate number of base stations. In addition, while some commenters argue that GPS or terrestrial-based communications systems with location capabilities are more spectrally efficient," we are not persuaded that LMS should be eliminated from the **902-928** MHz band on this basis. The alternative technologies put forward by commenters have disadvantages as well as advantages in comparison to LMS. For example, GPS and LORAN-based systems used in fleet tracking permit a vehicle to determine its location, but a separate communications link is required to transmit this information back to a dispatch location. Similarly, **Lojack, Inc. (Lojack)** manufactures a vehicle location system that operates on a single channel in the 170 MHz band, but this system requires use of **direction-finding** antennas to locate the vehicle. By contrast, multilateration LMS systems use larger amounts of spectrum, but can both receive "**fixes**" on large numbers of vehicles and transmit messages back to such vehicles from a central source -- all within one integrated system.

19. We further conclude that the public will be best served by expanding the current AVM allocation of 18 MHz to include an additional 8 MHz so that LMS will be permitted to use the entire **902-928** MHz band. This will allow development of diverse LMS services and technologies. LMS providers are already developing systems with differing capacities, and future designs may surpass the capacity of systems available today. In addition, we believe that developing a diversity of LMS services is important to promote competition and continued technological advances. Promoting alternative technologies will provide consumers choices of a variety of locating services, enabling them to address their individual communications needs. The demand and need for greater capacity, capability and alternatives will grow. Thus, providing additional spectrum for LMS systems within the **902-928 MHz** band allows for development of the full scope of location and monitoring techniques.⁴²

⁴⁰ In the Report and Order in Docket 18302, we stated that the interim nature of the rules was to allow continued development of AVM systems under a flexible licensing arrangement and to allow the rules to be fine tuned as additional **information** is gained regarding the operation of various types of **AVM** systems. Report and Order, Docket No. 18302, at **paras. 5 and 10, 30 RR 2d 1665** (1974).

⁴¹ See Comments of the Portland Amateur Radio Club (PARC), Technology Radio Amateur Club (TRAC), the Part 15 Coalition, **Spectralink** Corporation (Spectralink), American Telephone and Telegraph Company (AT&T), and **NATA**.

⁴² See Report and Order, Docket No. 18302 at **para. 10, 30 RR 2d 1665** (\$4).

C. Eligibility and Permissible Uses

20. As discussed in the Notice, LMS systems have the potential to offer a wide array of services that go beyond the mere tracking of **vehicles**.⁴³ We therefore proposed to expand the permissible uses of LMS to include the location of all animate and inanimate **objects**.⁴⁴ In addition, we proposed expanding the types of entities eligible to acquire LMS service to include individuals and the Federal Government,” and we proposed to allow LMS service to be rendered on a for-profit basis.⁴⁵ We requested comment on whether these proposals to expand eligibility and permissible uses would create unacceptable congestion of the 902-928 MHz band.”

21. In response to the Notice, providers of multilateration LMS services contend that there are significant potential public benefits to expanding LMS beyond vehicle location **alone**.⁴⁶ Southwestern Bell Mobile Systems (SBMS) urges that the **definition** of LMS be further expanded to permit messaging and data **transmissions** to **fixed** units and units for which location and monitoring is not being **provided**.⁴⁷ Additionally, certain multilateration providers have requested that it be made clear that LMS will be permitted to provide interconnected service to the public switched network (**PSN**).⁴⁸ Other commenters, however, such as IVHS America and the United States Department of Transportation (DOT), argue that LMS should remain primarily a vehicle-oriented service, with an emphasis on **ITS-related communications**.⁴⁹ Part 15 manufacturers and users and amateur operators also **contend** that expansion of the possible uses of LMS will result in more intensive use of the band, thus leading to severe spectrum **congestion**.⁵⁰

⁴³ Notice 8 FCC **Rcd** 2502, 2503 (1993).

⁴⁴ Id. at para 9.

⁴⁵ Id. at para. 7.

⁴⁶ &at para. 8.

⁴⁷ Id.

⁴⁸ Teletrac comments at 9-10; **MobileVision** comments at 4143; SBMS comments at 3-7; and Location Services **comments** at 6.

⁴⁹ SBMS **comments** at 3-7.

⁵⁰ Ex Parte Comments of **MobileVision**, Teletrac and Uniplex dated December 12, 1994, at 2.

⁵¹ M-IS America **comments** at 16; DOT reply **comments** at 15.

⁵² See comments of **Sensormatic** Electronics (Sensormatic); TIA; the Part 15 Coalition; Interdigital Communications (**Interdigital**); Spectralink; **NATA**; DAC; **Itron**; **Symbol**; **Telxon**; Thomson; **Norand**; the Alarm Industry Communications Committee (Alarm Industry); ARRL; PARC;

22. Commenters **also** express diverse views on whether LMS licensees should be allowed to provide for-profit service. SBMS and Southern California Gas Company (**SCG**) support offering multilateration LMS as a subscriber-based private radio **service**.⁵³ **MobileVision** also supports permitting LMS licensees to provide services to paying subscribers, stating that such licensing “recognizes the massive capital cost incumbent in deploying the type of extensive **infrastructure** required for an LMS system of appropriate scope and scale to effectively **serve** a market.”⁵⁴ On the other hand, the American Radio Relay League (ARRL) and the Part 15 Coalition oppose allowing multilateration LMS licensees to provide subscriber-based service.”

23. We recognize the concerns of the Part 15 and amateur communities that the expansion of permissible uses of the LMS service will result in more intensive use of the 902 - 928 MHz band. Unfettered interconnection and messaging in the LMS could not only increase the potential for harmful interference to other users of the band, but detract from the intended purpose of the LMS allocation. Based on these concerns, we conclude that while a limited expansion of potential applications of LMS is **warranted**, operational restrictions should be imposed to **maintain** the coexistence of the many varied users of the band. We **find** therefore that it is appropriate to impose: 1) limitations on the provision of **non-vehicular** location services; 2) restrictions on messaging services and interconnection and; 3) a prohibition against message **and** data **transmissions** to **fixed** units and units for which location and monitoring is not being provided. We believe that these restrictions strike an equitable balance between the needs of LMS service providers and those of the Part 15 users and manufacturers and amateur operators, and additionally ensure that LMS systems are utilized primarily for location service and not as a general messaging or interconnected voice or data service. To ensure compliance with these restrictions, we may request, and licensees shall supply, whatever records or information necessary to demonstrate that these provisions are being followed.

24. Accordingly, we will allow non-vehicular location services to be rendered only by multilateration LMS systems whose **primary** operations involve the provision of vehicle location services. This limited expansion of permissible LMS uses recognizes the general capability of multilateration systems to cover a wide area and perform location determinations for any type of object within that area. We believe that non-multilateration systems, however, should continue to be used for vehicle monitoring only because the

and **TRAC**.

⁵³ **See Comments** of SBMS dated June 29, 1993, at 4; and Comments of **SGC** dated June 29, 1993, at 2-3 (“private carrier” support, but outside of **902-928** MHz).

⁵⁴ **MobileVision** Comments dated **June** 29, 1993, at **40-41**.

⁵⁵ **See** Comments of ARRL dated June 29, 1993, at 11-12; and **Comments** of the Part 15 Coalition at 16.

spectrum they occupy has a heavier concentration of amateur radio operators, Part 15 devices and Federal Government radiolocation operations than other portions of the band. We are concerned that permitting non-multilateration systems to provide this additional service will cause more intensive use of the sub-band, to the detriment of these other users.

25. While we expand the potential applications of LMS as described above, we decline to allow LMS to be used for the type of messaging proposed by Southwestern Bell. We agree with numerous commenters who argue that creating such a broad messaging and data service would be an inappropriate use of this **spectrum**.⁵⁶ The LMS service is a mobile location and monitoring service. We do not intend to expand use of this band so that it becomes primarily a **fixed**, point-to-multipoint or point-to-point messaging service. Our rules make adequate provision elsewhere for this type of communications.” The 902-928 MHz band, however, is the only allocation for location services that provides **sufficient** spectrum to accommodate the types of advanced location and monitoring systems currently being implemented. Although there are other methods and spectrum available to determine the location of a unit, these other methods do not offer the same capabilities or potential as systems developed in the **902-928 MHz band**.⁵⁸

26. We do not intend for this service to be used for general messaging purposes. Accordingly, we will require that all messaging be associated with the location or monitoring of the vehicle or unit. We will permit communications necessary to provide accurate, timely and complete status and instructional information relating to the vehicle being located or the occupant(s) of the vehicle, including voice communications. Thus, LMS systems will be permitted to transmit status and instructional messages, either voice or non-voice, so long as they are related to the location or monitoring functions of the system. We find that such use of **LMS** will be invaluable to the implementation of ITS of the **future**.⁵⁹

⁵⁶ **TIA comments** at 6; Interdigital comments at 3; Alarm Industry comments at 7; **Ademco** comments at 4; Consumer Electronics Group of the Electronic Industry Association (**EIA/CEG**) **comments** at 5; and Proxim, Inc. (Proxim) comments at 3. Uniplex notes that the **NPRM** requires that messages be related to the unit being located but urges that tighter restrictions be placed on messages, Uniplex comments at 3.

⁵⁷ **See generally**, Parts 21 and 94 of our Rules, 47 C.F.R. Part 21 and 94.

⁵⁸ **See para.** 18, **supra**.

⁵⁹ Both **IVHS** America and DOT **emphasized** the need for sufficient communications capacity to implement ITS services, including Advanced **Traffic** Management Systems, Advanced Traveler Information Systems, Advanced Vehicle Control Systems, Commercial Vehicle Operations, and Advanced Public Transportation Systems. **See** comments of **IVHS** America and DOT. **See also** Strategic Plan for Intelligent Vehicle Highway Systems in the United States, prepared by **IVHS** America. **Implementation** of such an array of ITS services will require substantial **communications** capacity and a combination of various technologies to provide **sufficient location** and traffic management information in many different circumstances.

27. In addition, we will permit limited **LMS interconnection**.⁶⁰ We will permit “store and forward” interconnection, where either (1) **transmissions** from a vehicle or object being monitored are stored by the **LMS** provider for later transmission over the PSN, or (2) **transmissions** received by the **LMS** provider from the PSN are stored for later transmission to the vehicle or object being monitored. We will not permit real-time interconnection between vehicles or objects being monitored and the PSN, except for emergency communications related to a vehicle or a passenger in a **vehicle**.⁶¹ Additionally, the vehicle or object being monitored may only send or receive real-time interconnected communications to or from entities eligible in the Public Safety or Special Emergency Radio **Services**⁶² or a system dispatch point. Finally, the requirement discussed above that all messages be associated with the location or monitoring of the vehicle continues to apply. We believe these limitations on interconnection will serve to impede the proliferation of interconnected voice and data communications by **LMS** systems while also providing them the flexibility to better serve the subscribers to the **service**.⁶³

28. Finally, we **find** it in the public interest to allow LMS licensees to make service available to individuals and the Federal Government in addition to Part 90 eligibles. This step will effectively enable LMS operators to serve all members of the public, thus increasing the potential for the public to benefit from the expansion of ITS services. In addition, because many LMS systems will entail construction of extensive **infrastructure** over wide geographic areas, we also find it in the public interest to permit LMS to be offered to paying subscribers. By **permitting** LMS offerings to be **structured** as commercial **subscriber-based** service, we afford licensees a realistic means of underwriting system development.

D. Accommodation of **Secondary** Users in the **902-928** MHz Band

29. As **noted** above, there are **currently** five separate user groups sharing the **902-928** MHz band. In addition, the relative hierarchy among these users is well established. The **902-928** MHz band is allocated for primary use by the Federal Government for Radiolocation, Fixed and Mobile services and by users of **Industrial, Scientific, and Medical (ISM)** devices. Use of the **spectrum** by government fixed and mobile and AVM **systems** is secondary to both of these uses. The **remaining users of the 902-928 MHz band, licensed** amateur radio operators and users of Part 15 equipment, operate on a **secondary** basis to all

⁶⁰ We note that Part 15 devices performing functions similar or identical to those of licensed **LMS operations are not restricted from interconnecting with the PSN**.

⁶¹ **Emergency** communications may include information about a medical condition that **requires** immediate attention or the mechanical breakdown or **failure** of an automobile.

⁶² **See 47 C.F.R. Part 90, Subparts B and C. This would also permit “911” interconnection** where this service is available.

⁶³ **See** Ex Parte Comments of **MobileVision** dated **December 14, 1994**, at **5-6**.

other uses, including **AVM**. In the Notice, we requested comment on whether LMS systems would be able to share the band with these other classes of users. The Notice also sought comment on whether a warning label should be **required** on LMS instruction manuals, operator manuals, and brochures to warn potential **LMS** users that **LMS** systems are secondary to Federal Government users and to ISM equipment? The Notice also requested comment on potential alternatives to LMS sharing with other user categories, “short of removing Part 15 users and amateur operations from the band, restricting where such users could operate in the band, or placing stricter limitations on the operation of such users in this band.”⁶⁵

30. The Federal Government and ISM users did not comment on sharing of the band, and LMS manufacturers and users generally did not express concern about continued sharing of the spectrum with either the Federal Government or ISM equipment. The American Radio Relay League (ARRL), however, **requests** that we provide a primary allocation in a portion of the **902-928 MHz** band for amateur **operations**.⁶⁶ The Interagency Group requests that LMS systems providing electronic toll **and** traffic management (**ETTM**) services be given co-primary status with Federal Government and ISM users, claiming that this is required to “instill confidence” in **ETTM** users that their long-term use of this band is **assured**.⁶⁷ We do not believe that these considerations warrant disturbing the primary status of Federal Government and ISM operations in relation to other uses of the band. Therefore, under the rules adopted today, LMS licensees **will** continue to operate on a secondary basis to Federal Government users and ISM equipment. Further, we **conclude** that no primary allocation for amateur operations in the requested sub-bands is **warranted**. Although the ARRL states that there has been “rapid increases in amateur **use**”,⁶⁸ that “the **Amateur** Radio Service is increasingly looking to the **902-928 MHz band**,”⁶⁹ and that “amateur use of the band has been growing”,⁷⁰ the only quantitative support that it provides is that there are 16 known manufacturers of amateur equipment for this band and that there are 20 amateur stations in

⁶⁴ Notice at **para. 24**, **8 FCC Rcd. 2502, 2506** (1993).

⁶⁵ **8 FCC Rcd 2502, 2506-2507** (1993), as revised by Erratum, **8 FCC Rcd 3233** (1993).

⁶⁶ See footnote 34, supra. The ARRL requests a primary allocation in the 902-904 MHz and 912-918 MHz bands. Also, by letter to **Chairman, Reed E. Hundt**, dated October 4, 1994, ARRL asks that the Commission not extend any substantive accommodation for Part 15 entities that is not extended as well to the Amateur service.

⁶⁷ Interagency Group **comments** at 11-12.

⁶⁸ **ARRL Petition for Rule Making** at 3.

⁶⁹ ARRL Petition for Rule **Making** at 10.

⁷⁰ ARRL Petition for Rule Making at 9.

Rochester, New York using the band.” There are, on the other hand, a large number of various uses of this band with quantitatively **known** combined (and competing) requirements. They include the existence of more than 4 million Part 15 devices and 500,000 **non-multilateration** LMS tag readers. **ARRL’s** petition thus fails to adequately justify a change in the allocation status for the Amateur Radio Service in any portion of this band.

31. In the Notice, we proposed that a warning label be required on all LMS instruction manuals, operator manuals, and brochures to warn potential LMS users that **LMS** systems are secondary to Government radiolocation and to ISM equipment and that, as a result, such systems may suffer from “undesired operation.” Notice at **para. 24**, 8 FCC **Rcd.** 2502, 2506 (1993). We have decided not to require such a warning label. Many wireless telecommunications systems operate on spectrum that is also allocated for other uses and are susceptible to varying degrees of interference. We generally do not place warning labels on these systems. To do so in this instance might unfairly label **LMS** as an inferior service to other similarly-situated services, quite possibly deterring growth of the service and reducing the likelihood of prompt public benefit from its use. Moreover, LMS providers have an inherent incentive to **minimize** the deleterious effects of interference to provide reliable service and to attract and retain a loyal customer base. We do warn **LMS** licensees and users, however, that many LMS systems in the 902-928 MHz band will be sharing the band with one another, and operating on a secondary basis to Federal Government users and ISM equipment. Systems operating in such an environment are always subject to the possibility of interference, and must comply with our criteria for co-channel sharing where applicable.

32. The relationship between LMS, especially multilateration systems, and Part 15 uses of the **902-928** MHz band presents more complex issues, as the comments indicate. There are millions of Part 15 devices in operation throughout the United States today and this number is expected to increase in the future. Because Part 15 devices operate at extremely low power and each has a limited area of operation, the record indicates that they can coexist more easily with non-multilateration LMS systems, which also operate with relatively short **range**.⁷² Conversely, Part 15 commenters generally contend that they will not be able to effectively share the spectrum with multilateration LMS systems.” These commenters believe that Part 15 devices and **multilateration** LMS cannot coexist in the same band because the high power multilateration **transmissions** will overpower and desensitize their low power,

⁷¹ ARRL Petition for Rule Making at note 18.

⁷² Ex Parte **Comments** of **Amtech** dated **March 29, 1994**, at 8-9.

⁷³ **See** Ex Parte Comments of Ademw dated March 15, 1994 at 5-11; Ex Parte Comments of Part 15 Coalition dated August 12, 1994 at 3; Ex Parte Comments of the Ad Hoc Gas Distribution Utilities Coalition dated August 12, 1994 at 7; Ex Par&e Comments of **Itron** dated August 12, 1994 at 1.

unlicensed operations.” Additionally, Part 15 commenters believe that with **unrestricted** use of high power services, the noise floor will increase throughout the band. They claim that this increase of noise in the band, without a limitation in the power and location of the multilateration **transmissions**, would make their sensitive receivers -- which must accurately detect low-power signals -- obsolete and unusable anywhere in the 902-928 MHz **band**.⁷⁵ Multilateration **LMS** commenters argue that operation of some Part 15 devices is likely to cause harmful interference to LMS systems. Examples of potential interference sources identified by multilateration operators include anti-shoplifting field disturbance sensors that operate under Section 15.245 of the rules and certain video links that operate under Section 15.249 of the **rules**.⁷⁶ Multilateration parties also contend that harmful interference is likely to be caused by Part 15 devices that either transmit continuous signals or transmit from antennas placed at relatively high out-of-doors elevations. On the other hand, multilateration proponents do not believe that interference is likely to be received from any other type of Part 15 operations?

33. Commenters have suggested a number of solutions to mitigate potential harmful interference, including 1) limiting the permissible uses for the LMS service, 2) moving the LMS service to another band, 3) elevating Part 15 devices to w-equal status with LMS systems, 4) retaining existing rules until a joint technical committee can be established to study the feasibility of sharing, and 5) giving amateur operators primary status in a part of the **band**.⁷⁸ In ex parte comments **filed** in mid-August 1994, some LMS commenters discussed additional alternatives for continuing to allow Part 15 operations in the 902-928 MHz **band while seeking to minimize** possible interference to **LMS** operations. These commenters focused on establishing thresholds that would determine whether Part 15 devices were causing harmful interference to **LMS** systems, based on criteria such as field strength limits, height of outdoor antennas used by Part 15 devices, the directional gain of antennas associated with Part 15 devices, and the **existence** of field disturbance sensors operating under Section 15.245 of our rules.⁷⁹ Part 15 commenters, however, had little, if any,

⁷⁴ See Ex Parte Comments of the Part 15 Coalition dated August 12, 1994, at 4.

⁷⁵ See e.g., Ex Parte Comments of **Cellnet & KNOGO** dated **August 19, 1994**, at 3.

⁷⁶ Letter from **AirTouch** Teletrac, Pinpoint Communications, **Inc.**, Uniplex and **MobileVision**, L.P., to Ralph A. **Haller, Chief**, Private Radio Bureau, dated June 23, 1994.

⁷⁷ See **ex parte comments** of Teletrac, **MobileVision**, Pinpoint and Uniplex, dated June 23, 1994 at 5.

⁷⁸ See Ex Parte Comments of **Metricom** and Southern California Edison Company dated August 12, 1994 at 4; Ex Parte Comments of Symbol Technologies at 34; Ex Parte Comments of Part 15 Coalition dated August 12, 1994 at 6-7; Petition for Rule **Making** filed by the American Radio Relay League (ARRL) on January **13, 1994** at 1.

⁷⁹ See Further Comments of **AirTouch** Teletrac, **MobileVision** and SBMS dated August 12, 1994.

support for these types of interference threshold **criteria**.⁸⁰

34. We recognize the important contribution to the public that both Part 15 technologies and amateur operators provide in the **902-928** MHz frequency band. For example, Part 15 devices currently operating in the 902-928 MHz band provide **valuable** services such as automated meter reading, inventory control, package tracking and shipping control, alarm services, local area networks, and cordless telephones. These devices allow businesses to operate more effectively and efficiently, without the regulatory complexities of many licensed services. The amateur service is used by technically inclined private citizens world-wide to engage in self-training, information exchange, and radio experimentation. It is at the forefront of communications technology and has been instrumental in the development of land mobile systems, hand held radios, and satellite communications. In times of disaster when normal communications are disrupted, amateur systems often alert the world to the disaster and provide assistance in relief operations. By the actions in this proceeding we seek to **maximize** the ability of Part 15 and amateur operations to coexist with the operation of **LMS** systems.

35. We also conclude that effective sharing of this band between amateur and Part 15 users and multilateration **LMS** systems does not require a change in the relative status between these two allocations and uses, as some parties have suggested. Rather, we have decided to balance the equities and value of each use without undermining the established relationship between unlicensed operations and licensed services. Thus, we affirm that unlicensed Part 15 devices in the **902-928** MHz band, as in any other band, may not cause **harmful** interference to and must accept interference from all other operations in the **band**;⁸¹ persons operating unlicensed Part 15 devices have no vested or recognizable right to continued use of any given frequency;” and finally, an operator of an unlicensed Part 15 device is **required** to cease operations upon notification by a Commission representative that the device is causing harmful interference and may not resume operations until the condition causing the harmful interference has been **corrected**.⁸³ Furthermore, the amateur radio service will retain its status as a licensed, secondary service.

⁸⁰ **See Ex Parte Comments** of ADEMCO, Axxon Corp., C&K Systems, Gas Utilities, **ITRON, Metricom & Southern** Cal Edison, **NavGuard/Summit** Telewm, Sensormatic, Symbol Technologies, Tatung Telewm, Teatherless Access, TIA, Uniplex Corp., **Utilicom**, UTC, **WINFORUM and WISE** Communications, August 1994.

⁸¹ 47 C.F.R. § 15.5(b).

⁸² 47 C.F.R. § 15.5(a).

⁸³ 47 C.F.R. § 15.5(c).

36. Amateur **and Part 15** operations will continue to be secondary to services with a higher allocation status. They may continue to operate as their licenses and/or the rules permit. To accommodate their concerns about their secondary status in light of multilateration LMS, however, we are adopting rules that define and clarify what constitutes harmful interference from their secondary operations. **Harmful** interference is **defined** as **"(a)ny** emission, radiation or induction that endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with this chapter."⁸⁴ To promote cooperative use of the 902-928 **MHz** band we are elaborating on this standard to define what is **not harmful** interference **from** both amateur operations and **unlicensed** Part 15 devices to multilateration LMS systems. This "negative definition" will promote effective use of the 902-928 MHz band by the various services by clearly establishing the parameters under which licensed Amateurs and unlicensed users of Part 15 devices may operate without risk of being considered sources of harmful interference to services with a higher allocation status. Part 15 and amateur operators who voluntarily operate within the following parameters will not be subject to harmful interference complaints from multilateration **LMS** systems at 902-928 MHz. Thus, we are adopting rules that provide that a Part 15 device will **not** be deemed to be causing interference to a multilateration LMS system if it is otherwise operating in accordance with the provisions of 47 C.F.R. Part 15 and it meets at least one of the following conditions:

- (a) it is a Part 15 field disturbance sensor operating under Section 15.245 of the rules and it is not operating in the 904909.750 or **919.750-928.000 MHz sub-bands;**⁸⁵ or
- (b) it does not employ an outdoor antenna; or
- (c) if it does employ an outdoor antenna, then if
 - (1) the directional gain of the antenna does not exceed **6 dBi**, or if the directional gain of the antenna exceeds **6 dBi**, it reduces its transmitter output power below 1 watt by the proportional amount that the directional gain of the **antenna** exceeds **6 dBi;**⁸⁶ and
 - (2) either

⁸⁴ 47 C.F.R. § 15.3(m). See also 47 C.F.R. § 2.1.

⁸⁵ SBMS and **MobileVision** stated they supported this field disturbance sensor limitation as an interference determinant. See Ex Parte Comments of SBMS dated August 12, 1994, and **Ex Parte** Comments of **MobileVision** dated August 12, 1994. Multilateration entities **concur** that the majority of interference complaints from Part 15 devices **concern** field disturbance sensors and long **range** video links. See the LMS Consensus Position on Part 15 Interference dated June 22, 1994; see also the Ex Parte Letter from **Teletrac** to the Chief, **Private** Radio Bureau, dated June **21, 1994**.

⁸⁶ See 47 C.F.R. Section 15.247.

- (A) the antenna is 5 meters or less in height above ground; or
- (B) the antenna is more than 5 meters in height above ground but less than or equal to 15 meters in height above ground and either:
 - (i) adjusts its transmitter output power below 1 watt by $20 \log(h/5)$ dB, where h is the height above ground of the antenna in meters; or
 - (ii) is providing the **final** link for communications of entities eligible under Subparts B or C of Part 90 of the rules.

Amateur operations in this band meeting these same parameters concerning antenna location, gain, and height as well as transmitter output power will also not be considered as sources of **harmful** interference. Conversely, Part 15 and Amateur operations not meeting these parameters **and** seriously degrading, obstructing or repeatedly interrupting the operation of a multilateration system, will be deemed to be causing harmful interference and, thus, upon Commission notification, be required to cease operations until the condition causing the interference has been corrected. We emphasize, however, that Part 15 or Amateur use is not restricted from operating beyond these parameters. Part 15 and Amateur operations can continue to operate as long as interference is not caused and are limited only by the technical parameters contained in the rules applicable to their **respective** services.

37. We agree with SBMS that the appropriate threshold for determining that Part 15 devices are presumptively **not** causing harmful interference to multilateration LMS systems is whether they are operating above 1 watt, because 1 watt "is approximately the level at which some **current** LMS devices transmit, and is well above most cordless phones and other personal Part 15 **devices**."⁸⁷ Under our rules, the transmitter output power of a Part 15 device is not permitted to be more than 1 watt. An antenna less than 5 meters in height driven by a transmitter with 1 watt or less of output power will only affect LMS operations that are relatively close. A higher antenna, however, has the capability to affect a larger number of LMS operations. This is why, between 5 **and** 15 meters, we adopt the stated formula to adjust the Part 15 transmitter output power. This assures that between 5 and 15 meters an outdoor antenna has the equivalent effect on multilateration LMS operations of a **5-**meter antenna using no more than 1 watt transmitter output power. (We have not applied this sliding power reduction scale to devices directly serves public safety and special emergency eligibles so as to **minimize** the effect on communications involving the safety of life or property.) Height and transmitter power alone, however, are not the only components of a transmitted signal. The directional gain of the antenna also affects the radiated power, and thus the signal strength at the affected receiver. **"If a 6 dBi antenna is used, pointing in the direction of the LMS site, then the received signal level, at the LMS site, will be 6 dB higher than if a 0 dBi antenna were used."**⁸⁸ We conclude, therefore, that use of a Part 15 outdoor antenna with a directional gain of equal to or less than 6 **dBi**, or a Part 15 outdoor

⁸⁷ Ex Parte Comments of SBMS dated August 12, 1994.

⁸⁸ Ex Parte Comments of **MobileVision** dated August 12, 1994, at **Annex 1**, page 4.

antenna with a **directional gain** of greater than 6 **dBi** having a proportional transmitter output power reduction, constitutes an appropriate threshold at which there is little likelihood of desensitization of the receiver(s) at an LMS site. Finally, because multilateration entities concur that most Part 15 interference to multilateration LMS systems is likely to be from field disturbance sensors and long range video **links**,⁸⁹ we will not make any presumption of interference-free operations for these devices when they operate in exclusive-use bands.

38. In view of the technical diversity of the many LMS systems in existence and the multiplicity of Part 15 devices that will eventually be placed in operation, we conclude that the above **standards** will not provide solutions to all interference problems, and this agency may not be able to resolve all interference problems that may arise between unlicensed Part 15 and LMS systems. As such, multilateration LMS systems that experience interference from an amateur or Part 15 transmission may face two different scenarios. Under the first scenario, where the interference is from an amateur or Part 15 system operating within the parameters set forth in paragraph 36, the interference is not considered to be harmful. The multilateration LMS system experiencing the interference has no recourse by way of complaint to the Commission. It may only attempt to resolve the interference by modifying its own system or by obtaining the voluntary cooperation of the amateur operator or Part 15 user. Under the second scenario, where the interference is from an amateur or Part 15 **transmission** that does not fall within the parameters set forth in paragraph 36, the multilateration LMS system experiencing the interference may have recourse by way of complaint to the Commission if voluntary measures fail to resolve an interference **problem**.⁹⁰ To assure that our limited resources are used efficiently and effectively, the complaint must identify the exact source of the **interference**. A Part 15 user that is causing harmful interference may resolve such a complaint by **voluntarily** adhering to the parameters stated above. Alternatively, the Part 15 user causing harmful interference may choose other courses of action, including: (1) reducing power sufficiently to avoid causing harmful interference; (2) lowering antenna height sufficiently to avoid causing harmful interference; (3) changing antenna directionalization to avoid causing harmful interference; (4) any combination of 1-3; (5) reaching an accord with the complaining LMS system; or (6) terminating operations. We do not envision readily solving all interference problems because of the technical diversity of the many LMS systems in existence and the multiplicity of Part 15 devices in operation, but believe that the vast majority of equipment and services can operate successfully in this band.

39. We believe that the **procedures** described above afford the best opportunities for amateur, Part 15 and multilateration LMS operations to coexist in the 902-928 MHz frequency band.. Manufacturers of Part 15 devices whose equipment may cause harmful interference to multilateration systems may choose to restrict the operating frequency of their

⁸⁹ **See** the LMS Consensus Position on Part 15 Interference dated June 22, 1994; **see also** the Ex Parte Letter from **Teletrac** to the Chief, Private Radio Bureau, dated June 21, 1994.

⁹⁰ See footnote 210 for a discussion of the nature of harmful interference to an LMS system.

devices to the **902-904** and **909.750-919.750 MHz** sub-bands that will not be occupied by multilateration systems. Additionally, the 24002483.5 MHz band may prove to be useful to Part 15 operations that may not be accommodated successfully in the 902-928 MHz band (see discussions of the 2402-2417 MHz band in the Notice of Proposed Rulemaking in ET Docket **94-32**).

E. Spectrum Allocation Plan

40. Currently, LMS systems can be licensed on a permanent basis at 904-912 and 918-926 **MHz** and on a developmental basis at **903-904** and **926-927 MHz**.⁹¹ In the Notice, we proposed that LMS systems be licensed on a permanent basis throughout the **902-928 MHz** band, and that the band be divided into five sub-bands: **902-904**, 904-912, 912-918, 918-926, 926-928 **MHz**.⁹² We further proposed that multilateration systems be licensed in the 904-912 and 918-926 **MHz** sub-bands and that non-multilateration systems be licensed in the **902-904**, 912-918, and 926-928 MHz **sub-bands**.⁹³

41. Most entities providing or developing **LMS** systems support licensing LMS systems throughout the **902-928 MHz band**.⁹⁴ Part 15 and amateur operators **uniformly** oppose our proposal to expand LMS use to all of the **902-928 MHz** band. The Part 15 Coalition originally proposed that LMS systems be **restricted** to the existing two 8 megahertz bands and that each multilateration system be authorized for only 4 **MHz** each. Other commenters, such as **NATA, DAC, and the Alarm Industry**, propose that the total amount of spectrum for all LMS **services** be reduced to 8 **MHz**.⁹⁵ AT&T proposes that **LMS** systems be licensed only in the two 8 megahertz sub-bands **currently** allocated for LMS and that the rules be changed to eliminate multilateration systems, permitting only non-multilateration systems in the bands.”

42. Teletrac, **MobileVision**, Location **Services**, and SBMS support our proposal to

⁹¹ See Section 90.239 of the Rules, 47 C.F.R. § 90.239.

⁹² Notice at para. 15, 8 FCC Rcd 2504 (1993).

⁹³ Id.

⁹⁴ See **Teletrac comments** at 20; **MobileVision comments** at 29-32; Mark IV comments at 6; **Location Services comments** at 4-5; **AT/comm** comments; **Hughes comments** at 6-7; **Amtech** comments at 2; **Pinpoint** comments at 2-3; and **SBMS** comments at 10.

⁹⁵ **NATA** comments at 12; **DAC comments** at 14; **Alarm Industry comments** at 9.

⁹⁶ Comments of AT&T.

create separate sub-bands for multilateration and non-multilateration systems.⁹⁷ Amtech and Pinpoint advocate shared use of the entire 902-928 MHz band by both multilateration and non-multilateration systems to maximize the capacity of multilateration systems and provide sufficient spectrum for non-multilateration systems requiring larger amounts of spectrum.⁹⁸ Texas Instruments/MFS proposes that multilateration systems be allocated only one 8 megahertz sub-band and that the rest of the band be available for non-multilateration use.⁹⁹ IVHS America and the DOT support our proposed division of the band, but would also permit multilateration and non-multilateration systems to have immediate access to each other's spectrum on a secondary basis and, after six years, would allow any unlicensed spectrum to be available for primary use by either multilateration or non-multilateration systems.¹⁰⁰ Mark IV and the Interagency Group would permit only electronic toll and traffic management (ETTM) systems to have access on an equal basis with multilateration systems on the proposed multilateration spectrum.¹⁰¹ Several commenters have submitted studies to illustrate the difficulties that multilateration and non-multilateration systems would have in sharing the same spectrum.¹⁰² Only two commenters, Amtech and Pinpoint, claim that such sharing is feasible and present a detailed sharing plan.¹⁰³

43. In addition to requesting comment on the appropriate use of spectrum in the 902-928 MHz band for multilateration and non-multilateration LMS systems, we also made proposals and solicited comment on how multilateration systems, in particular, should be licensed. Specifically, we proposed that multilateration systems be licensed on a shared basis in the 904-912 and 918-926 MHz bands and that licensees be responsible for coordinating

⁹⁷ See Teletrac wmmments at 20; MobileVision wmmments at 29; Location Services comments at 5; and SBMS comments at 10 [SBMS supports further dividing the sub-bands proposed for use by multilateration systems].

⁹⁸ Pinpoint comments at 9; Amtech comments at 7-14. Amtech, in its August 12, 1994 comments, indicates that ". . . at a minimum, the rules should accommodate the use of two 6 MHz channels for read-write tapes." Comments at 2.

⁹⁹ Texas Instruments Incorporated/MFS Network Technologies, Inc. (TI/MFS) wmmments at 11-13.

¹⁰⁰ IVHS America wmmments at 20; DOT reply wmmments at 16-17.

¹⁰¹ See Interagency group comments at 11-12; and Mark IV reply comments at 6-8.

¹⁰² Teletrac comments at Appendix 2; MobileVision reply comments at appendix 3.

¹⁰³ See Amtech wmmments at 17-35; and Pinpoint wmmments at 9-39. Although Mark IV supports permitting co-equal access to spectrum for multilateration and at least ETTM non-multilateration systems, it does not provide a detailed sharing plan and does not evaluate the effects that non-multilateration systems would have on multilateration systems.

among themselves to avoid interference.¹⁰⁴ We also offered an alternative that systems be licensed on an exclusive basis for five years, after which licensing would be on a shared basis with any new licensees required to protect **incumbents**.¹⁰⁵

44. Several multilateration parties oppose our proposal to license these systems on a shared basis, claiming that it is not technically or economically feasible to share spectrum on a co-equal basis with other multilateration **licensees**.¹⁰⁶ Two commenters that are developing multilateration systems, Pinpoint and Uniplex, support shared licensing, albeit on a limited basis? SBMS, while opposing shared use of spectrum for multilateration systems, would divide the two 8-megahertz bands into four 4-megahertz bands licensed on an exclusive **basis**.¹⁰⁸ The commenters agree that sharing of **spectrum** among multilateration licensees would require the use of an interference avoidance measure, such as time **sharing**.¹⁰⁹ Time sharing would reduce system capacity since it requires the use of guard bands and other additional system overhead that represent additional uses of capacity that do not contribute to the content of the message.¹¹⁰ With each addition of a new multilateration system, the quality of service provided by incumbent **operators** would **diminish** due to **increases in system** delays and time **required** for a subscriber to access the **system**.¹¹¹ In a shared environment, the multilateration interference tolerance threshold would be more likely to be violated, causing the time of arrival to be distorted for the return signal and therefore, not accurately providing location services.¹¹² Finally, if there is more than one multilateration system using the same **frequency** band, it would be extremely **difficult** to have adequate power control

¹⁰⁴ Notice at **para.** 65, 8 FCC **Rcd** 2502, 2506 (1993).

¹⁰⁵ Id.

¹⁰⁶ Comments of Teletrac at 24-39; Comments of **MobileVision** at 33-36; Comments of Southwestern Bell Mobile Systems (SBMS) at 12-14; and Comments of Location Services at 4. We hereby grant **SBMS's** Motion to Accept Supplement to Reply Comments because it serves the public interest and best ensures the proper dispatch of Commission business to develop a full and **complete** record in this **proceeding**. See 47 U.S.C. § 154(j).

¹⁰⁷ See Comments of Pinpoint at **9-20**; Ex Parte Comments of **Pinpoint** dated August 3, 1994; Ex Parte Comments of Uniplex dated September **30, 1994** (supporting Pinpoint's August 3, 1994 position).

¹⁰⁸ SBMS **comments** at **12-14**.

¹⁰⁹ See Pinpoint **comments** at 17.

¹¹⁰ See Ex **Parte Comments** of SBMS dated March 29, 1994, at 16-17.

¹¹¹ See Ex **Parte Comments** of Teletrac dated **March 15, 1994**, at **2**, Ex **Parte Comments** of SBMS dated **March 29, 1994**, at 16-17.

¹¹² See Comments of **MobileVision** at 33-4, Reply Comments of Mobile&ion at 12-13.

among users from disparate systems. Without adequate power control, overall system capacity would suffer.¹¹³ Sharing could also require the establishment of **standards** to which all of the systems would have to conform. With different technologies employed by the various systems being proposed, we are not in a position, nor are we inclined, to set such **standards**. For these reasons, we conclude that sharing in the multilateration segment of this service is neither practical nor desirable from either a technical or regulatory standpoint.

45. Some commenters also provided economic analyses of the impact of sharing on competition in the multilateration LMS market over the **long-term**.¹¹⁴ Teletrac opposed sharing, pointing to various substantial **fixed** costs and technical difficulties to argue that a market with open entry to shared spectrum would not necessarily sustain more than two **firms**. Teletrac suggested that the close coordination among licensees needed to make sharing spectrum successful could inhibit vigorous competition. Teletrac also argued that exclusive licensing would not allow licensees to exercise market power because of the availability of alternative location services. SBMS, on the other hand, argues that sharing may be economically beneficial because it would encourage competition and technical innovation. SBMS also expressed concern that exclusive spectrum assignments would make the multilateration LMS market a natural monopoly.

46. We believe that both multilateration and non-multilateration systems will play an important role in achieving a nationwide ITS **infrastructure and** that a sufficient amount of spectrum must be available to enable both types of systems to **develop**.¹¹⁵ We also agree with commenters that to enable both multilateration and **non-multilateration** systems to develop **effectively**, we should create separate allocations for the two types of systems to the extent possible.¹¹⁶ Further, we believe that, for the most part, non-multilateration systems can share **spectrum** with one another if they are separated from multilateration operations (see paragraph 66, infra). separated, as discussed earlier, we believe that there are technical, operational and economic justifications supporting our decision to provide exclusive spectrum for exclusive assignments for multilateration systems.

¹¹³ See Ex Parte Comments of SBMS dated October 19, 1994, Final Report of the Mobile and Portable Radio Research Group at 35.

¹¹⁴ See Comments of North American Teletrac and Location Technologies, Inc. (Teletrac), Reply comments of Mob&vision, L.P., Pinpoint Communications, Inc., and supplemental reply comments of SBMS.

¹¹⁵ IVHS America comments at 13-15; DOT reply comments at 12-15.

¹¹⁶ MFS/TI, in its August 12, 1994 comments suggests that multilateration use, "... even on a **secondary** basis [to non-multilateration use] would prove to be unworkable in day-today operations" and could "... present an untenable situation for non-multilateration systems with **primary** use over the band." Comments at 8 and 9.

F.¹²¹

49. The plan also accommodates the **needs** of non-multilateration systems by providing a total of 14 **MHz** for such systems rather than the 10 **MHz** of spectrum proposed in the Notice (see footnote 98, supra). Of this 14 **MHz**, 10 **MHz** is contiguous spectrum at 909.750-919.750 **MHz** that is not shared with multilateration systems, which should address the spectrum requirements of most non-multilateration systems.” In addition, **non-multilateration** systems may obtain up to a 12 **MHz** block of contiguous spectrum by also **using the 2 MHz** of spectrum at 919.750-921.750 **MHz** (Band D). Although this 2 MHz block will be shared on a co-equal basis with multilateration systems, it will nonetheless provide opportunities for non-multilateration systems that require additional spectrum to operate effectively. ¹²³

F. Geographic Areas for Exclusive Licenses

50. In the Notice, we sought comment on how to license spectrum to multilateration **LMS systems**.¹²⁴ In the Notice of Proposed Rulemaking in PP Docket No. 93-253, we asked for comment on the appropriateness of awarding **LMS** licenses through competitive **bidding**.¹²⁵ Finally, after adopting the Notice in this docket, we sought specific comment on certain alternative licensing aspects, such as the use of Basic Trading Areas (**BTAs**) in defining the license service **area**.¹²⁶

51. Teletrac favors **BTAs** over **MSAs/RSAs** for **multilateration LMS** licensing “because the coverage area customers seek for tracking and emergency services extends

¹²¹ Licensees may not be authorized to operate on more than one of the multilateration bands in a given **MTA**, except **that** they will be permitted to aggregate Bands D and G and Bands E and F.

¹²² Mark IV has indicated that its non-multilateration systems can operate in the 912-918 MHz range. Comments of Mark IV dated June 29, 1993, at 8-10. **MFS/TI** has indicated **that** “it may be Possible for AVI (non-multilateration) technologies to operate in as little as 10 **MHz** of (contiguous) bandwidth.” Comments of **MFS/TI** dated August 12, 1994, at 8.

¹²³ See Amtech comments at 9. **Amtech** states that two-way data transmission between a moving vehicle and a fixed location will require large bandwidths. See also TI/MFS ex parte comments filed December 2, 1993, at 5 and Hughes comments at 6.

¹²⁴ See Notice of Proposed Rule Making, PR Docket No. 93-61, 8 FCC Rcd 2502 (1993) at paragraph 21.

¹²⁵ See, Notice of Proposed Rule Making, PP Docket No. 93-253, 8 FCC Rcd 7635, para 145, n. 153 (1993).

¹²⁶ See Public Notice, DA 94-129, PR Docket No. 93-61, 59 Fed.Reg. 7239 (February 15, 1994).

beyond city limits to the broader metropolitan area where people are likely to commute, conduct business, or routinely **drive.**"¹²⁷ SBMS favors **MSAs/RSAs** over **BTAs** because, it claims, (1) the Commission has had favorable experience with **MSAs/RSAs** in licensing cellular systems, (2) **BTAs** do not coincide with cellular service areas, to the detriment of **cellular** entities that are would-be **LMS** providers, (3) **MSAs/RSAs** are widely known and easily ascertainable, and (4) no private party or **entity** has ever attempted to control dissemination of maps or listings which depict or define these **areas.**¹²⁸ SBMS also argues that allowing existing licensees to expand to the borders of their **BTAs** could have **anti-competitive** implications.¹²⁹ Symbol Technologies believes that choosing **BTAs** for **LMS** would result in a congruency of service areas for **LMS** and PCS that would allow **LMS** providers to be de facto PCS providers and directly compete with PCS.¹³⁰

52. We generally agree with Teletrac's view that the geographic scope of LMS systems logically correlates to areas in which there are centers of consumption of durable goods. We also find, however, that LMS has the potential to serve larger areas; vehicle location and monitoring will be useful for the individual motorist and for fleets of vehicles, and for short-range travel as well as long-range travel. For this reason, we conclude that Major Trading Areas (**MTAs**) as defined in the 1993 Rand McNally Commercial Atlas and Marketing Guide¹³¹ and four additional MTA-like service **areas,**¹³² unlike the smaller **BTAs,** provide a more suitable regulatory construct for multilateration licensing. While it is clear that multilateration systems will benefit from being centered upon areas of commerce and trade, use of **MTAs** will give systems greater capacity to accommodate large numbers of prospective users of location services. This will promote competition, encourage the advancement of new technologies, and result in better and speedier service to the public. We will thus provide for one exclusive multilateration system license in each MTA in the sub-bands **identified** for exclusive assignments (i.e., Bands B and H, D and G, and E and **F**). Multilateration licensees on these exclusive assignments will be allowed to construct stations anywhere within their **MTAs,** subject to technical and operational considerations discussed in paragraph 87-98, infra.

¹²⁷ Comments of **PacTel** Teletrac dated **March 15, 1994,** at 8.

¹²⁸ Comments of SBMS dated **March 15, 1994,** at 5. SBMS makes reference to "**PCIA, Rand McNally Settle Out-of-Court On Use of BTA/MTA Listings,**" **Washington Telecom Week,** February 18, 1994, at 2-3.

¹²⁹ Comments of SBMS dated **March 15, 1994,** at 14-16.

¹³⁰ Comments of Symbol Technologies, Inc. in Response to the Public Notice of February 9, 1994, at 7-8 (note 9).

¹³¹ See footnote 23, supra.

¹³² See footnote 24, supra.

G. Competitive Bidding for Exclusive Multilateration LMS Licenses

53. In response to the Notice of Proposed Rule Making in PP Docket No. 93-253, we received comment on the issue of whether mutually exclusive applications for AVM systems should be resolved by competitive bidding.¹³³ Teletrac and SBMS oppose use of competitive bidding to license in this service. These parties contend that the statutory requirement that auctionable spectrum be exclusively assigned and principally used to serve paying subscribers is not met because LMS operations are secondary to ISM and Federal Government use of the band. Amtech and Pinpoint, who oppose competitive bidding for LMS licenses for other reasons, argue that LMS's secondary status does not in and of itself statutorily preclude competitive bidding.

54. In the Second Report and Order in PP Docket No. 93-253, we concluded that it was premature to authorize competitive bidding for AVM systems during the pendency of PR Docket No. 93-61, because "the likelihood of mutually exclusive applications" was unknown or was debated by the commenters.¹³⁴ However, in light of our decision to grant exclusive multilateration LMS licenses within three sub-bands, and because they will be used to offer for-profit, subscriber-based services, we conclude that competitive bidding should be used to grant exclusive licenses where mutually exclusive applications are accepted for filing. Use of competitive bidding in such cases meets the general statutory criteria for auctioning licenses set forth in Section 309(j)(2) of the Act.¹³⁵ The statute permits auctions where: (1) mutually exclusive applications for initial licenses or construction permits are accepted for filing by the Commission; (2) the principal use of the spectrum will involve, or is reasonably likely to involve, the receipt by the licensee of compensation from subscribers in return for enabling those subscribers to receive or transmit communications signals utilizing the licensed frequencies; and (3) the public interest objectives of Section 309(j) would be served by subjecting mutually-exclusive applications in the service to competitive bidding."

55. We conclude that the above requirements are satisfied, thus making competitive bidding available for licensing within certain band segments. First, in accordance with the statute, the licensing scheme we adopt herein allows for mutual exclusivity among applicants for initial licenses. Specifically, we have rejected the option of allowing multilateration LMS

¹³³ Several commenters to that proceeding oppose grant of non-multilateration licenses by competitive bidding. See, e.g., Comments of Hughes Transportation Management, Interagency Group and Amtech.

¹³⁴ See Second Report and Order, PP Docket No. 93-253, 9 FCC Rcd 2348, 2351-2, (1994).

¹³⁵ See 47 U.S.C. § 309(j)(2). See also H.R. Rep. 111, 103d Cong. 1st Sess. 254 (1993).

¹³⁶ A comprehensive discussion of these principles for determining whether licenses may be auctioned is set forth in the Second Report and Order in PP Docket No. 93-253, 9 FCC Rcd 2398 (1994) at paras. 11-67.

systems to operate in an unlimited shared use environment and have instead decided to grant only one licensee the use of each of three sub-bands for multilateration LMS in each MTA. (see paragraphs 4446, **Wera**) do not believe that the likely existence of some grandfathered AVM multilateration operations alters this conclusion. See **para. 61, infra**. **Because** no more than one multilateration licensee will be permitted in any single sub-band in an MTA (hereinafter “MTA licensee”), we anticipate that mutually exclusive applications will be filed. We also conclude that the use of the spectrum by other services does not preclude the applicability of the competitive bidding process. Shared spectrum for which we exclude competitive bidding is “where mutual exclusivity between applications cannot exist because channels must be shared by multiple licensees. . . . [W]e proposed to exclude these services from competitive bidding because there can be no mutual exclusivity.”¹³⁷ That is not the case here, where in all likelihood there will be mutually exclusive applications for each exclusive MTA license. The relevant statutory prerequisite, as set forth in Section 309(j) of the Budget Act, is that “mutually exclusive applications are accepted for filing.” This standard does not require that the relevant spectrum be completely unoccupied by other services.

56. Second, as the statute requires, the “principal use” of the spectrum is reasonably likely to involve MTA licensees receiving compensation from subscribers in return for those subscribers receiving or transmitting signals. We have concluded that this requirement allows us to evaluate classes of licenses, rather than individual licenses, in determining the “principal use” of spectrum.¹³⁸ Thus, while MTA licensees may be secondary in the band to government and ISM operations, the “principal use” test, as we have interpreted it, permits us to conclude that the principal uses of multilateration LMS are **primarily** subscriber-based offerings.¹³⁹

57. In addition, we believe that use of a competitive bidding procedure for the licensing of these services satisfies the public interest objectives for auctioning set forth in Section **309(j)(3)** of the Act. Specifically, use of competitive bidding to award MTA licenses, as compared to other licensing methods, will speed the development and deployment of new services to the public with minimal **administrative** or judicial delays, and encourages efficient use of the spectrum as **required** by Section 309(j)(A) and **(D)**. Furthermore, in accordance with Section **309(j)(3)(B)**, we believe that competitive bidding will promote access to multilateration services and technologies and **disseminate** licenses among a wide variety of applicants by encouraging participation by all interested or qualified bidders. Finally, we conclude that competitive bidding will recover for the public a portion of the value of the

¹³⁷ **In** the Matter of Implementation of Section **309(j)** of the **Communications Act – Competitive Bidding**, Second Report and Order, PP **Docket** No. **93-253**, 9 **FCC Rcd** 2348 at **para. 13** (1994).

¹³⁸ **See** Second Report and Order in PP Docket N. 93-253, FCC **94-61**, 9 **FCC Rcd** 2348 at **para. 34** (1994).

¹³⁹ Comments of Pinpoint at 5; Comments of SBMS at 4.

spectrum, as envisioned in Section 309@ (3)(C). Specific rules and procedures for competitive bidding for **this** spectrum, including rules and **procedures** for designated entities, will be established in a separate proceeding. We will not accept applications for multilateration LMS licenses until after these rules and **procedures** have been established.

H. Construction Period for LMS Systems

58. In the Notice, we proposed that LMS systems be constructed and placed in operation within eight months of the date a license is granted, which is the current **standard** for **AVM** licensees under Part 90.¹⁴⁰ The majority of **commenters** that addressed this issue support our proposal so long as provision is made for extended implementation periods for local governments or especially large and complex **systems**.¹⁴¹ **MobileVision** supports a five-year construction period with **construction benchmarks** for multilateration systems but states that eight months is appropriate for non-multilateration **systems**.¹⁴² **SBMS** supports a **12-month construction period**.¹⁴³

59. Most non-multilateration installations use relatively few transmitters in a limited number of locations. Accordingly, we shall retain the **current requirement** that these systems be constructed and placed in operation within eight months. We will consider a **non-multilateration LMS system** to be **constructed** and placed in operation if at least one base station has been constructed **and** the system is providing **service** to at least one mobile radio unit. As they may do currently, a local government entity **requiring** more than eight **months** to construct a non-multilateration LMS system because of the system's size and complexity can request **extended** implementation in accordance with Section 90.155(b) of our Rules.

60. We recognize that multilateration LMS systems, because they will be licensed on an MTA basis, will likely be larger and more complex than non-multilateration **LMS** systems. Rather than imposing benchmarks and reporting **requirements** on these systems for all or part of their license term, we will require a multilateration LMS licensee authorized to operate throughout an **MTA** to construct a **sufficient** number of base stations that utilize multilateration technology to provide multilateration location service to a **substantial** portion of at least one BTA in that MTA within twelve months after initial **authorization**.¹⁴⁴ LMS

¹⁴⁰ Notice at para. 26, 8 FCC Rcd. 2502, 2507 (1993). See 47 C.F.R. § 90.155.

¹⁴¹ **Hughes comments** at 15; **Amtech comments** at 35-36; **Mark IV comments** at 14; **IVHS America comments** at 19; **Interagency Group comments** at 10.

¹⁴² **MobileVision comments** at 46-49.

¹⁴³ **SBMS comments** at 22.

¹⁴⁴ **This requirement is comparable to the substantial service requirement for 10 MHz PCS licensees** set forth in Memorandum Opinion and Order, GEN Docket No. 90-314, 9 FCC Rcd 5108,

systems not constructed and placed in operation in a timely fashion (i.e., within 8 months for non-multilateration systems and within twelve months, as described above, for multilateration systems) will cancel automatically.

I. Grandfathering Provisions for Existing Multilateration AVM Licensees

61. As of February 3, 1995, we will no longer accept applications for the operation of multilateration LMS systems in the 904-912 and 918-926 MHz bands under our current rules. To ensure that our new licensing scheme does not impose undue hardship on existing, operating multilateration AVM systems, we will adopt certain grandfathering provisions which will allow them to continue to operate their systems under the current rules. We **will** also confer grandfathering provisions on multilateration AVM licensees who have not yet **constructed** their systems so that such licensees may construct and operate their licensed stations **under** our newly adopted rules.

62. A grandfathered multilateration AVM station will be considered constructed and placed in operation if it is built in accordance with its authorized parameters and is regularly interacting with one or more other stations to provide location service, using multilateration technology, to one or more mobile units. See 47 C.F.R. § 90.155. Specifically, LMS multilateration stations will only be considered **constructed** and placed in operation if they are part of a system that can interrogate a mobile, receive the response at 3 or more **sites**, compute the location from the time of arrival of the responses and transmit the location either back to the mobile or to a subscriber's **fixed** site. A grandfathered **multilateration** AVM station will receive no protection or exclusivity based upon mileage separation or service area criteria, but instead **will** operate on a **co-equal** shared basis with stations of any other grandfathered licensee or the exclusive MTA licensee operating in the same sub-band. We have concluded that sharing of **spectrum** among **unlimited** numbers of **multilateration** licensees is not technically feasible (see paragraph 44, supra), and thus we have not adopted rules that would permit the sharing of **spectrum** among multiple multilateration systems over an entire **MTA**. However, given the very small number of multilateration licensees **currently** authorized, in any given MTA **there will ultimately be, at most, one** or two **grandfathered licensees operating in the same spectrum as the eventual MTA licensee**. In such limited cases, we expect cooperative arrangements for sharing among these licensees to be reached. Where this is not possible or achieved, MTA licensees may build their systems in areas geographically removed **from** grandfathered stations, or may attempt to acquire existing systems from the **grandfathered** licensee(s) in their licensed area.

63. To attain grandfathered status, existing multilateration AVM licensees must **Ne**, within thirty days of the effective date of the rules adopted in this **&port and Order**, applications to **modify** their licenses to comply with the new band plan. These applications to modify must identify which new sub-band or sub-bands (i.e., Band B and H, Band D and

¶ 155 (1994).

G, or Band E and **F**) they intend to operate their licensed **multilateration** AVM stations in, once their applications to modify have been authorized. We will not restrict multilateration AVM licensees to selecting a particular sub-band or sub-bands for their modified **authorization**, but will permit these licensees to choose the spectrum band(s) -- not to exceed a total of 8 **MHz** -- that best meets with their future LMS requirements. The application to modify a license to comply with the new band plan may also include a **modification** to specify an alternate site, so long as the alternate site is 2 kilometers or less from the site specified in the original license.¹⁴⁵ Further, at the time that existing multilateration AVM licensees **file** these applications to **modify**, they **must** certify that either (1) their multilateration AVM system has been constructed and is operational as of February 3, 1995, or (2) that it is not constructed at that time. Multilateration AVM systems that **are** constructed and operational as described above will be given until April 1, 1998 to convert to the spectrum identified in their modified LMS system license. Such licensees may continue to operate their multilateration AVM systems under either the old rules or the new rules during the process of converting their systems during this period. Licensees of constructed and operational multilateration AVM systems that do not file applications to modify within this **30-day** period will be permitted to continue operations under the provisions of Section 90.239 **until** April 1, 1998 or the end of their original license term, whichever occurs first, at which time such licenses will cancel automatically and will not be renewed.

64. Multilateration AVM licensees for stations not constructed as of February 3, 1995 must construct and operate their modified LMS systems on the spectrum identified in their modified LMS system license by April 1, 1996. These licensees will not be allotted the lengthy transition period that licensees of constructed and operational systems are provided (i.e., until April 1, 1998) because they do not have an existing, operating **infrastructure** that will require this additional time for conversion. Licenses for stations not constructed under the old rules as of February 3, 1995 will terminate 30 days after the effective date of the new rules unless timely applications to **modify** are filed. Parties may file applications to modify those licenses that they plan to construct by April 1, 1996.¹⁴⁶ We have provided a transition period that we believe is appropriate for construction and operation for current licensees to attain grandfathered status. Because this spectrum will be subject to competitive bidding, we must balance our wish to accommodate the desired construction schedules of existing multilateration AVM licensees against the need for prospective bidders to be able to evaluate the likely **value** of the spectrum upon which they will be bidding.

¹⁴⁵ See **generally** Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory **Treatment** of Mobile Services, GN **Docket** No. 93-252, PR Docket No. 93-144, PR Docket No. 89-553, **Third** Report and Order, FCC 94-212, released Sept. 23, 1994, at **para.** 356.

¹⁴⁶ We note that **Airtouch** and Mobilevision have offered to limit the number of licenses they construct to 20 percent of the unbuilt licenses they hold. While we are not adopting this 20 percent limit, we expect all licensees to file modification applications only for those **unbuilt** licenses that realistically can be constructed by April 1, 1996. If the number of modification **applications** submitted **significantly** varies **from** the number built, we will consider appropriate measures.

J. Licensing of Non-Multilateration Systems

65. We proposed that non-multilateration systems be licensed in the **902-904**, 912-918, and 926-928 MHz bands.¹⁴⁷ Mark IV believes that 6 MHz of contiguous spectrum at 912-918 MHz is sufficient for its type of system.¹⁴⁸ MFS Network Technologies/Texas Instruments recommend 12 or 14 MHz of contiguous spectrum for non-multilateration systems, but indicate that 10 MHz may be **sufficient**.¹⁴⁹ **Amtech** states that a minimum of 12 MHz of contiguous spectrum is required for non-multilateration systems, because these **systems need 6 MHz** wide channels and two such channels are necessary for high-speed operation at most toll booth locations.”

66. We also proposed that non-multilateration systems be licensed on a shared basis with licensees responsible for coordinating use to avoid **interference**.¹⁵¹ Lockheed proposes licensing of non-multilateration systems based on a fixed mileage **separation**.¹⁵² Mark IV supports the use of frequency coordinators to coordinate the assignment of **spectrum**.¹⁵³ **NABER** proposes that it be designated as the frequency coordinator for non-multilateration **LMS systems**.¹⁵⁴ We are adopting our proposal to license non-multi&ration LMS systems on a shared basis because these systems generally cover relatively short distances, and licensing based on a **fixed** mileage separation would limit **re-use** of spectrum and thereby limit the potential uses of these systems. We also decline to designate a frequency coordinator for this service. Many non-multilateration licenses have been issued and many stations have been placed in operation without such a formal coordination process and there appear to be no negative consequences. Considering the limited coverage of these systems and the expanded amount of **spectrum** available under the allocation plan we have adopted, it should not be difficult for non-multilateration systems to share their sub-bands.

¹⁴⁷ Notice at **para. 25**, 8 FCC **Rcd. 2502, 2507** (1993).

¹⁴⁸ Comments of Mark IV M-IS Division dated June 29, 1993, at 8.

¹⁴⁹ Ex **Parte Comments** of MFS Network **Technologies/Texas Instruments** dated August 12, 1994.

¹⁵⁰ Ex Parte Comments of **Amtech** dated August 12, 1994.

¹⁵¹ Notice at **para. 25**, 8 FCC **Rcd. 2502, 2507** (1993).

¹⁵² Lockheed comments at 4. Mark IV supported a **fixed milage** separation in its comments but modified its support in reply comments. Mark IV comments at 8-9, reply comments at 8.

¹⁵³ Mark IV reply **comments** 8-10.

¹⁵⁴ NABER comments at 6-7.

67. The **Interagency** Group, with the support of Mark IV, proposes that local governments be able to obtain blanket licenses for non-multilateration **systems**.¹⁵⁵ We decline to adopt a blanket licensing scheme for non-multilateration systems. In a shared use environment, it is important that applicants and other co-channel users **know** exactly where systems are located if they are to avoid interference. If we issue blanket licenses, it will be difficult for the Commission or the public to ascertain the exact location of LMS transmitters.

68. Finally, we proposed that existing non-multilateration systems licensed to operate in spectrum allocated for use by multilateration systems be **required** to move their operations within three years of the effective date of any new **rules**.¹⁵⁶ SBMS and Location Services support this proposal.¹⁵⁷ Both Teletrac and **Amtech** favor grandfathering existing **non-multilateration** systems, although Teletrac would only do so for systems licensed prior to the initiation of this **proceeding**.¹⁵⁸

69. **As** discussed earlier, we have modified our proposal to provide for shared use of the 902.000-904.000 and **909.750-921.750** MHz bands by non-multilateration LMS systems, thus allocating a total of 14 MHz that will be available for non-multilateration operations. Although a non-multilateration licensee could be **required** to share 2 MHz of this **spectrum** (at **919.750-921.750** MHz) with an MTA multilateration licensee, we believe that the benefit to those non-multilateration systems **requiring** a minimum of 12 MHz of contiguous **spectrum to operate** remains **substantial** and warrants this overlap.

70. In addition, because we have concluded that sharing between multilateration and non-multilateration systems is generally inadvisable (see paragraph 46, **supra**), we are **requiring** that licenses for non-multilateration systems in spectrum other than the 902.000-904.000 and **909.750-921.750** MHz bands must be modified by April 1, 1998, to specify operation solely in those bands and to operate **consistent** with the rules we are adopting by this **Report and Order**. This is consistent with our decision to require multilateration systems to relocate their operations within the same time period. Similarly, authorizations not so modified within this period will cancel automatically.

¹⁵⁵ Comments of Interagency Group at 12; Reply Comments of Mark IV at 6-8.

¹⁵⁶ **Notice** at para. 16, 8 FCC Rcd. (1993).

¹⁵⁷ **SBMS** comments at 12; **Location Services** at 5.

¹⁵⁸ **Teletrac** comments at 22-23; **Amtech** comments at 36-38.

K. Multilateration System Operations

71. From review of the lengthy record in this proceeding, we have determined that multilateration systems have two distinct methods of operation. One type of **multilateration** system utilizes a low power, **wideband** location pulse originating from the mobile units and a high powered, narrowband interrogation and control signal emanating from the fixed/base stations. These systems also utilize **narrowband** transmissions, **within** the band that is used for the location pulse, for two-way voice and data communications between fixed/base stations and mobile units. Another kind of multilateration system operates in a **different** manner, utilizing **wideband transmissions** for: the location pulse from the mobiles, the interrogation and control signal from the fixed/base stations and the two-way messaging between the fixed/base stations and the mobile units. As we understand these two types of multilateration systems, there are three basic elements used to accomplish location and monitoring functions: forward link, reverse links and communication links. Forward links originate at the **fixed/base** site and are used to control and interrogate mobile units. In contrast, reverse links are signals transmitted from **the** mobile units or **fixed** station **to fixed/base** stations to determine the location of the mobiles or from fixed stations to other **fixed/base** stations for system synchronization and testing purposes. Communication links **connect** fixed/base stations and mobile units and are utilized for two-way messaging related to the location or monitoring functions of the system. In addition, multilateration systems use these three basic elements either in what we will refer to as the “narrowband” or the “broadband” portion of the **LMS** band. The narrowband portion we will **define** as the 250 **kHz** sub-bands (i.e., the sub-bands **927.250-927.500**, **927.500-927.750** and **927.750-928.000** MHz) and we will define the broadband portion as the **sub-bands** 904.000-909.750, 919.750-921.750 and **921.750-927.250** MHz. Each of the three basic elements are **discussed** below in accordance with their location in the narrowband or broadband portion of the LMS band, along with how they are considered in our overall regulation of multilateration systems.

Narrowband Segment

a) Narrowband Forward Links

72. In the **Notice**, we observed that many multilateration systems are designed using forward **links** to contact units to be located.¹⁵⁹ Consistent with existing systems, we proposed that multilateration licensees authorized to operate in the 904-912 **MHz** sub-band be licensed to operate their forward links in the 250 **kHz** of **spectrum** between 924.890 and 925.140 MHz and that multilateration licensees authorized to operate in the **918-926 MHz** sub-band be licensed to operate their forward links in the 250 **kHz** of **spectrum** between 904.375 and 904.625 **MHz**.¹⁶⁰

¹⁵⁹ **Notice** at **para.** 19, 8 FCC **Rcd** 2502, 2405 (1993).

¹⁶⁰ **Notice** at **para.** 19, 8 FCC **Rcd** 2502.2505 (1993).

73. Teletrac is the only **commenter** that supports the proposed location of the forward links, claiming that it will be adversely affected otherwise because its systems now employ forward links in the manner proposed in the **Notice**.¹⁶¹ **MobileVision** favors placing the forward links within a licensee's authorized sub-band rather than in the other multilateration **LMS** sub-band as proposed.¹⁶² Location Services proposes keeping the forward links in the opposite sub-band but would move the links to the edges of each **sub-band**.¹⁶³ SBMS prefers that the forward links be placed as far from **wideband** frequencies as practical and assigned exclusively.¹⁶⁴ Pinpoint prefers a **wideband** forward link that operates over an entire multilateration system sub-band.¹⁶⁵ **Amtech** recommends placement of the forward links at the edges of the **902-928** MHz band or make licensees use alternative spectrum for forward links, such as common carrier or private carrier paging **spectrum**.¹⁶⁶ Symbol, **ITRON** and **TIA** urge that multilateration LMS forward links be placed at the upper edge of the **902-928** MHz band if Part 15 devices are to be **accommodated**.¹⁶⁷ Other Part 15 commenters expressed fear of being "drowned out" by high powered forward links, particularly **wideband** forward **links**.¹⁶⁸

74. Although there is no identification of forward links in our current rules, we will define a forward link as any signal transmitted **to** a mobile unit to be located by a multilateration LMS system.¹⁶⁹ We will also dedicate a portion of spectrum in the **902-928** MHz band where narrowband forward links may be used by the multilateration systems that require them for their operations. Thus, in accordance with our band plan for multilateration systems, multilateration licensees will be authorized to use only the following spectrum for **narrowband** forward links:

The **904.000-909.750** MHz band narrowband forward link is **927.750-928.000** MHz
The **919.750-921.750** MHz band narrowband forward link is **927.500-927.750** MHz

¹⁶¹ Teletrac Comments at 51, Reply Comments at 33-35.

¹⁶² **MobileVision** Comments at 43-44.

¹⁶³ Location Services Comments at 5-6.

¹⁶⁴ Ex Parte Comments of SBMS, dated August 12, 1994.

¹⁶⁵ Ex Parte Comments of Pinpoint dated September 19, 1994, Ex Parte Comments of Pinpoint dated September 15, 1994.

¹⁶⁶ **Amtech** Comments at 31-32.

¹⁶⁷ **Further Comments** of **ITRON**, Symbol and **TIA** dated August 12, 1994.

¹⁶⁸ **See Itron** comments, dated August 12, 1994.

¹⁶⁹ **See** Section 90.7 of our rules.

The **921.750-927.250** MHz band narrowband forward link is 927250427.500 MHz

The placement of narrowband forward links at the upper edge of the **902** to **928 MHz** band meets the requirements of the majority of the multilateration industry and also accommodates the needs of Part 15 **interests**.¹⁷⁰ We have provided the flexibility requested by these various commenters, with two of the narrowband forward links placed in spectrum apart from the licensee's multilateration sub-band (e.g., the 927.50X7.75 and **927.75-928** MHz forward links) and the third forward link (**927.25-927.50** MHz) placed adjacent to its related multilateration sub-band.

75. Based upon comments from entities that employ narrowband forward links, we believe that **250 kHz** for each multilateration system is a suitable amount of spectrum for narrowband forward **links**.¹⁷¹ Furthermore, because narrowband forward link **transmissions will** be situated in the uppermost portion of the **902-928 MHz** band -- and thus somewhat removed from the operations of other licensed and unlicensed services in the band -- a relatively greater power level for this use should be permitted. We therefore will allow narrowband forward links to operate with a maximum power of 300 watts **ERP**.

Broadband Segment

a) **Wideband Forward Links**

76. Pinpoint and Uniplex have expressed interest in employing a **wideband** forward link, which, like the narrowband **forward** link, would be used to communicate with mobile units. However, unlike the narrowband forward link, a **wideband** forward link would operate over a multilateration system's entire authorized **sub-band**.¹⁷² Part 15 users uniformly oppose this request on the grounds that such **transmissions** are likely to cause interference to Part 15 devices. **Itron**, for example, points out that the high powered **wideband** forward link could adversely affect the operations of Part 15 devices because it would "present an essentially constant signal at any particular geographic **location**."¹⁷³ Pinpoint, however, asserts that its

¹⁷⁰ Ex Parte Comments of **Teletrac** dated August 12, 1994; **Mobilevision Comments** at 4344; **Location Services Comments** at 5-6; Ex Parte **Comments** of Southwestern Bell dated August 12, 1994; **Amtech** Comments at 31-32; Further **Comments** of **ITRON**, Symbol and TIA dated August 12, 1994.

¹⁷¹ Ex Parte Comments of SBMS dated August 12, 1994, Ex Parte Comments of **Teletrac** dated August 12, 1994, Ex Parte **Comments** of **MobileVision** dated August 12, 1994.

¹⁷² **Ex Parte Comments** of Pinpoint dated September 19, 1994, Ex **Parte** Comments of **Uniplex** dated September 30, 1994.

¹⁷³ See e.g., Ex Park Comments of **ITRON** Inc. at p. 3, dated August 12, 1994 and Symbol Technologies, dated August 12, 1994.

system, which is based on the use of the **wideband** forward link, would pose far less of an interference threat to users of the **902-928** MHz band than that caused by a certain, currently deployed Part 15 data distribution system.¹⁷⁴ We will permit the authorization of **wideband** forward links, but note that multilateration operations are wnditioned on further testing as described in paragraphs 81-82, **infra**.

b) Reverse Links

77. As **discussed** above, a multilateration signal transmitted **to** the **fixed/base stations** will be referred to as a "reverse link" and is utilized by both types of multilateration systems. These signals are **contained within** the broadband segment of the multilateration allotment and are primarily location pulses originating **from** mobile units **and** used for determination of the position of mobile units. Such **transmissions** may also originate from other **fixed/base** stations for the purpose of system synchronization or testing. **These transmissions** are likely to occur less **frequently** and more randomly than the above-mentioned forward links and are therefore less likely to cause interference to Part 15 operations. However, as pointed out by one wmmenter, reverse link **transmissions could** present significant problems to Part 15 operations depending on the power levels, duty cycles and density of mobile **units**.¹⁷⁵ Reverse links are an essential part of any multilateration LMS system and therefore must be accommodated. However, in order to limit the potential for interference from such **transmissions**, we will limit the **maximum** power level of reverse links to 30 watts ERP. This is a sufficient amount of power to enable mobile units to provide an adequate signal to fixed sites for location, synchronization **and** testing purposes.

c) Communication Links

78. As noted by multilateration service **providers**,¹⁷⁶ there is an additional **transmission** that multilateration systems **utilize** for two-way messaging that we will refer to as a "**communication** link." The communication link emanates from the **fixed/base** stations and mobile units ancillary to the location and monitoring function of the multilateration system and provides status and **instructional** information relating to the vehicle being located or the **occupant(s)** of the vehicle. Additionally, these links may be interconnected with the PSN to enable **emergency communications**.¹⁷⁷ Moreover, the method of **transmission** of the communication link differs between **multilateration** systems, the differences centering on the

¹⁷⁴ **See comments** filed by **Pinpoint Communications, Inc.**, dated Septunber 19, 1994.

¹⁷⁵ **See letter from Metricom, Inc., Alarm Industry Communications** committee, **Electronic Industries Association, Itron, Inc., Part 15 Coalition, Sensormatic Electronics Corporation, Southern California Edison, and Telecommunications Industry Association.**, dated August 12, 1994.

¹⁷⁶ **See e.g., Ex Parte Comments** of **MobileVision** dated December 14, 1994, at 1-2.

¹⁷⁷ **See** paragraphs 26 **and** 27, **supra**.

size of the channel(s) **being** used.

i) **Narrowband Communication Links**

79. Narrowband communication links are used in certain multilateration systems to provide voice and data communications within the broadband portion of their allocation of **spectrum**. Additionally, the narrowband communication link differs from a **wideband** communication link in that it uses small (e.g., 25 **kHz**) channels to accomplish its messaging **functions**. These narrowband **transmissions** are a valuable asset and may enhance the economic viability and flexibility of these particular multilateration **systems**.¹⁷⁸ However, as we did for reverse links in order to limit their **interference** potential, we will also limit the maximum power of narrowband communication links to 30 watts ERP. This limitation encompasses communication links that originate at fixed/base stations as well as mobiles. Due to the fact that these **transmissions** should only occur sporadically or in the event of an emergency, we believe that this power level should serve to limit interference to Part 15 operations. However, we note that multilateration licenses are conditioned on additional testing as discussed in paragraphs 81-82.

ii) **Wideband Communication Links**

80. Certain multilateration systems use **wideband** communication links, integrated with accompanying **wideband** forward links, to provide messaging within the broadband segment. This **wideband** link differs from narrowband communication **links** because it transmits a direct sequence spread spectrum signal across the entire sub-band (e.g. all of the 904.000-909.750 MHz sub-band) instead of signals on small channels within the **sub-band**. Although these links are perceived to represent greater **interference** potential to Part 15 **devices**,¹⁷⁹ we **conclude** that these **wideband links** should be authorized. As noted earlier, however, **multilateration** system licenses are conditioned on additional testing as discussed in paragraphs 81-82.

Testing of _____ M u _____

81. **In comments, a number of parties to this proceeding have expressed the desire** and need for additional testing to demonstrate the feasibility of multiple services coexisting in the **902-928** MHz band, in particular the multilateration LMS users and the operators of Part 15 devices. Our record contains a **significant** amount of information on the issue of mutual coexistence between these parties, which was submitted in the form of theoretical analyses, **demonstrations and testing (See Appendix B)**. **This record shows that certain aspects and elements of these various systems and services create a greater potential for interference than**

¹⁷⁸ **See Ex Parte Comments** of Mobilevision dated December 14, 1994, at 5.

¹⁷⁹ **See e.g., Ex Parte Comments** of Cellnet and KNOGO dated August 19, 1994, at 4.

others.¹⁸⁰ The band plan adopted in this item was crafted on the basis of this extensive record. In addition, these submissions were used to establish technical limitations or criteria on the operations of the various systems, to **minimize** the potential for interference and provide a more **conducive** environment for sharing of the band by the disparate services.

82. The record of this proceed@ **contains substantial** technical analysis supporting the band plan we now adopt. We are persuaded, however, that additional testing **could** provide users of the band with data that **could** contribute to "fine-tuning" system operations. Therefore, to ensure that the coexistence of the various services in the band is as successful as possible and to identify whether further refinements in our rules are necessary, we will condition grant of each MTA **multilateration** license on the licensee's ability to demonstrate through actual field tests that their systems do not cause unacceptable levels of interference to Part 15 devices. To provide such protection and to facilitate band sharing and **minimize** interference to Part 15 operations, multilateration licensees may employ any one of a number of technical refinements, i.e., limiting duty cycle, pulse duration power, etc. It is our expectation that such testing be accomplished through close cooperation between multilateration systems users and operators of Part 15 systems.

L. LMS Below 512 MHz

83. In the Notice, we proposed that the expanded **definition** of LMS would apply to below 512 **MHz** systems, but that licensees of such systems would not be permitted to provide service to individuals or to provide service on a private carrier basis. NABER is the only commenter that addressed **LMS** operation below 512 MHz. NABER requests **clarification** of several points **pertaining** to these systems, including coordination **requirements** and co-channel separation **requirements** between **LMS** systems and **non-LMS** systems used for voice operations.¹⁸¹ NABER also notes that proposed Section **90.105(b)(3)(i)** discusses loading criteria for systems operating with single frequencies, **two-frequency** mode, and pairs of frequencies, but that Section **90.105(b)(3)(ii)** only discusses separation criteria for operations using single **frequencies** or two frequencies. NABER suggests that because the loading criteria are the same, we apply the same separation criteria for single **frequency** operations to operations using pairs of frequencies.

84. Section 90.175 of our Rules provides that applicants for frequencies below 512 **MHz** must generally obtain a frequency recommendation from a frequency coordinator. We

¹⁸⁰ Many of these submissions have focused on concerns regarding the use of **wideband** forward links for multi-**rate** systems, the **location** of such links in the band, and the appropriate power levels for both forward and reverse link **transmissions**.

¹⁸¹ NABER **comments**. NABER also requests clarification as to the effect our "**Refarming**" proceeding (PR Docket 92-235, Notice of Proposed Rule Making, 7 FCC Rcd 8105 (1992)) will have on LMS systems. No final action has yet been taken in the **Refarming proceeding**. **Ultimately**, LMS **systems** below 512 MHz will have to adhere to any decisions reached in that proceed&

conclude that LMS applicants should be subject to these same coordination requirements when applying for these frequencies. Accordingly, applicants for LMS systems below 512 MHz must meet the coordination requirement of Section 90.175(a) of our Rules, 47 C.F.R. § 90.175(a). Applicants will use the frequency coordinator for the radio service in which they have established their eligibility. We will also require LMS systems **authorized** below 512 **MHz** to modify their licenses under the same conditions as other land mobile licensees. This means that a modification application will have to be **filed** for changes in the number of base, **fixed**, control, or mobile transmitters.”

85. Section **90.105(b)(3)(i)** only discusses using pairs of frequencies in the 470-512 **MHz** band. Because these frequencies are only available within **80** km (50 miles) of 13 major urban areas, applying a 120 km (75 miles) separation between **non-LMS** voice systems and LMS systems would severely restrict LMS use of this **spectrum**. Pairs of frequencies in the 470-512 **MHz** band will be assigned in accordance with the allocation plan for the band as described in Subpart L, 47 C.F.R. Part 90, Subpart L, except that the 200 mobile unit loading criteria will apply and an LMS system will not be authorized to share a channel utilized by a non-LMS licensee operating a voice system unless an agreement with the licensee is reached. Accordingly, the **co-channel** separation between **LMS** systems and **co-channel non-LMS** voice systems in the 470-512 **MHz** band will be 64 km (40 miles), except on Channel 15 in Chicago, Channel 20 in Philadelphia, and Channel 17 in **Washington** where the minimum co-channel separation is 32 km (20 miles). See 47 C.F.R. § 90.313.

86. We also adopt our proposal to extend the definition of LMS to below-512 **MHz** systems. We are not, however, expanding uses of **LMS** systems below 512 **MHz** to provide service to individuals or to provide service on a commercial basis. Such **commercial** uses of **LMS** would be inconsistent with the nature of the spectrum below 512 **MHz**, which is intended primarily for the use of private land mobile radio (**PLMR**) communications to enable private land mobile eligibles to provide for their own internal communications needs. Moreover, the frequency bands below 512 **MHz** on which LMS systems are licensed are shared **PLMR frequencies**. Many of these channels are already unacceptably crowded. We are **currently** considering rule changes to **increase** channel capacity and promote more efficient use of **PLMS frequencies** below 512 **MHz**.¹⁸³ Permitting LMS systems authorized below 512 **MHz** to provide service on a commercial basis, or to provide service to individuals, would only exacerbate this **spectrum** congestion.

M. Technical Issues

87. In the **Notice**, we proposed a number of technical **requirements** for LMS systems to **minimize** the possibility of both **co-channel** and adjacent-channel interference and we proposed that equipment be type accepted to ensure compliance with these **standards**. The

¹⁸² See 47 C.F.R. § 90.135(a).

¹⁸³ See Notice of Proposed Rule Making, PR **Docket** No. 92-235, 7 **FCC Rcd** 8105 (1992).

following technical **criteria** will be applied to licensees of LMS systems. Our proposals, commenters' responses, and our decisions are discussed below.

88. Type Acceptance. We proposed that LMS equipment be required to be type accepted.¹⁸⁴ This proposal was supported by Teletrac, **MobileVision**, SBMS, Mark IV, and Location **Services**.¹⁸⁵ Teletrac proposes that we require the equipment to be authorized through the notification process one-year **from** the adoption date of this **Report and Order** while SBMS suggests type acceptance after **18-months**.¹⁸⁶ Location **Services** suggests that licensees be permitted to operate new equipment on a wmmmercial basis for 18 months before such equipment must be type accepted.¹⁸⁷ We are adopting our proposal to require type acceptance. We decline to adopt Teletrac's proposal that we only require equipment **"notification."**¹⁸⁸ Considering the mobile nature of most LMS transmitters and that new, advanced technologies will be employed in this equipment, we find that the **stricter** regulatory oversight of having equipment type accepted rather than "notified" is justified. Accordingly, all LMS equipment imported or marketed after April **1, 1996**, must be type accepted for use under Part **90** of our Rules, 47 C.F.R. Part 90. This **includes** the "transmitting tags" used in certain **non-multilateration** systems. If, however, these units meet the requirements of Part 15 of our Rules, 47 C.F.R. Part **15**, they may be authorized under that Part. **By** delaying the requirement for type acceptance, we effectively adopt Location Services' proposal for a grace period in which to operate **LMS** equipment without authorization, albeit for a lesser period than 18 months. As **discussed** in the **Notice**,¹⁸⁹ licensees still in the developmental stages that do not wish to seek type acceptance may be licensed on a developmental basis in accordance with Subpart Q of Part **90**.¹⁹⁰

89. Emissions. We proposed that no restriction be placed on the type of emission that may be authorized for LMS operation in the 902-928 MHz **band**.¹⁹¹ **MobileVision and**

¹⁸⁴ **Notice** at **para. 29, 8 FCC Rcd 2502, 2507** (1993).

¹⁸⁵ Teletrac wmmments at 48; **MobileVision** wmmments at SO; SBMS wmmments 23; Mark **IV** wmmments at 13; and Location Services wmmments at 3.

¹⁸⁶ Teletrac wmmments at 48; SBMS **comments** at 23.

¹⁸⁷ Location Services comments at 3.

¹⁸⁸ Teletrac wmmments at 48.

¹⁸⁹ **Notice** at **para. 29, 8 FCC Rcd. 2502, 2507** (1993).

¹⁹⁰ 47 C.F.R. Part 90 Subpart Q.

¹⁹¹ **Notice** at **para. 30, 8 FCC Rcd 2502, 2507** (1993). **See** Section 2.201 of **the Rules**, 47 C.F.R. § 2.201, for a description of emission designators.

SBMS support this proposal.¹⁹² Teletrac supports this proposal only if multilateration systems are required to be physically **separated**.¹⁹³ Teletrac claims that, in the absence of geographic separation, stricter limits on emissions are **required** to prevent interference between **multilateration systems**.¹⁹⁴ We are adopting our proposal to place no limits on the type of emission that can be authorized for LMS systems. Allowing any types of emissions **will** enable any type of location or monitoring technology or ancillary service to develop without restrictions. We will limit the likelihood of **interference** through appropriate power, frequency tolerance and emission mask limitations. Moreover, exclusive licensing of multilateration systems in **MTAs** in each of the three respective sub bands should ameliorate **concerns** of co-channel **multilateration** LMS interference.

90. Bandwidth. We proposed to limit the bandwidth of **LMS** systems as follows:

for 904-912 and **918-926** MHz -- maximum 8 **MHz**
for **902-904** and **926-928** MHz -- maximum 2 **MHz**
for 912-918 MHz -- maximum 6 **MHz**¹⁹⁵

MobileVision supports the maximum bandwidths proposed while Pinpoint opposes limiting the maximum permissible bandwidth within the **902-928** MHz **band**.¹⁹⁶ In accordance with the band plan we have adopted, we are adopting maximum permissible bandwidths as follows:

For **Multilateration** systems:

for 904.000-909.750 MHz -- maximum 5.750 MHz
for **919.750-921.750** MHz -- maximum 2.000 **MHz**
for 921.750-927.300 **MHz** -- maximum 5.750 **MHz**¹⁹⁷
for **919.750-927.750** MHz -- maximum 8.000 **MHz**¹⁹⁸

¹⁹² **MobileVision** comments at 50; **SBMS** comments at 24.

¹⁹³ **Teletrac** comments at 49.

¹⁹⁴ **Id.**

¹⁹⁵ **Notice** at para. 30, 8 **FCC Rcd.** 2502, 2507 (1993).

¹⁹⁶ **MobileVision** Comments at 49; **Pinpoint** Comments at 23-26.

¹⁹⁷ **This includes** 5.5 **MHz multilateration** bandwidth and adjoining, associated 0.25 **MHz** forward link.

¹⁹⁸ This **bandwidth** capability only exists for **licensees** aggregating the ad.. 2 **MHz** and 5.5 **MHz multilateration** bands and **includes** the adjoining, associated forward link **bands**.

For Narrow Band Links:

for **927.250-927.500** MHz -- maximum 250 **kHz**
for **927.500-927.750** MHz -- maximum 250 **kHz**
for **927.750-928.000** MHz -- maximum 250 **kHz**

For Non-multilateration systems:

for 902.000-904.000 MHz -- maximum 2.000 **MHz**
for **909.750-921.750** MHz -- maximum 12.000 **MHz**

While we establish these maximum permissible bandwidths, applicants for non-multilateration LMS systems should request only the minimum amount of bandwidth necessary to meet their operational needs.

91. Frequency Tolerance. We proposed a frequency tolerance for transmitters in the 904-912 and 918-926 **MHz** bands of 0.0005 percent and proposed that no minimum **frequency tolerance** be established for transmitters in the **902-904**, 912-918, and 926-928 **MHz bands**.¹⁹⁹ The frequency tolerance for these systems would be specified on the station's authorization. **MobileVision**, SBMS, Mark TV, and Hughes support the proposed **frequency tolerance** of 0.0005 percent for multilateration systems and support having no specific **frequency tolerance** for non-multilateration systems.²⁰⁰ Teletrac argues that tighter frequency tolerances are required and recommends a tolerance of 0.00025 percent for both multilateration **and** non-multilateration **systems**.²⁰¹ We agree with Teletrac that tighter frequency tolerances **are** justified to help reduce the **potential** for interference to systems operating on adjacent **frequencies** and that this argument **extends** to non-multilateration as well as multilateration systems. Additionally, as Teletrac points out, the **frequency tolerance it has proposed is more liberal than that required for other services in the 900 MHz band**. Accordingly, we are adopting a frequency tolerance of 0.00025 percent for both multilateration and non-multilateration systems.

92. Effective Radiated Power. We proposed a maximum peak effective radiated power (**ERP**) for any **LMS** systems operating in the **902-928** **MHz** band of 300 **watts**.²⁰²

¹⁹⁹ **Notice** at **para. 30**, 8 **FCC Rcd. 2502, 2507** (1993).

²⁰⁰ **MobileVision** comments at 49; SBMS **comments** at 24; Mark **IV** **comments** at 13; Hughes comments at 13.

²⁰¹ Teletrac **comments** at 49.

²⁰² **Notice** at **para. 30**, 8 **FCC Rcd 2502, 2507** (1993). The current maximum power for multilateration systems is 1 **kW** peak envelope power (**PEP**) transmitter output **power**. **See** existing 47 C.F.R. § 90.239(e)(2)(i).

SBMS supports our proposed 300 watt peak **ERP**.²⁰³ **MobileVision** opposes any reduction in permissible power. AT&T and Hughes support a 30 watt ERP power limit for **non-multilateration** systems with 10 meter and 15 meter antenna height restrictions **respectively**.²⁰⁴ **Amtech** and Pinpoint support various power limits for different systems based a shared use of the entire **band**.²⁰⁵ Mark IV supports a field strength limit of 1 **mV/m** at 3000 meters with a maximum antenna height of 10 meters for non-multilateration systems rather than a limit on peak **ERP**.²⁰⁶

93. As discussed **earlier**,²⁰⁷ we will limit the maximum ERP of multilateration LMS system narrowband forward links, which operate between 927.250-928.000 MHz, to 300 watts. However, we will limit maximum power for **transmissions** of multilateration system base and mobile stations **outside** the **927.250-928.000** MHz sub-band to 30 watts maximum ERP. Limiting base and mobile stations' power levels will reduce the potential for interference between co-channel multilateration systems²⁰⁸ and **will** reduce the likelihood of interference to any other operations in the **902-928** MHz band. In addition, we are limiting the peak ERP of non-multilateration systems to 30 watts and limiting the antenna height above ground of these systems to 15 meters. Reducing the maximum power and antenna height of non-multilateration systems will allow non-multilateration systems to share spectrum more easily with other non-multilateration systems **and** with users of Part 15 **devices and will permit greater frequency reuse for these systems**.

94. currently, facilities authorized in the private radio services are categorically excluded from our rules **requiring** an environmental **assessment** to demonstrate that a facility complies with **standards concerning** human exposure to radiofrequency radiation. (**See Second Report and Order**, in Gen. Docket No. **79-144, 2 FCC Rcd** 2064 (1987); and **Erratum to FCC Rcd 2 526 (1987)** for **evaluating** the environmental effects of radiofrequency radiation, however, are **currently** under review in **ET** Docket No. 93-62 (**See Notice of Proposed Rule Making**, ET Docket No. **93-62, 8 FCC Rcd**, No. 93-62 (1993)). In that proceeding we note that some of the current categorical exclusions may be inconsistent with the **new guidelines** being **considered**. We wish to emphasize here that **LMS** systems will be **required** to **comply** with any **requirements** adopted in **ET Docket** No. 9342.

²⁰³ SBMS comments at 24.

²⁰⁴ AT&T **comments** at 7-8; Hughes **comments** at 7-9.

²⁰⁵ **Amtech** **comments** at 33-3s; Pinpoint **commas** at 31-34.

²⁰⁶ **Mark IV** **comments** at 13.

an **See** discussion of Forward Links, **paragraphs** 73-76.

²⁰⁸ We **contemplate** that this issue will have **significance** in **MTAs** where **exclusive** LMS licensees must co-exist with **grandfathered** LMS licensees.

95. **Interference Criteria for Co-Channel Multilateration Licensees.**

Exclusive MTA multilateration LMS licensees and co-channel grandfathered multilateration LMS licensees must not **interfere** with one another. Similarly, exclusive MTA multilateration **LMS** licensees must also ensure that they do not cause interference to exclusive co-channel **MTA licensees in adjacent MTAs**. To **help** reduce the likelihood for interference between adjacent MTA licensees, we will impose a 47 **dBuV/m** field strength limit at the MTA boundary on signals transmitted from the base stations of **MTA licensees**.²⁰⁹ If differences arise over whether interference has been caused, we will expect the particular licensees to cooperate with one another to resolve these disputes. Should the Commission have to become involved in any disagreements among licensees, we may employ a wide variety of tools to resolve such disputes.²¹⁰ These tools **could** include, but are not limited to, **requiring** use of a common controller or **mandating** a particular time sharing arrangement. If, however, we determine that an **LMS** licensee has not cooperated in developing a suitable **mechanism to minimize harmful** interference, or that a licensee's system design renders it **extraordinarily** sensitive to **interference**, we may authorize the other licensee to operate its LMS system regardless of **interference** caused to the **LMS** system that failed to cooperate or that has a system design highly susceptible to **interference**.

96. Emission Mask. We proposed that emissions anywhere within a licensee's authorized bandwidth not be **required** to be attenuated but that any emissions outside of the authorized bandwidth be attenuated by at least $55 + 10\log(P)$ **dB** where P is the highest emission (in watts) of the transmitter inside the authorized **bandwidth**.²¹¹ This requirement applies to both multilateration and non-multi&ration systems. We also requested comment on whether multilateration systems should be required to **distribute** power evenly throughout

²⁰⁹ We note that in adopting this 47 dBuV/m limit, we are not determining that this field strength will **necessarily** result in reliable service for all **multilateration** systems. It is merely a level that may not be exceeded by **MTA** licensees and **is** thus **established** for interference planning purposes only. (see **Second Report and Order, Amendment** of the Commission's Rules to Establish New Personal Communications Services, GEN Docket No. **90-314**, FCC **93-451**, released **October 22, 1993** at paragraph 177).

²¹⁰ Disputes over harmful interference (as descrii in **Section 90.173(b)** of our Rules) are typically resolved on a **case-by-case** basis. For these services, while absolute blocking of a licensee's **transmissions throughout a large region** would constitute the only clear-cut **case of** harmful interference (see Section 90.7 for definition of harmful **interference** under 47 C.F.R. Part **90**), it is Possible that **lesser degrees** of interference could **diminish** the **accuracy** or reliability of certain **multilateration systems in a** limited portion of a system's area of operation. The degree to which such lesser **amounts of interference** would be considered harmful cannot be **determined** in advance, and there can be no **guarantee** that licensees will be **unconditionally protected** from interference of this type. Because of these unique **characteristics** of multilateration systems, we decline to specify what will be considered to **constitute** harmful interference to such systems.

²¹¹ **Notice** at para. 30, 8 FCC **Rcd.** 2507 (1993).

their authorized **band**.²¹²

97. Mark IV M-IS was the only **commenter** that supports a requirement that power be evenly distributed across a licensee's authorized bandwidth. Both Mark IV **IVHS** and Teletrac believe that only emissions outside of the **902-928 MHz** band (rather than any emissions outside of a licensee's authorized bandwidth) should be attenuated by $55 + 10\log(P)$ **dB**. Mark IV **IVHS** would require that frequencies outside of the licensee's authorized bandwidth only be attenuated by $30 + 10\log(P)$ **dB**, while Teletrac would just require that 99 percent of the power be within the licensee's **authorized** bandwidth. **MobileVision** would require that spurious spread spectrum emission should not exceed $100 + 10\log P$ **dBW/Hz** and the level of any spurious discrete emission could not exceed $55 + 10\log P$ **dBW**. **SBMS** would merely require that the first side-lobe be **20 dB** below main lobe and each following side-lobe be progressively reduced by **10 dB** out to the third lobe. **Amtech** and Pinpoint provide recommendations for various power, height and emissions limits for different systems and supports establishment of robustness and sharing requirements.

98. We will require licensees to attenuate their emissions by $55 + 10\log(P)$ **dB** at the edges of the specified **LMS** subbands. The licensed **frequency** band edges for multilateration systems for which emissions must be attenuated are 904, 909.75, 919.75, 921.75, 927.50, **927.75 and 928 MHz**. If the 919.75-921.75 **and 921.75-927.25 MHz subbands** are aggregated by a single licensee, the emission mask limitations at the band edges at 921.75 and 927.50 **MHz** may be ignored. The licensed **frequency** band edges for non-multilateration systems for which emissions must be attenuated are 902, **904**, 909.75 and 921.75 MHz. These emission limitations will assure that multilateration and non-multi&ration systems will not interfere with each other and that operations below **902 MHz** and above **928 MHz** are protected.

IV. CONCLUSION

99. Given the plethora of diverse users that share the **902-928 MHz** band, this has been an especially difficult proceeding. While we strongly support and wish to encourage the continued development **and** deployment of an **LMS industry**, we also recognize the valuable services being provided by other users of this **spectrum**. We believe that the rules we have adopted herein fairly balance these diverse interests. While we have not been able to satisfy **all of the concerns** of **all** of the parties in this proceeding, we reviewed extensive **comments and replies to the Notice as well as a very large number of ex parte filings in this docket and serious** consideration was given to each position. Given the diverse and often mutually exclusive **interests** of the many parties that participated, our decisions were the best that could be achieved. The rules **will** allow for the continued growth of **LMS services and**

²¹² **Id.**

advance Congress' goal of developing an intelligent transportation system infrastructure. At the same time, we have attempted to ensure that other users of the band, including Amateur operators and users of Part 15 devices, will be able to co-exist with LMS.

100. We have taken the long-term beneficial action of creating the Transportation **Infrastructure** Radio Service. By creating this new **service** at this early date in ITS development, we will be able to take an organized approach to regulating spectrum and services related to ITS and transportation infrastructure in general.

V. FINAL REGULATORY FLEXIBILITY ANALYSIS

101. Pursuant to the Regulatory Flexibility Act of 1980, the Commission's final analysis is as follows:

Need and Purpose of the Action

102. The rules adopted herein will enhance use of the **902-928** MHz band for location and monitoring systems. These rules replace the existing interim rules that govern automatic vehicle monitoring systems. The new rules create a more stable environment for **LMS** system licensees and provides much needed flexibility for operators of such systems.

Issues Raised in Response to the Initial Regulatory Flexibility Analysis

103. **There** were no comments submitted in response to the Initial Regulatory Flexibility Analysis.

Significant Alternatives Considered and Rejected

104. All significant alternatives are **discussed** in this Report and Order.

VI. PAPERWORK REDUCTION

105. The proposal contained herein has been analyzed with respect to the Paperwork Reduction Act of 1980 and found to contain no new or modified form, information collection and/or record keeping, labeling, disclosure, or record retention requirements; and will not increase or decrease burden hours imposed on the public.

VI. ORDERING CLAUSES

106. Accordingly, IT IS ORDERED that, pursuant to the authority of Sections 4(i), 302, 303(r), and 332(a)(2) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 302, 303(r), and 332(a), Parts 2 and 90 of the Commission's Rules, 47 C.F.R. Parts 2 and 90, ARE AMENDED as set forth in Appendix A below, effective [thirty days after publication in the Federal Register].

107. The Petition for Rule Making filed on January 13, 1994 by the American Radio Relay League IS DENIED.

108. For further information concerning this Report and Order, contact Thomas S. Dombrowsky, Martin D. Liebman or John J. Rorkowski of the Wireless Telecommunications Bureau at (202) 418-0620.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

Appendix A

A. Part 2 of Chapter 1 of Title 47 of the Code of Federal Regulations is amended to read as follows:

PART 2 - FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

1. The authority citation for Part 2 continues to read as follows:

Authority: Sec. 4, 302, 303, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 154(i), 302, 303, 303(r), and 307, unless otherwise noted.

2. Section 2.106 is amended by adding "Private Land Mobile (90)" to the FCC use designators in the row for 902-928 MHz in the table and by revising footnotes US218 and US275 to read as follows:

§ 2.106 Table of Frequency Allocations

* * * * *

International table	United States table		FCC use designators	
* * *	Government	Non-Government	Rulepart(s)	Special-use frequencies
* * *	902-928 RADIOLOCATION	902-928	Private Land Mobile (90) Amateur (97)	915 ± 13 MHz Industrial, scientific, and medical frequency.
	707 US215 US218 US267 US275 G11 G59	707 US215 US218 US267 US275		

* * * * *

US218 The band 902-928 MHz is available for Location and Monitoring Service (LMS) systems subject to not causing harmful interference to the operation of all Government stations authorized in these bands. These systems must tolerate interference from the

operation of industrial, scientific, and medical (ISM) devices and the operation of Government stations authorized in these bands.

US275 The band 902-928 MHz is allocated on a secondary basis to the amateur service subject to not causing harmful interference to the operations of Government stations authorized in this band or to Location and Monitoring Service (LMS) systems. Stations in the Amateur service must tolerate any interference from the operations of industrial, scientific, and medical (ISM) devices, LMS systems, and the operations of Government stations authorized in this band. Further, the Amateur Service is prohibited in those portions of Texas and New Mexico bounded on the south by latitude 31°41' North, on the east by longitude 104°11' West, and on the north by latitude 34°30' North, and on the west by longitude 107°30' West; in addition, outside this area but within 150 miles of these boundaries of White Sands Missile Range the service is restricted to a maximum transmitter peak envelope power output of 50 watts.

* * * * *

B. Part 90 of Chapter 1 of Title 47 of the Code of Federal Regulations is amended to read as follows:

PART 90 - PRIVATE LAND MOBILE RADIO SERVICES

1. The authority citation for Part 90 continues to read as follows:

Authority: Secs. 4, 303, 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303, and 332, unless otherwise noted.

2. The Table of Contents for Part 90 is revised by amending Subpart M, adding new text and listings in this Subpart to read as follows:

* * * * *

Subpart M -- Transportation Infrastructure Radio Service

§ 90.350 Scope.

§ 90.351 Location and Monitoring Service.

§ 90.353 LMS Operations in the 902 - 928 MHz band.

§ 90.355 LMS Operations below 512 MHz.

§ 90.357 Frequencies for LMS systems in the 902 - 928 MHz band.

§ 90.359 Field Strength Limits for MTA-licensed LMS systems.

§ 90.361 Interference from Part 15 devices.

§ 90.363 Grandfathering provisions for existing AVM Licensees.

* * * * *

3. Section 90.7 is amended by removing the entry for Automatic Vehicle Monitoring and adding a new definition for Basic Trading Areas, Forward Links, Location and Monitoring Service (LMS), Major Trading Areas, Multilateration LMS System, and Non-multilateration LMS System in their proper alphabetical order to read as follows:

§ 90.7 Definitions.

* * * * *

Basic Trading Areas. Service areas that are based on the Rand McNally 1992 Commercial Atlas & Marketing Guide, 123rd Edition, at pages 38-39, with the following additions licensed separately as BTA-like areas: American Samoa; Guam; Northern Mariana Islands; Mayaguez/Aguadilla-Ponce, Puerto Rico; San Juan, Puerto Rico; and the United States Virgin Islands. The Mayaguez/Aguadilla-Ponce BTA-like service area consists of the following municipios: Adjuntas, Aguada, Aguadilla, Anasco, Arroyo, Cabo Rojo, Coamo, Guanica, Guayama, Guayanilla, Hormigueros, Isabela, Jayuya, Juana Diaz, Lajas, Las Marias, Maricao, Maunabo, Mayaguez, Moca, Patillas, Penuelas, Ponce, Quebradillas, Rincon, Sabana Grande, Salinas, San German, Santa Isabel, Villalba, and Yauco. The San Juan BTA-like service area consists of all other municipios in Puerto Rico.

* * * * *

Forward Links. Transmissions in the frequency bands specified in § 90.357(a) and used to control and interrogate the mobile units to be located by multilateration LMS systems.

* * * * *

Location and Monitoring Service (LMS). The use of non-voice signaling methods to locate or monitor mobile radio units. LMS systems may transmit and receive voice and non-voice status and instructional information related to such units.

* * * * *

Major Trading Areas. Service areas based on the Rand McNally 1992 Commercial Atlas & Marketing Guide, 123rd Edition, at pages 38-39, with the following exceptions and additions:

- (1) Alaska is separated from the Seattle MTA and is licensed separately.
- (2) Guam and the Northern Mariana Islands are licensed as a single MTA-like area.
- (3) Puerto Rico and the United States Virgin Islands are licensed as a single MTA-like area.

(4) American Samoa is licensed as a single MTA-like area.

* * * * *

Multilateration LMS System. A system that is designed to locate vehicles or other objects by measuring the difference of time of arrival, or difference in phase, of signals transmitted from a unit to a number of fixed points or from a number of fixed points to the unit to be located.

* * * * *

Non-multilateration LMS System. A system that employs any of a number of non-multilateration technologies to transmit information to and/or from vehicular units.

* * * * *

4. Section 90.101 is revised to read as follows:

§ 90.101 Scope.

The Radiolocation Service accommodates the use of radio methods for determination of direction, distance, speed, or position for purposes other than navigation. Rules as to eligibility for licensing, permissible communications, frequency available, and any special requirements are set forth in the following section. Provisions for the Location and Monitoring Service (LMS) are contained in Subpart M of this Part.

5. Section 90.103 is amended by removing paragraph (d) and by redesignating existing paragraph (e) as paragraph (d).

6. Section 90.155 is amended by revising paragraph (a) and adding new paragraph (d) and (e) to read as follows:

(a) All stations authorized under this part, except as provided in paragraphs (b) and (d) of this section and in §§ 90.629 and 90.631(f), must be placed in operation within eight (8) months from the date of grant or the authorization cancels automatically and must be returned to the Commission.

* * * * *

(d) Multilateration LMS systems authorized in accordance with § 90.353 must be constructed and placed in operation within twelve (12) months from the date of grant or the authorization cancels automatically and must be returned to the Commission. MTA-licensed multilateration LMS systems will be considered constructed and placed in operation if such systems construct a sufficient number of base stations that utilize multilateration technology

(see paragraph (e) of this Section) to provide multilateration location service to a substantial portion of at least one BTA in the MTA.

(e) An LMS station will be considered constructed and placed in operation if it is built in accordance with its authorized parameters and is regularly interacting with one or more other stations to provide location service, using multilateration technology, to one or more mobile units. Specifically, LMS multilateration stations will only be considered constructed and placed in operation if they are part of a system that can interrogate a mobile, receive the response at 3 or more sites, compute the location from the time of arrival of the responses and transmit the location either back to the mobile or to a subscriber's fixed site.

7. Section 90.179 is amended by revising paragraph (g) to read as follows:

§ 90.179 Shared use of radio stations.

* * * * *

(g) Above 800 MHz, shared use on a for-profit private carrier basis is permitted only by SMR, Private Carrier Paging, and LMS licensees. See Subparts M, P, and S of this Part.

8. Section 90.203 is amended by adding new paragraph (b)(7) to read as follows:

§ 90.203 Type acceptance required.

* * * * *

(b) * * *

(7) Transmitters imported and marketed prior to April 1, 1996 for use by LMS systems.

* * * * *

9. Section 90.205(b) is amended by adding the 902-927.25 and 927.25-928 MHz bands to the table and by adding footnote (13) to read as follows:

§ 90.205 Power.

* * * * *

(b) * * *

Frequency range (megahertz)	Maximum Output power (watts)	Maximum effective radiated power (watts)
* * * * *		
902-927.25	30 ⁽¹³⁾
927.25-928	300
* * * * *		

13 Effective radiated power shall be measured as peak envelope power.

* * * * *

10. Paragraph (g) of Section 90.207 is removed and reserved.

11. Section 90.209 is amended by adding new paragraphs (b)(10) and (m) to read as follows:

§ 90.209 Bandwidth limitations.

* * * * *

(b) * * *

(10) The maximum authorized bandwidth shall be 12 MHz for non-multilateration LMS operations in the band 909.75-921.75 MHz and 2 MHz in the band 902.00-904.00 MHz. The maximum authorized bandwidth for multilateration LMS operations shall be 5.75 MHz in the 904.00-909.75 MHz band; 2 MHz in the 919.75-921.75 MHz band; 5.75 MHz in the 921.75-927.25 MHz band and its associated 927.25-927.50 MHz narrowband forward link; and 8.00 MHz if the 919.75-921.75 MHz and 921.75-927.25 MHz bands and their associated 927.25-927.50 MHz and 927.50-927.75 MHz narrowband forward links are aggregated.

* * * * *

(m) For transmitters authorized under Subpart M that operate in the 902-928 MHz band, the peak power of any emission shall be attenuated below the power of the highest emission contained within the authorized channel bandwidth in accordance with the following schedule:

(1) On any frequency within the authorized bandwidth: Zero dB.

(2) On any frequency outside of the authorized bandwidth: $55+10\log(P)$ dB where (P) is the highest emission (watts) of the transmitter inside the authorized bandwidth.

(3) The resolution bandwidth of the instrumentation used to measure the emission power shall be 100 kHz. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth.

(4) Emission power (P) shall be measured in peak values.

12. Section 90.213 is amended by adding the 902-928 MHz band to the table in paragraph (a) to read as follows:

§ 90.213 Frequency tolerance.

(a) * * *

Frequency Tolerance

Frequency range	Fixed and base stations		Mobile stations	
	Over 200W output power	200 w or less output power	Over 2W output power	2W or less output power
		* * * * *		
902-9280005	.0005	.0005	.0005
		* * * * *		

13. Section 90.239 is removed and reserved.

14. Subpart M is amended by redesignating it the Transportation Infrastructure Radio Service to read as follows:

Subpart M -- Transportation Infrastructure Radio Service

15. A new Section 90.350 is added to Subpart M to read as follows:

§ 90.350 Scope.

The Transportation Infrastructure Radio Service is for the purpose of integrating radio-based technologies into the nation's transportation infrastructure and to develop and implement the nation's intelligent transportation systems. It includes the Location and Monitoring Service (LMS). Rules as to eligibility for licensing, frequencies available, and any special requirements for services in the Transportation Infrastructure Radio Service are set forth in this Subpart.

16. A new Section 90.351 is added to Subpart M to read as follows:

§ 90.351 Location and Monitoring Service.

These provisions authorize the licensing of systems in the location and monitoring service (LMS). LMS systems utilize non-voice radio techniques to determine the location and status of mobile radio units. LMS licensees authorized to operate a system in the 902-928 MHz band may serve individuals, federal government agencies, and entities eligible for licensing in Part 90.

(a) Each application to license an LMS system shall include the following supplemental information:

(1) A detailed description of the manner in which the system will operate, including a map or diagram.

(2) The necessary or occupied bandwidth of emission, whichever is greater.

(3) The data transmission characteristics as follows:

(i) The vehicle location update rates;

(ii) Specific transmitter modulation techniques used;

(iii) For codes and timing scheme: A table of bit sequences and their alphanumeric or indicator equivalents, and a statement of bit rise time, bit transmission rates, bit duration, and interval between bits;

(iv) A statement of amplitude-versus-time of the interrogation and reply formats, and an example of a typical message transmission and any synchronizing pulses utilized.

(4) A plan to show the implementation schedule during the initial license term.

(b) LMS stations are exempted from the identification requirements of § 90.425; however, the Commission may impose automatic station identification requirements when determined to be necessary for monitoring and enforcement purposes.

17. A new Section 90.353 is added to Subpart M to read as follows:

§ 90.353 LMS Operations in the 902 - 928 MHz band.

(a) LMS systems may be authorized within the 902-928 MHz band, subject to the following conditions. LMS licensees are required to maintain whatever records are necessary to demonstrate compliance with these provisions and must make these records available to the Commission upon request:

(1) LMS operations will not cause interference to and must tolerate interference from industrial, scientific, and medical (ISM) devices and radiolocation Government stations that operate in the 902 - 928 MHz band.

(2) LMS systems are authorized to transmit status and instructional messages, either voice or non-voice, so long as they are related to the location or monitoring functions of the system.

(3) LMS systems may interconnect with the public switched network (PSN) only to enable emergency communications. These interconnected communications may only be sent to or received from a system dispatch point or entities eligible in the Public Safety or Special Emergency Radio Services. (See Subparts B and C).

(4) Multilateration LMS systems will be authorized on a primary basis within the bands 904-909.75 MHz and 921.75-927.25 MHz. Additionally, multilateration and non-multilateration systems will share the 919.75-921.75 MHz band on a co-equal basis. Licensing will be on the basis of Major Trading Area (MTA) service areas for multilateration systems, with one exclusive MTA license being issued for each of these three sub-bands. Except as provided in paragraph (a)(3) of this Section, multilateration MTA licensees may be authorized to operate on only one of the three multilateration bands within a given MTA. Additionally, MTA multilateration LMS licenses will be conditioned upon the licensee's ability to demonstrate through actual field tests that their systems do not cause unacceptable levels of interference to Part 15 devices.

(5) Multilateration MTA-licensed systems and grandfathered AVM systems (see Section 90.363) are authorized on a shared basis and must cooperate in the selection and use of frequencies in accordance with Section 90.173(b).

(6) Multilateration MTA licensees may be authorized to operate on both the 919.75-921.75 MHz and 921.75-927.25 MHz bands within a given MTA (see Section 90.209(b)(10)).

(7) Multilateration LMS systems whose primary operations involve the provision of vehicle location services, may provide non-vehicular location services.

(8) Non-multilateration stations are authorized to operate on a shared, non-exclusive basis in the 902-904 MHz and 909.75-921.75 MHz sub-bands. Non-multilateration systems and multilateration systems will share the 919.75-921.75 MHz band on a co-equal basis. Non-multilateration LMS systems may not provide non-vehicular location services. The maximum antenna height above ground for non-multilateration LMS systems is 15 meters.

18. A new section 90.355 is added to Subpart M to read as follows:

§ 90.355 LMS Operations below 512 MHz.

(a) Applicants requiring not more than 25 kHz bandwidth per frequency in the 25-50 MHz, 150-170 MHz, and 450-512 MHz bands may use either base-mobile frequencies currently assigned the applicant, or be assigned base-mobile frequencies available in the service in which eligibility has been established, provided that:

(1) For transmission between vehicles and base stations, each frequency in a single-frequency mode of operation will provide location data for approximately 200 vehicles, or both frequencies in a two-frequency mode of operation will provide location data for approximately 400 vehicles, except that for frequencies in the 450-512 MHz band that are assigned in pairs in accordance with the allocation plan for the band, the requirement is that location data be provided for approximately 200 vehicles for each frequency pair; and a showing is made that 50 percent of the vehicles will be in operation within the system by the end of the second year of the initial license term, and 70 percent will be in operation within the system by the end of the initial license term; except that if these vehicle loading standards will not be met, frequencies will be assigned only on a secondary non-interference basis to any authorized radiotelephony operation.

(2) The minimum separation between a proposed LMS station and the nearest co-channel base station of another licensee operating a voice system is 75 miles (120 km) for a single frequency mode of operation or 35 miles (56 km) for a two-frequency mode of operation. Where the minimum mileage separation cannot be achieved, agreement to the use of F1D, F2D, G1D, G2D or P0N emission must be received from all existing co-channel licensees using voice emissions within the applicable mileage limits. If there is interference with voice operations and required agreement was not received, or operation was authorized on a secondary non-interference basis, the licensee of the LMS system is responsible for eliminating the interference.

(3) Frequencies additional to any assigned under paragraph (b)(2)(i) of this section will not be assigned to the same licensee at any stations located within 64 km (40 miles) of any station in which the licensee holds an interest until each of such licensee's frequencies for LMS operation is shown to accommodate not less than 90 percent of the frequency loading requirements specified in paragraph (b)(3)(i) of this section.

19. A new Section 90.357 is added to subpart M to read as follows:

§ 90.357 Frequencies for LMS systems in the 902 - 928 MHz band.

(a) (1) Multilateration LMS systems will be authorized on the following LMS sub-bands:

<u>LMS Sub-band</u>	<u>Forward Link⁽¹⁾</u>
904.000-909.750 MHz	927.750-928.000 MHz
919.750-921.750 MHz ⁽²⁾	927.500-927.750 MHz
921.750-927.250 MHz	927.250-927.500 MHz

1 Forward links for LMS systems may also be contained within the LMS sub-band. However, the maximum allowable power in these sub-bands is 30 watts ERP in accordance with Section 90.205(b).

2 The frequency band 919.750-921.750 MHz is shared co-equally between multilateration and non-multilateration LMS systems.

(b) Non-multilateration LMS systems will be authorized on the following frequency bands:

LMS Sub-band¹

902.000-904.000 MHz
909.750-921.750 MHz

1 Applicants for non-multilateration LMS systems should request only the minimum amount of bandwidth necessary to meet their operational needs.

20. A new Section 90.359 is added to subpart M to read as follows:

§ 90.359 Field Strength Limits for MTA-licensed LMS systems.

MTA-licensed multilateration systems shall limit the field strength of signals transmitted from their base stations to 47 dBuV/m at their MTA boundary.

21. A new Section 90.361 is added to subpart M to read as follows:

§ 90.361 Interference from Part 15 and Amateur operations.

Part 15 and Amateur operations may not cause harmful interference to LMS systems in the 902-928 MHz band. These operations will not be considered to be causing harmful

interference to a multilateration LMS system operating in one of the three MTA sub-bands (see Section 90.357(a)(1)) if they operate in accordance with the provisions of 47 C.F.R. Parts 15 or 97 and at least one of the following conditions are met:

(a) it is a Part 15 field disturbance sensor operating under Section 15.245 of the rules and it is not operating in the 904-909.750 or 919.750-928.000 MHz sub-bands; or

(b) it does not employ an outdoor antenna; or

(c) if it does employ an outdoor antenna, then if

(1) the directional gain of the antenna does not exceed 6 dBi, or if the directional gain of the antenna exceeds 6 dBi, it reduces its transmitter output power below 1 watt by the proportional amount that the directional gain of the antenna exceeds 6 dBi; and

(2) either

(A) the antenna is 5 meters or less in height above ground; or

(B) the antenna is more than 5 meters in height above ground but less than or equal to 15 meters in height above ground and either:

(i) adjusts its transmitter output power below 1 watt by $20 \log(h/5)$ dB, where h is the height above ground of the antenna in meters; or

(ii) is providing the final link for communications of entities eligible under Subparts B or C of Part 90 of the rules.

22. A new Section 90.363 is added to Subpart M to read as follows:

§ 90.363 Grandfathering provisions for existing AVM Licensees.

(a) These provisions authorize grandfathered operation by automatic vehicle monitoring (AVM) systems licensed on or before February 3, 1995. To attain grandfathered status for their stations, existing multilateration AVM licensees must file, within thirty days of the effective date of the rules adopted in PR Docket No. 93-61, applications to modify their station licenses to comply with the band plan shown in Section 90.357. These applications to modify must identify the multilateration sub-band or sub-bands in which they intend to operate their LMS system stations, once their applications to modify have been authorized. The application to modify a license to comply with the band plan shown in Section 90.357 may also include a modification to specify an alternate site, so long as the alternate site is 2 kilometers or less from the site specified in the original license. When existing AVM

licensees file these applications to modify, they must certify that either 1) the stations that compose their AVM system have been constructed and are operational as of February 3, 1995 or 2) that the stations are not constructed in accordance with Section 90.155(e) as of February 3, 1995. Multilateration AVM systems that are constructed and operational on February 3, 1995 will be given until April 1, 1998 to convert to the spectrum identified in their LMS system license. Such licensees may continue to operate their systems during this period. Licensees of multilateration AVM constructed and operational systems that do not file applications to modify within this 30-day period will be permitted to continue operations under the provisions of Section 90.239 until April 1, 1998 or the end of their original license term, whichever occurs first, at which time such licenses will cancel automatically and will not be renewed. Multilateration AVM licensees for stations not constructed as of February 3, 1995 must construct and operate their LMS systems on the spectrum identified in their LMS system license by April 1, 1996. These licenses will terminate 30 days after the effective date of the rules contained in PR Docket 93-61 unless timely modification applications are filed.

(b) Non-multilateration systems licensed prior to February 3, 1995 in spectrum other than the 902.00-904.00 and 909.75-921.75 MHz bands must modify their licenses by April 1, 1998 to specify operation solely in the bands provided in Section 90.357 for non-multilateration systems and to operate their systems consistently with the provisions of Section 90.353.

Appendix B

List of Technical Studies, Tests and Analyses (included in the record in PR Docket 93-61)

- June 25, 1993 **Theoretical and Field Performance of Radiolocation Systems**
Pactel Teletrac filed on June 29, 1993
- June 28, 1993 **Engineering Analysis of Cochannel Pulse-Ranging LMS Systems**
Professor Raymond Pickholtz, filed by Teletrac on June 29, 1993
- June 29, 1993 **The relationship between Position-fixing rate & Occupied Bandwidth in**
AVL Systems
Louis H. M. Jandrell, Pinpoint
- July 29, 1993 **Response to Comments filed in PR Docket 93-61**
Louis H. M. Jandrell, Pinpoint
- January 14, 1994 **Capacity and Interference Resistance of Spread-Spectrum Automatic**
Vehicle Monitoring Systems in the 902 - 928 MHz ISM Band Interim
Report Mobile Portable Radio Research Group of the Bradley Dept of
Electrical Engineering at Virginia Tech, filed by Southwestern Bell
Feb. 1, 1994
- January 20, 1994 **Review and Discussion of the Pinpoint ARRAY™ Network and Its**
Performance
Hatfield Associates, Inc., filed by Pinpoint
- March 15, 1994 **Time Division Considerations for Wideband LMS Systems**

Technical Review of the Virginia Tech Interim Report "Capacity and
Interference Resistance of Spread Spectrum Automatic Vehicle
Monitoring Systems in the 902 - 928 MHz Band"

Technical Review of Hatfield Associates' "Review and Discussion of
the Pinpoint ARRAY Network and Its Performance"
Graham Smith, MobileVision
- May 10, 1994 **Report on the Viability of Location Monitoring Services Technology**
Within the IVHS Industry
MobileVision
- June 21, 1994 **Experience with Part 15 Interference**
AirTouch Teletrac

- June 22, 1994 Further Analysis of Interference of Part 15 Devices and LMS Wideband Systems
Probability of Interference
Graham Smith, MobileVision filed on June 22, 1994
- June 23, 1994 LMS Consensus Position on Part 15 Interference
Filed by Teletrac, MobileVision, Pinpoint and Uniplex on June 23, 1994
- August 2, 1994 Comments on MobileVision's "Further Analysis of Interference of Part 15 Devices and LMS Wideband Systems Probability of Interference"
Dr. Jay E. Padgett, Chairman, TIA Consumer Radio Section, filed by Part 15 Coalition on August 12, 1994
- August 8, 1994 Wide Area Pulse-Ranging AVM/LMS: Messaging/Locating System Design Tradeoffs and Part 15 Interference
Dr. Jay E. Padgett, Chairman, TIA Consumer Radio Section, filed by Part 15 Coalition on August 12, 1994
- September 15, 1994 Letter to William F. Caton concerning "Wide Area Pulse-Ranging AVM/LMS: Messaging/Locating System Design Tradeoffs and Part 15 Interference" by Louis H. M. Jandrell, Pinpoint
- October 14, 1994 Capacity and Interference Resistance of Spread-Spectrum Automatic Vehicle Monitoring Systems in the 902 - 928 MHz ISM Band Final Report, Mobile and Portable Radio Research Group of the Bradley Department of Electrical Engineering, Virginia Tech
Filed by Southwestern Bell on October 19, 1994
- November 30, 1994 Response to Pinpoint's Comments on "Wide Area Pulse-Ranging AVM/LMS: Messaging/Locating System Design Tradeoffs and Part 15 Interference"
Dr. Jay E. Padgett, Chairman, TIA Consumer Radio Section
- December 7, 1994 On the Effect of Bandwidth on the Performance of AVM Systems Operating in the 902 - 928 MHz ISM Band
Costas N. Georghiadis
Electrical Engineering Dept, Texas A&M University
Filed by Pinpoint
- December 13, 1994 Desensitization Calculations for Part 15 Devices and Wideband LMS
Graham Smith, MobileVision



SELECTED FCC RULES

This is an unofficial staff compilation of selected rules applicable to the Location and Monitoring Service, drawn from Parts 1 and 90 of the FCC's Rules, which applicants may use until such time as the Government Printing Office publishes a current version in the Code of Federal Regulations (CFR). Applicants should refer to the official version of the rules contained in FCC orders and in the Federal Register. The official rules govern in the case of conflicts. Relevant orders adopted to date by the FCC are provided in Tab E of this Bidder Information Package. Applicants need to stay apprised of any rule changes that occur after release of this Bidder Information Package by checking the FCC website and the Federal Register.



PART 90—PRIVATE LAND MOBILE RADIO SERVICES

Subpart M--Intelligent Transportation Systems Radio Service

Sec. 90.350 Scope.

The Intelligent Transportation Systems Radio Service is for the purpose of integrating radio-based technologies into the nation's transportation infrastructure and to develop and implement the nation's intelligent transportation systems. It includes the Location and Monitoring Service (LMS). Rules as to eligibility for licensing, frequencies available, and any special requirements for services in the Intelligent Transportation Systems Radio Service are set forth in this Subpart.

Sec. 90.351 Location and Monitoring Service.

These provisions authorize the licensing of systems in the Location and Monitoring Service (LMS). LMS systems utilize non-voice radio techniques to determine the location and status of mobile radio units. LMS licensees authorized to operate a system in the 902-928 MHz band may serve individuals, federal government agencies, and entities eligible for licensing in this part 90.

(a) Each application to license an LMS system shall include the following supplemental information:

(1) A detailed description of the manner in which the system will operate, including a map or diagram.

(2) The necessary or occupied bandwidth of emission, whichever is greater.

(3) The data transmission characteristics as follows:

(i) The vehicle location update rates;

(ii) Specific transmitter modulation techniques used;

(iii) For codes and timing scheme: A table of bit sequences and their alphanumeric or indicator equivalents, and a statement of bit rise time, bit transmission rates, bit duration, and interval between bits;

(iv) A statement of amplitude-versus-time of the interrogation and reply formats, and an example of a typical message transmission and any synchronizing pulses utilized.

(4) A plan to show the implementation schedule during the initial license term.

(b) LMS stations are exempted from the identification requirements of Sec. 90.425; however, the Commission may impose automatic station identification requirements when determined to be necessary for monitoring and enforcement purposes.

Sec. 90.353 LMS operations in the 902-928 MHz band.

LMS systems may be authorized within the 902-928 MHz band, subject to the conditions in this section. LMS licensees are required to maintain whatever records are necessary to

demonstrate compliance with these provisions and must make these records available to the Commission upon request:

(a) LMS operations will not cause interference to and must tolerate interference from industrial, scientific, and medical (ISM) devices and radiolocation Government stations that operate in the 902-928 MHz band.

(b) LMS systems are authorized to transmit status and instructional messages, either voice or non-voice, so long as they are related to the location or monitoring functions of the system.

(c) LMS systems may utilize store and forward interconnection, where either transmissions from a vehicle or object being monitored are stored by the LMS provider for later transmission over the public switched network (PSN), or transmissions received by the LMS provider from the PSN are stored for later transmission to the vehicle or object being monitored. Real-time interconnection between vehicles or objects being monitored and the PSN will only be permitted to enable emergency communications related to a vehicle or a passenger in a vehicle. Such real-time, interconnected communications may only be sent to or received from a system dispatch point or entities eligible in the Public Safety or Special Emergency Radio Services. See subparts B and C of this part.

(d) Multilateration LMS systems will be authorized on a primary basis within the bands 904-909.75 MHz and 921.75-927.25 MHz. Additionally, multilateration and non-multilateration systems will share the 919.75-921.75 MHz band on a co-equal basis. Licensing will be on the basis of Economic Areas (EAs) for multilateration systems, with one exclusive EA license being issued for each of these three sub-bands. Except as provided in paragraph (f) of this section, multilateration EA licensees may be authorized to operate on only one of the three multilateration bands within a given EA. Additionally, EA multilateration LMS licenses will be conditioned upon the licensee's ability to demonstrate through actual field tests that their systems do not cause unacceptable levels of interference to 47 CFR part 15 devices.

(e) Multilateration EA-licensed systems and grandfathered AVM systems (see Sec. 90.363) are authorized on a shared basis and must cooperate in the selection and use of frequencies in accordance with Section 90.173(b).

(f) Multilateration EA licensees may be authorized to operate on both the 919.75-921.75 MHz and 921.75-927.25 MHz bands within a given EA (see Sec. 90.209(b)(10)).

(g) Multilateration LMS systems whose primary operations involve the provision of vehicle location services, may provide non-vehicular location services.

(h) Non-multilateration stations are authorized to operate on a shared, non-exclusive basis in the 902-904 MHz and 909.75-921.75 MHz sub-bands. Non-multilateration systems and multilateration systems will share the 919.75-921.75 MHz band on a co-equal basis.

Non-multilateration LMS systems may not provide non-vehicular location services. The maximum antenna height above ground for non-multilateration LMS systems is 15 meters.

(i) Non-multilateration LMS licenses will be issued on a site-by-site basis, except that municipalities or other governmental operatives may file jointly for a non-multilateration license covering a given U.S. Department of Commerce Bureau of Economic Analysis Economic Area (EA). Such an application must identify all planned sites. After receiving the license, the non-multilateration EA licensee must notify the Commission if sites are deleted or if new sites are added, before those sites may be put into operation.

Sec. 90.355 LMS operations below 512 MHz.

Applications requiring not more than 25 kHz bandwidth per frequency in the 25-50 MHz, 150-170 MHz, and 450-512 MHz bands may use either base-mobile frequencies currently assigned the applicant, or be assigned base-mobile frequencies available in the service in which eligibility has been established, provided that:

(a) For transmission between vehicles and base stations, each frequency in a single-frequency mode of operation will provide location data for approximately 200 vehicles, or both frequencies in a two-frequency mode of operation will provide location data for approximately 400 vehicles, except that for frequencies in the 450-512 MHz band that are assigned in pairs in accordance with the allocation plan for the band, the requirement is that location data be provided for approximately 200 vehicles for each frequency pair; and a showing is made that 50 percent of the vehicles will be in operation within the system by the end of the second year of the initial license term, and 70 percent will be in operation within the system by the end of the initial license term; except that if these vehicle loading standards will not be met, frequencies will be assigned only on a secondary non-interference basis to any authorized radiotelephony operation.

(b) The minimum separation between a proposed LMS station and the nearest co-channel base station of another licensee operating a voice system is 75 miles (120 km) for a single frequency mode of operation or 35 miles (56 km) for a two-frequency mode of operation. Where the minimum mileage separation cannot be achieved, agreement to the use of F1D, F2D, G1D, G2D or P0N emission must be received from all existing co-channel licensees using voice emissions within the applicable mileage limits. If there is interference with voice operations and required agreement was not received, or operation was authorized on a secondary non-interference basis, the licensee of the LMS system is responsible for eliminating the interference.

(c) Frequencies additional to any assigned under paragraph (a) of this section will not be assigned to the same licensee at any stations located within 64 km (40 miles) of any station in which the licensee holds an interest until each of such licensee's frequencies for LMS operation is shown to accommodate not less than 90 percent of the frequency loading requirements specified in paragraph (a) of this section.

Sec. 90.357 Frequencies for LMS systems in the 902-928 MHz band.

(a) Multilateration LMS systems will be authorized on the following LMS sub-bands:

LMS Sub-band	Forward Link (1)
904.000-909.750 MHz	927.750-928.000 MHz.
919.750-921.750 MHz (2)	927.500-927.750 MHz.
921.750-927.250 MHz	927.250-927.500 MHz.

(1) Forward links for LMS systems may also be contained within the LMS sub-band. However, the maximum allowable power in these sub-bands is 30 watts ERP in

accordance with Sec. 90.205(j).

(2) The frequency band 919.750-921.750 MHz is shared co-equally between multilateration and non-multilateration LMS systems.

(b) Non-multilateration LMS systems will be authorized on the following frequency bands:

LMS Sub-band (1)

902.000-904.000 MHz

909.750-921.750 MHz

(1) Applicants for non-multilateration LMS systems should request only the minimum amount of bandwidth necessary to meet their operational needs.

Sec. 90.359 Field strength limits for EA-licensed LMS systems.

EA-licensed multilateration systems shall limit the field strength of signals transmitted from their base stations to 47 dBuV/m at their EA boundary.

Sec. 90.361 Interference from Part 15 and Amateur operations.

Operations authorized under Parts 15 and 97 of this chapter may not cause harmful interference to LMS systems in the 902-928 MHz band. These operations will not be considered to be causing harmful interference to a multilateration LMS system operating in one of the three EA sub-bands (see Sec. 90.357(a)) if they are non-video links operating in accordance with the provisions of Parts 15 or 97 of this chapter and at least one of the following conditions are met:

(a) It is a field disturbance sensor operating under Sec. 15.245 of this chapter and it is not operating in the 904-909.750 or 919.750-928.000 MHz sub-bands; or

(b) It does not employ an outdoor antenna; or

(c) If it does employ an outdoor antenna, then if:

(1) The directional gain of the antenna does not exceed 6 dBi, or if the directional gain of the antenna exceeds 6 dBi, it reduces its transmitter output power below 1 watt by the proportional amount that the directional gain of the antenna exceeds 6 dBi; and

(2) Either:

(i) The antenna is 5 meters or less in height above ground; or

(ii) The antenna is more than 5 meters in height above ground but less than or equal to 15 meters in height above ground and either:

(A) Adjusts its transmitter output power below 1 watt by $20 \log (h/5)$ dB, where h is the height above ground of the antenna in meters; or

(B) Is providing the final link for communications of entities eligible under subpart B or C of this Part, or is providing the final link for communications of health care providers that serve

rural areas, elementary schools, secondary schools or libraries.

Sec. 90.363 Grandfathering provisions for existing AVM Licensees.

(a) These provisions authorize grandfathered operation by automatic vehicle monitoring (AVM) systems licensed on or before February 3, 1995. To attain grandfathered status for their stations, existing multilateration AVM licensees must file, on or before May 22, 1995, applications to modify their station licenses to comply with the band plan shown in Sec. 90.357(a). These applications to modify must identify the multilateration sub-band or sub-bands in which the applicants intend to operate their LMS system stations, once their applications to modify have been authorized. The application to modify a license to comply with the band plan shown in Sec. 90.357(a) may also include a modification to specify an alternate site, so long as the alternate site is 2 kilometers or less from the site specified in the original license.

(b) When existing multilateration AVM licensees file applications to modify, as specified in paragraph (a) of this section, they must certify that either:

(1) The stations that compose their AVM system were constructed and placed in operation in accordance with Sec. 90.155(e) on or before February 3, 1995; or

(2) The stations were not constructed and placed in operation in accordance with Sec. 90.155(e) on or before February 3, 1995.

(c) Multilateration AVM systems that were constructed and placed in operation on or before February 3, 1995 will be given until April 1, 1998 to convert to the spectrum identified in their LMS system license. Such licensees may continue to operate their systems during this period. Licensees of multilateration AVM constructed and operational systems that do not file applications to modify on or before May 22, 1995, will be permitted to continue operations under the provisions of former Section 90.239 until April 1, 1998 or the end of their original license term, whichever occurs first, at which time such licenses will cancel automatically and will not be renewed.

(d) Multilateration AVM licensees for stations that were not constructed and placed in operation on or before February 3, 1995 must construct their LMS systems and place them in operation on the spectrum identified in their LMS system license on or before September 1, 1996, or their licenses will cancel automatically (see Section 90.155 (e)). Also, these licenses will cancel automatically on July 1, 1996 unless timely modification applications are filed on or before this date (see paragraph (a) of this section).

(e) Non-multilateration systems licensed in spectrum other than the 902.00-904.00 and 909.75-921.75 MHz bands must modify their licenses by April 1, 1998 to specify operation solely in the bands provided in Sec. 90.357(b) for non-multilateration systems and to operate their systems consistently with the provisions of Sec. 90.353.

Sec. 90.365 Partitioned licenses and disaggregated spectrum.

(a) Eligibility--(1) Parties seeking approval for partitioning and disaggregation shall request an authorization for partial assignment of a license pursuant to Sec. 90.153.

(2) Multilateration LMS licensees may apply to partition their licensed geographic service area or disaggregate their licensed spectrum at any time following the grant of their licenses. Multilateration LMS licensees may partition or disaggregate to any party that is also eligible to be a multilateration LMS licensee. Partitioning is permitted along any service area defined by the parties, and spectrum may be disaggregated in any amount. The Commission will also consider requests for partial assignment of licenses that propose combinations of partitioning and disaggregation.

(b) Technical Requirements--In the case of partitioning, requests for authorization for partial assignment of a license must include, as attachments, a description of the partitioned service area, and a calculation of the population of the partitioned service area and the licensed geographic service area. The partitioned service area shall be defined by coordinate points at every three degrees along the partitioned service area unless county lines are followed. The geographic coordinates must be specified in degrees, minutes, and seconds to the nearest second of latitude and longitude and must be based upon the 1927 North American Datum (NAD27). Applicants may supply geographical coordinates based on 1983 North American Datum (NAD83) in addition to those required based on NAD27. In the case where county lines are utilized, applicants need only list the specific area(s) (through use of county names) that constitute the partitioned area.

(c) License term. The license term for a partitioned license area, and for disaggregated spectrum shall be the remainder of the original licensee's license term.

(d) Construction requirements--(1) Requirements for partitioning.

(i) Parties seeking authority to partition must meet one of the following construction requirements:

(A) The partitionee may certify that it will satisfy the applicable construction requirements for the partitioned license area; or

(B) The original licensee may certify that it has or will meet the construction requirement for the entire license area.

(ii) Applications requesting authority to partition must include a certification by each party as to which of the above construction options they select.

(iii) Failure by any partitionee to meet its respective construction requirements will result in the automatic cancellation of the partitioned or disaggregated license without further Commission action.

(2) Requirements for disaggregation. Parties seeking authority to disaggregate must submit with their partial assignment application a certification signed by both parties stating which of the parties will be responsible for meeting the construction requirement for the licensed market. Parties may agree to share responsibility for meeting the construction requirements. Parties that accept responsibility for meeting the construction requirements and later fail to do so will be subject to license forfeiture without further Commission action.

Subpart X--Competitive Bidding Procedures for Location and Monitoring Service

Sec. 90.1101 Location and Monitoring Service subject to competitive bidding.

Mutually exclusive initial applications for multilateration Location and Monitoring Service licenses are subject to competitive bidding procedures. The procedures set forth in part 1, subpart Q of this chapter will apply unless otherwise provided in this part.

Sec. 90.1103 Designated entities.

(a) This section addresses certain issues concerning designated entities in the Location and Monitoring Service (LMS) subject to competitive bidding. Issues that are not addressed in this section are governed by the designated entity provisions in part 1, subpart Q of this chapter.

(b) Eligibility for small business provisions.

(1) A small business is an entity that, together with its affiliates and controlling interests, has average gross revenues not to exceed \$15 million for the preceding three years.

(2) A very small business is an entity that, together with its affiliates and controlling interests, has average gross revenues not to exceed \$3 million for the preceding three years.

(3) For purposes of determining whether an entity meets either of the definitions set forth in paragraph (b)(1) or (b)(2) of this section, the gross revenues of the entity, its affiliates, and controlling interests shall be considered on a cumulative basis and aggregated.

(4) Where an applicant (or licensee) cannot identify controlling interests under the standards set forth in this section, the gross revenues of all interest holders in the applicant, and their affiliates, will be attributable.

(5) A consortium of small businesses (or a consortium of very small businesses) is a conglomerate organization formed as a joint venture between or among mutually independent business firms, each of which individually satisfies the definition in paragraph (b)(1) of this section (or each of which individually satisfies the definition in paragraph (b)(2) of this section). Where an applicant or licensee is a consortium of small businesses (or very small businesses), the gross revenues of each small business (or very small business) shall not be aggregated.

(c) Controlling interest. (1) For purposes of this section, controlling interest includes individuals or entities with de jure and de facto control of the applicant. De jure control is greater than 50 percent of the voting stock of a corporation, or in the case of a partnership, the general partner. De facto control is determined on a case-by-case basis. An entity must disclose its equity interest and demonstrate at least the following indicia of control to establish that it retains de facto control of the applicant:

(i) the entity constitutes or appoints more than 50 percent of the board of directors or management committee;

(ii) the entity has authority to appoint, promote, demote, and fire senior executives that

control the day-to-day activities of the licensee; and

(iii) the entity plays an integral role in management decisions.

(2) Calculation of certain interests.

(i) Ownership interests shall be calculated on a fully diluted basis; all agreements such as warrants, stock options and convertible debentures will generally be treated as if the rights thereunder already have been fully exercised.

(ii) Partnership and other ownership interests and any stock interest equity, or outstanding stock, or outstanding voting stock shall be attributed as specified below.

(iii) Stock interests held in trust shall be attributed to any person who holds or shares the power to vote such stock, to any person who has the sole power to sell such stock, and, to any person who has the right to revoke the trust at will or to replace the trustee at will. If the trustee has a familial, personal, or extra-trust business relationship to the grantor or the beneficiary, the grantor or beneficiary, as appropriate, will be attributed with the stock interests held in trust.

(iv) Non-voting stock shall be attributed as an interest in the issuing entity.

(v) Limited partnership interests shall be attributed to limited partners and shall be calculated according to both the percentage of equity paid in and the percentage of distribution of profits and losses.

(vi) Officers and directors of an entity shall be considered to have an attributable interest in the entity. The officers and directors of an entity that controls a licensee or applicant shall be considered to have an attributable interest in the licensee or applicant.

(vii) Ownership interests that are held indirectly by any party through one or more intervening corporations will be determined by successive multiplication of the ownership percentages for each link in the vertical ownership chain and application of the relevant attribution benchmark to the resulting product, except that if the ownership percentage for an interest in any link in the chain exceeds 50 percent or represents actual control, it shall be treated as if it were a 100 percent interest.

(viii) Any person who manages the operations of an applicant or licensee pursuant to a management agreement shall be considered to have an attributable interest in such applicant or licensee if such person, or its affiliate pursuant to Sec. 1.2110(b)(4) of this chapter, has authority to make decisions or otherwise engage in practices or activities that determine, or significantly influence,

(A) The nature or types of services offered by such an applicant or licensee;

(B) The terms upon which such services are offered; or

(C) The prices charged for such services.

(ix) Any licensee or its affiliate who enters into a joint marketing arrangement with an applicant or licensee, or its affiliate, shall be considered to have an attributable interest, if such applicant or licensee, or its affiliate, has authority to make decisions or otherwise engage in practices or activities that determine, or significantly influence,

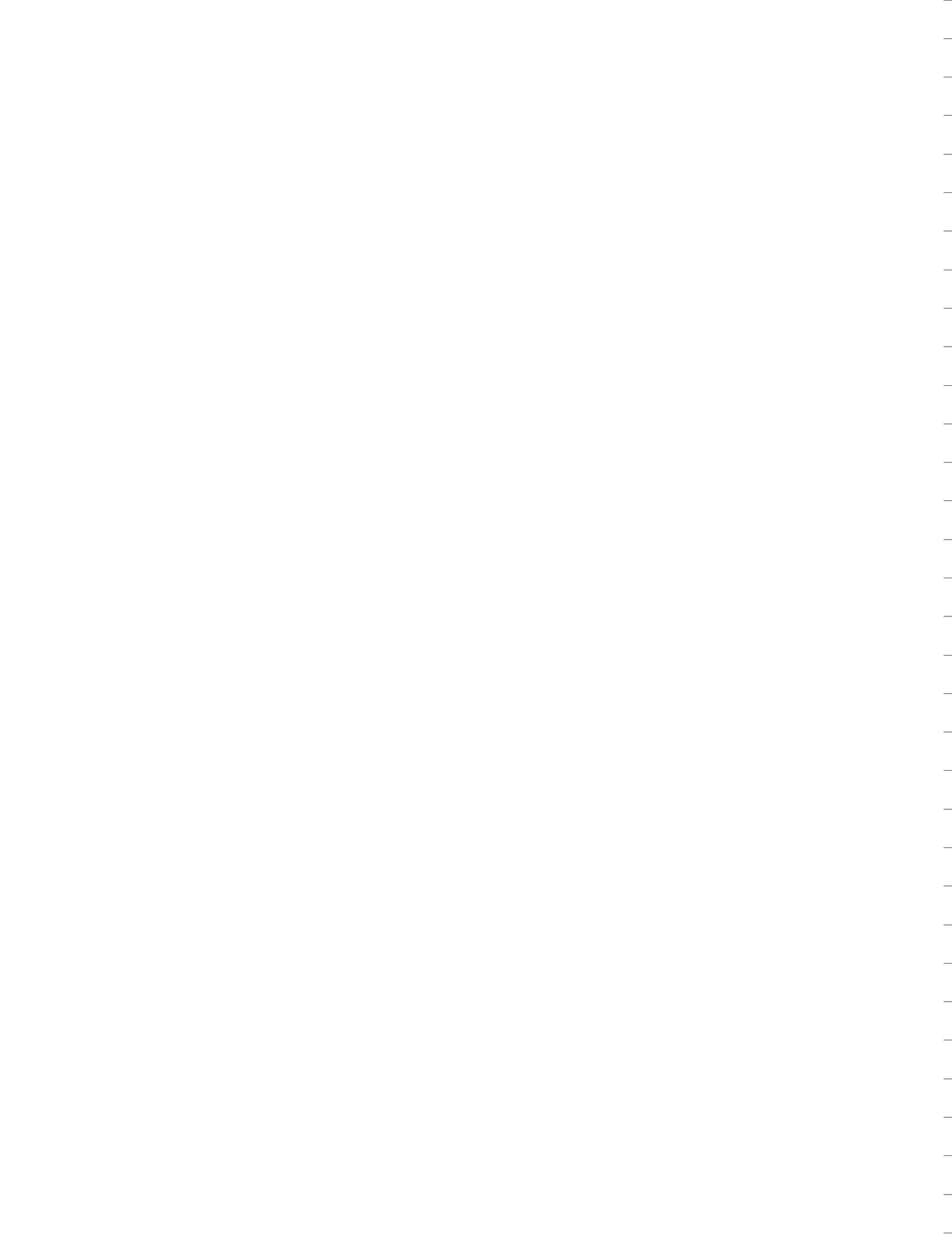
(A) The nature or types of services offered by such an applicant or licensee;

(B) The terms upon which such services are offered; or

(C) The prices charged for such services.

(d) A winning bidder that qualifies as a small business or a consortium of small businesses as defined in paragraph (b)(1) or (b)(5) of this section may use the bidding credit specified in Sec. 1.2110(e)(2)(ii) of this chapter. A winning bidder that qualifies as a very small business or a consortium of very small businesses as defined in paragraph (b)(2) or (b)(5) of this

section may use the bidding credit specified in Sec. 1.2110(e)(2)(i) of this chapter.



PART 1--PRACTICE AND PROCEDURE

SUBPART Q--Competitive Bidding Proceedings

Sec. 1.2101 Purpose.

The provisions of this subpart implement Section 309(j) of the Communications Act of 1934, as added by the Omnibus Budget Reconciliation Act of 1993 (Pub. L. 103-66) and the Balanced Budget Act of 1997 (Pub. L. 105-33), authorizing the Commission to employ competitive bidding procedures to choose from among two or more mutually exclusive applications for certain initial licenses.

Sec. 1.2102 Eligibility of applications for competitive bidding.

(a) Mutually exclusive initial applications are subject to competitive bidding.

(b) The following types of license applications are not subject to competitive bidding procedures:

(1) Public safety radio services, including private internal radio services used by state and local governments and non-government entities and including emergency road services provided by not-for-profit organizations, that

(i) Are used to protect the safety of life, health, or property; and

(ii) Are not commercially available to the public;

(2) Initial licenses or construction permits for digital television service given to existing terrestrial broadcast licensees to replace their analog television service licenses; or

(3) Noncommercial educational and public broadcast stations described under 47 U.S.C. 397(6).

Note to Section 1.2102: To determine the rules that apply to competitive bidding, specific service rules should also be consulted.

Sec. 1.2103 Competitive bidding design options.

(a) The Commission will choose from one or more of the following types of auction designs for services or classes of services subject to competitive bidding:

(1) Simultaneous multiple-round auctions (using remote or on-site electronic bidding);

(2) Sequential multiple round auctions (using either oral ascending or remote and/or on-site electronic bidding);

(3) Sequential or simultaneous single-round auctions (using either sealed paper or remote and/or on-site electronic bidding); and

(4) Combinatorial (package/contingent) bidding auctions.

(b) The Commission may use combinatorial bidding, which would allow bidders to submit all or nothing bids on combinations of licenses or authorizations, in addition to bids on individual licenses or authorizations. The Commission may require that to be declared the high bid, a combinatorial bid must exceed the sum of the individual bids by a specified

amount. Combinatorial bidding may be used with any type of auction. The Commission may also allow bidders to submit contingent bids on individual and/or combinations of licenses.

(c) The Commission may use single combined auctions, which combine bidding for two or more substitutable licenses and award licenses to the highest bidders until the available licenses are exhausted. This technique may be used in conjunction with any type of auction.

(d) **Minimum Bid Increments, Minimum Opening Bids and Maximum Bid Increments.** The Commission may, by announcement before or during an auction, require minimum bid increments in dollar or percentage terms. The Commission also may establish minimum opening bids and maximum bid increments on a service-specific basis.

Sec. 1.2104 Competitive bidding mechanisms.

(a) **Sequencing.** The Commission will establish the sequence in which multiple licenses will be auctioned.

(b) **Grouping.** In the event the Commission uses either a simultaneous multiple round competitive bidding design or combinatorial bidding, the Commission will determine which licenses will be auctioned simultaneously or in combination.

(c) **Reservation Price.** The Commission may establish a reservation price, either disclosed or undisclosed, below which a license subject to auction will not be awarded.

(d) **Minimum Bid Increments, Minimum Opening Bids and Maximum Bid Increments.** The Commission may, by announcement before or during an auction, require minimum bid increments in dollar or percentage terms. The Commission also may establish minimum opening bids and maximum bid increments on a service-specific basis.

(e) **Stopping Rules.** The Commission may establish stopping rules before or during multiple round auctions in order to terminate the auctions within a reasonable time.

(f) **Activity Rules.** The Commission may establish activity rules which require a minimum amount of bidding activity.

(g) **Withdrawal, Default and Disqualification Payment.** As specified below, when the Commission conducts an auction pursuant to Section 1.2103, the Commission will impose payments on bidders who withdraw high bids during the course of an auction, or who default on payments due after an auction closes or who are disqualified.

(1) **Bid withdrawal prior to close of auction.** A bidder who withdraws a high bid during the course of an auction is subject to a payment equal to the difference between the amount bid and the amount of the winning bid the next time the license is offered by the Commission. The bid withdrawal payment is either the difference between the net withdrawn bid and the subsequent net winning bid, or the difference between the gross withdrawn bid and the subsequent gross winning bid, whichever is less. No withdrawal payment is assessed if the subsequent winning bid exceeds the withdrawn bid. This payment amount is deducted from any upfront payments or down payments that the withdrawing bidder has deposited with the Commission.

(2) **Default or disqualification after close of auction.** If a high bidder defaults or is disqualified after the close of such an auction, the defaulting bidder will be subject to the payment in paragraph (g)(1) of this section plus an additional payment equal to 3 percent of the subsequent winning bid. If the subsequent winning bid exceeds the defaulting bidder's bid amount, the 3 percent payment will be calculated based on the defaulting bidder's bid

amount. If either bid amount is subject to a bidding credit, the 3 percent credit will be calculated using the same bid amounts and basis (net or gross bids) as in the calculation of the payment in paragraph (g)(1) of this section. Thus, for example, if gross bids are used to calculate the payment in paragraph (g)(1) of this section, the 3 percent will be applied to the gross amount of the subsequent winning bid, or the gross amount of the defaulting bid, whichever is less.

(h) The Commission will generally release information concerning the identities of bidders before each auction but may choose, on an auction-by-auction basis, to withhold the identity of the bidders associated with bidder identification numbers.

(i) The Commission may delay, suspend, or cancel an auction in the event of a natural disaster, technical obstacle, evidence of security breach, unlawful bidding activity, administrative necessity, or for any other reason that affects the fair and efficient conduct of the competitive bidding. The Commission also has the authority, at its sole discretion, to resume the competitive bidding starting from the beginning of the current or some previous round or cancel the competitive bidding in its entirety.

Sec. 1.2105 Bidding application and certification procedures; prohibition of collusion.

(a) **Submission of Short-Form Application (FCC Form 175).** In order to be eligible to bid, an applicant must timely submit a short-form application (FCC Form 175), together with any appropriate upfront payment set forth by Public Notice. Beginning January 1, 1999, all short-form applications must be filed electronically.

(1) All short-form applications will be due:

(i) On the date(s) specified by public notice; or

(ii) In the case of application filing dates which occur automatically by operation of law (see, *e.g.*, 47 CFR 22.902), on a date specified by public notice after the Commission has reviewed the applications that have been filed on those dates and determined that mutual exclusivity exists.

(2) The short-form application must contain the following information:

(i) Identification of each license on which the applicant wishes to bid;

(ii)(A) The applicant's name, if the applicant is an individual. If the applicant is a corporation, then the short-form application will require the name and address of the corporate office and the name and title of an officer or director. If the applicant is a partnership, then the application will require the name, citizenship and address of all general partners, and, if a partner is not a natural person, then the name and title of a responsible person should be included as well. If the applicant is a trust, then the name and address of the trustee will be required. If the applicant is none of the above, then it must identify and describe itself and its principals or other responsible persons; and

(B) Applicant ownership information, as set forth in Section 1.2112.

(iii) The identity of the person(s) authorized to make or withdraw a bid;

(iv) If the applicant applies as a designated entity pursuant to Section 1.2110, a statement to that effect and a declaration, under penalty of perjury, that the applicant is qualified as a designated entity under Section 1.2110.

(v) Certification that the applicant is legally, technically, financially and otherwise qualified pursuant to section 308(b) of the Communications Act of 1934, as amended. The Commission will accept applications certifying that a request for waiver or other relief from the requirements of section 310 is pending;

(vi) Certification that the applicant is in compliance with the foreign ownership provisions of section 310 of the Communications Act of 1934, as amended;

(vii) Certification that the applicant is and will, during the pendency of its application(s), remain in compliance with any service-specific qualifications applicable to the licenses on which the applicant intends to bid including, but not limited to, financial qualifications. The Commission may require certification in certain services that the applicant will, following grant of a license, come into compliance with certain service-specific rules, including, but not limited to, ownership eligibility limitations;

(viii) An exhibit, certified as truthful under penalty of perjury, identifying all parties with whom the applicant has entered into partnerships, joint ventures, consortia or other agreements, arrangements or understandings of any kind relating to the licenses being auctioned, including any such agreements relating to the post-auction market structure.

(ix) Certification under penalty of perjury that it has not entered and will not enter into any explicit or implicit agreements, arrangements or understandings of any kind with any parties other than those identified pursuant to paragraph (a)(2)(viii) regarding the amount of their bids, bidding strategies or the particular licenses on which they will or will not bid.

(x) Certification that the applicant is not in default on any Commission licenses and that it is not delinquent on any non-tax debt owed to any Federal agency.

Note to paragraph (a): The Commission may also request applicants to submit additional information for informational purposes to aid in its preparation of required reports to Congress.

(b) Modification and Dismissal of Short-Form Application (FCC Form 175).

(1) Any short-form application (FCC Form 175) that does not contain all of the certifications required pursuant to this section is unacceptable for filing and cannot be corrected subsequent to the applicable filing deadline. The application will be dismissed with prejudice and the upfront payment, if paid, will be returned.

(2) The Commission will provide bidders a limited opportunity to cure defects specified herein (except for failure to sign the application and to make certifications) and to resubmit a corrected application. During the resubmission period for curing defects, a short-form application may be amended or modified to cure defects identified by the Commission or to make minor amendments or modifications. After the resubmission period has ended, a short-form application may be amended or modified to make minor changes or correct minor errors in the application. Major amendments cannot be made to a short-form application after the initial filing deadline. Major amendments include changes in ownership of the applicant that would constitute an assignment or transfer of control, changes in an applicant's size which would affect eligibility for designated entity provisions, and changes in the license service areas identified on the short-form application on which the applicant intends to bid. Minor amendments include, but are not limited to, the correction of typographical errors and other minor defects not identified as major. An application will be considered to be newly

filed if it is amended by a major amendment and may not be resubmitted after applicable filing deadlines.

(3) Applicants who fail to correct defects in their applications in a timely manner as specified by public notice will have their applications dismissed with no opportunity for resubmission.

(c) Prohibition of collusion. (1) Except as provided in paragraphs (c)(2), (c)(3) and (c)(4) of this section, after the filing of short-form applications, all applicants are prohibited from cooperating, collaborating, discussing or disclosing in any manner the substance of their bids or bidding strategies, or discussing or negotiating settlement agreements, with other applicants until after the high bidder makes the required down payment, unless such applicants are members of a bidding consortium or other joint bidding arrangement identified on the bidder's short-form application pursuant to Section 1.2105(a)(2)(viii).

(2) Applicants may modify their short-form applications to reflect formation of consortia or changes in ownership at any time before or during an auction, provided such changes do not result in a change in control of the applicant, and provided that the parties forming consortia or entering into ownership agreements have not applied for licenses in any of the same geographic license areas. Such changes will not be considered major modifications of the application.

(3) After the filing of short-form applications, applicants may make agreements to bid jointly for licenses, provided the parties to the agreement have not applied for licenses in any of the same geographic license areas.

(4) After the filing of short-form applications, a holder of a non-controlling attributable interest in an entity submitting a short-form application may acquire an ownership interest in, form a consortium with, or enter into a joint bidding arrangement with, other applicants for licenses in the same geographic license area, provided that:

(i) The attributable interest holder certifies to the Commission that it has not communicated and will not communicate with any party concerning the bids or bidding strategies of more than one of the applicants in which it holds an attributable interest, or with which it has a consortium or joint bidding arrangement, and which have applied for licenses in the same geographic license area(s); and

(ii) The arrangements do not result in any change in control of an applicant; or

(iii) When an applicant has withdrawn from the auction, is no longer placing bids and has no further eligibility, a holder of a non-controlling, attributable interest in such an applicant may obtain an ownership interest in or enter into a consortium with another applicant for a license in the same geographic service area, provided that the attributable interest holder certifies to the Commission that it did not communicate with the new applicant prior to the date that the original applicant withdrew from the auction.

(5) Applicants must modify their short-form applications to reflect any changes in ownership or in membership of consortia or joint bidding arrangements.

(6) For purposes of this paragraph:

(i) The term applicant shall include all controlling interests in the entity submitting a short-form application to participate in an auction (FCC Form 175), as well as all holders of partnership and other ownership interests and any stock interest amounting to 10 percent or more of the entity, or outstanding stock, or outstanding voting stock of the entity submitting a short-form application, and all officers and directors of that entity; and

(ii) The term bids or bidding strategies shall include capital calls or requests for additional funds in support of bids or bidding strategies.

Example: Company A is an applicant in area 1. Company B and Company C each own 10 percent of Company A. Company D is an applicant in area 1, area 2, and area 3. Company C is an applicant in area 3. Without violating the Commission's Rules, Company B can enter into a consortium arrangement with Company D or acquire an ownership interest in Company D if Company B certifies either (1) that it has communicated with and will communicate neither with Company A or anyone else concerning Company A's bids or bidding strategy, nor with Company C or anyone else concerning Company C's bids or bidding strategy, or (2) that it has not communicated with and will not communicate with Company D or anyone else concerning Company D's bids or bidding strategy.

Sec. 1.2106 Submission of upfront payments.

(a) The Commission may require applicants for licenses subject to competitive bidding to submit an upfront payment. In that event, the amount of the upfront payment and the procedures for submitting it will be set forth in a Public Notice. No interest will be paid on upfront payments.

(b) Upfront payments must be made by wire transfer in U.S. dollars from a financial institution whose deposits are insured by the Federal Deposit Insurance Corporation and must be made payable to the Federal Communications Commission.

(c) If an upfront payment is not in compliance with the Commission's Rules, or if insufficient funds are tendered to constitute a valid upfront payment, the applicant shall have a limited opportunity to correct its submission to bring it up to the minimum valid upfront payment prior to the auction. If the applicant does not submit at least the minimum upfront payment, it will be ineligible to bid, its application will be dismissed and any upfront payment it has made will be returned.

(d) The upfront payment(s) of a bidder will be credited toward any down payment required for licenses on which the bidder is the high bidder. Where the upfront payment amount exceeds the required deposit of a winning bidder, the Commission may refund the excess amount after determining that no bid withdrawal penalties are owed by that bidder.

(e) In accordance with the provisions of paragraph (d), in the event a penalty is assessed pursuant to Section 1.2104 for bid withdrawal or default, upfront payments or down payments on deposit with the Commission will be used to satisfy the bid withdrawal or default penalty before being applied toward any additional payment obligations that the high bidder may have.

Sec. 1.2107 Submission of down payment and filing of long-form applications.

(a) After bidding has ended, the Commission will identify and notify the high bidder and declare the bidding closed.

(b) Unless otherwise specified by public notice, within ten (10) business days after being notified that it is a high bidder on a particular license(s), a high bidder must submit to the Commission's lockbox bank such additional funds (the "down payment") as are necessary to bring its total deposits (not including upfront payments applied to satisfy bid withdrawal or default payments) up to twenty (20) percent of its high bid(s). (In single round sealed bid auctions conducted under Section 1.2103, however, bidders may be required to submit their down payments with their bids.) Unless otherwise specified by public notice, this down payment must be made by wire transfer in U.S. dollars from a financial institution whose deposits are insured by the Federal Deposit Insurance Corporation and must be made payable to the Federal Communications Commission. Down payments will be held by the Commission until the high bidder has been awarded the license and has paid the remaining balance due on the license or authorization, in which case it will not be returned, or until the winning bidder is found unqualified to be a licensee or has defaulted, in which case it will be returned, less applicable payments. No interest on any down payment will be paid to the bidders.

(c) A high bidder that meets its down payment obligations in a timely manner must, within ten (10) business days after being notified that it is a high bidder, submit an additional application (the "long-form application") pursuant to the rules governing the service in which the applicant is the high bidder. Notwithstanding any other provision in title 47 of the Code of Federal Regulations to the contrary, high bidders need not submit an additional application filing fee with their long-form applications. Specific procedures for filing applications will be set out by Public Notice. Ownership disclosure requirements are set forth in Section 1.2112. Beginning January 1, 1999, all long-form applications must be filed electronically. An applicant that fails to submit the required long-form application under this paragraph and fails to establish good cause for any late-filed submission, shall be deemed to have defaulted and will be subject to the payments set forth in Section 1.2104.

(d) As an exhibit to its long-form application, the applicant must provide a detailed explanation of the terms and conditions and parties involved in any bidding consortia, joint venture, partnership or other agreement or arrangement it had entered into relating to the competitive bidding process prior to the time bidding was completed. Such agreements must have been entered into prior to the filing of short-form applications pursuant to Section 1.2105.

Sec. 1.2108 Procedures for filing petitions to deny against long-form applications.

(a) Where petitions to deny are otherwise provided for under the Act or the Commission's Rules, and unless other service-specific procedures for the filing of such petitions are provided for elsewhere in the Commission's Rules, the procedures in this section shall apply to the filing of petitions to deny the long-form applications of winning bidders.

(b) Within a period specified by Public Notice, and after the Commission by public notice announces that long-form applications have been accepted for filing, petitions to deny such applications may be filed. In all cases, the period for filing petitions to deny shall be no shorter than five (5) days. Any such petitions must contain allegations of fact supported by affidavit of a person or persons with personal knowledge thereof.

(c) An applicant may file an opposition to any petition to deny, and the petitioner a reply to such opposition. Allegations of fact or denials thereof must be supported by affidavit of a person or persons with personal knowledge thereof. The time for filing such oppositions shall be at least five (5) days from the filing date for petitions to deny, and the time for filing replies shall be at least five (5) days from the filing date for oppositions. The Commission may grant a license based on any long-form application that has been accepted for filing. The Commission shall in no case grant licenses earlier than seven (7) days following issuance of a public notice announcing long-form applications have been accepted for filing.

(d) If the Commission determines that:

(1) an applicant is qualified and there is no substantial and material issue of fact concerning that determination, it will grant the application.

(2) an applicant is not qualified and that there is no substantial issue of fact concerning that determination, the Commission need not hold an evidentiary hearing and will deny the application.

(3) substantial and material issues of fact require a hearing, it will conduct a hearing. The Commission may permit all or part of the evidence to be submitted in written form and may permit employees other than administrative law judges to preside at the taking of written evidence. Such hearing will be conducted on an expedited basis.

Sec. 1.2109 License grant, denial, default, and disqualification.

(a) Unless otherwise specified by public notice, auction winners are required to pay the balance of their winning bids in a lump sum within ten (10) business days following the release of a public notice establishing the payment deadline. If a winning bidder fails to pay the balance of its winning bids in a lump sum by the applicable deadline as specified by the Commission, it will be allowed to make payment within ten (10) business days after the payment deadline, provided that it also pays a late fee equal to five percent of the amount due. When a winning bidder fails to pay the balance of its winning bid by the late payment deadline, it is considered to be in default on its license(s) and subject to the applicable default payments. Licenses will be awarded upon the full and timely payment of winning bids and any applicable late fees.

(b) If a winning bidder withdraws its bid after the Commission has declared competitive bidding closed or fails to remit the required down payment within ten (10) business days after the Commission has declared competitive bidding closed, the bidder will be deemed to have defaulted, its application will be dismissed, and it will be liable for the default payment specified in Section 1.2104(g)(2). In such event, the Commission, at its discretion, may either re-auction the license to existing or new applicants or offer it to the other highest bidders (in descending order) at their final bids. The down payment obligations set forth in Section 1.2107(b) will apply.

(c) A winning bidder who is found unqualified to be a licensee, fails to remit the balance of its winning bid in a timely manner, or defaults or is disqualified for any reason after having made the required down payment, will be deemed to have defaulted and will be liable for the payment set forth in Section 1.2104(g)(2). In such event, the Commission may either re-auction the license to existing or new applicants or offer it to the other highest bidders (in descending order) at their final bids.

(d) Bidders who are found to have violated the antitrust laws or the Commission's Rules in connection with their participation in the competitive bidding process may be subject, in addition to any other applicable sanctions, to forfeiture of their upfront payment, down payment or full bid amount, and may be prohibited from participating in future auctions.

Sec. 1.2110 Designated entities.

(a) Designated entities are small businesses, businesses owned by members of minority groups and/or women, and rural telephone companies.

(b) Definitions. (1) Small businesses. The Commission will establish the definition of a small business on a service-specific basis, taking into consideration the characteristics and capital requirements of the particular service.

(2) Businesses owned by members of minority groups and/or women. Unless otherwise provided in rules governing specific services, a business owned by members of minority groups and/or women is one in which minorities and/or women who are U.S. citizens control the applicant, have at least 50.1 percent equity ownership and, in the case of a corporate applicant, a 50.1 percent voting interest. For applicants that are partnerships, every general partner either must be a minority and/or woman (or minorities and/or women) who are U.S. citizens and who individually or together own at least 50.1 percent of the partnership equity, or an entity that is 100 percent owned and controlled by minorities and/or women who are U.S. citizens. The interests of minorities and women are to be calculated on a fully-diluted basis; agreements such as stock options and convertible debentures shall be considered to have a present effect on the power to control an entity and shall be treated as if the rights thereunder already have been fully exercised. However, upon a demonstration that options or conversion rights held by non-controlling principals will not deprive the minority and female principals of a substantial financial stake in the venture or impair their rights to control the designated entity, a designated entity may seek a waiver of the requirement that the equity of the minority and female principals must be calculated on a fully-diluted basis. The term minority includes individuals of African American, Hispanic-surnamed, American Eskimo, Aleut, American Indian and Asian American extraction.

(3) Rural telephone companies. A rural telephone company is any local exchange carrier operating entity to the extent that such entity--

(i) provides common carrier service to any local exchange carrier study area that does not include either

(A) any incorporated place of 10,000 inhabitants or more, or any part thereof, based on the most recently available population statistics of the Bureau of the Census, or

(B) any territory, incorporated or unincorporated, included in an urbanized area, as defined by the Bureau of the Census as of August 10, 1993;

(ii) provides telephone exchange service, including exchange access, to fewer than 50,000 access lines;

(iii) provides telephone exchange service to any local exchange carrier study area with fewer than 100,000 access lines; or

(iv) has less than 15 percent of its access lines in communities of more than 50,000 on the date of enactment of the Telecommunications Act of 1996.

(4) Affiliate.

(i) An individual or entity is an affiliate of an applicant or of a person holding an attributable interest in an applicant if such individual or entity--

(A) Directly or indirectly controls or has the power to control the applicant, or

(B) Is directly or indirectly controlled by the applicant, or

(C) Is directly or indirectly controlled by a third party or parties that also controls or has the power to control the applicant, or

(D) Has an "identity of interest" with the applicant.

(ii) Nature of control in determining affiliation.

(A) Every business concern is considered to have one or more parties who directly or indirectly control or have the power to control it. Control may be affirmative or negative and it is immaterial whether it is exercised so long as the power to control exists.

Example. An applicant owning 50 percent of the voting stock of another concern would have negative power to control such concern since such party can block any action of the other stockholders. Also, the bylaws of a corporation may permit a stockholder with less than 50 percent of the voting stock to block any actions taken by the other stockholders in the other entity. Affiliation exists when the applicant has the power to control a concern while at the same time another person, or persons, are in control of the concern at the will of the party or parties with the power to control.

(B) Control can arise through stock ownership; occupancy of director, officer or key employee positions; contractual or other business relations; or combinations of these and other factors. A key employee is an employee who, because of his/her position in the concern, has a critical influence in or substantive control over the operations or management of the concern.

(C) Control can arise through management positions where a concern's voting stock is so widely distributed that no effective control can be established.

Example. In a corporation where the officers and directors own various size blocks of stock totaling 40 percent of the corporation's voting stock, but no officer or director has a block sufficient to give him or her control or the power to control and the remaining 60 percent is widely distributed with no individual stockholder having a stock interest greater than 10 percent, management has the power to control. If persons with such management control of the other entity are persons with attributable interests in the applicant, the other entity will be deemed an affiliate of the applicant.

(iii) Identity of interest between and among persons. Affiliation can arise between or among two or more persons with an identity of interest, such as members of the same family or persons with common investments. In determining if the applicant controls or has the power to control a concern, persons with an identity of interest will be treated as though they were one person.

Example. Two shareholders in Corporation Y each have attributable interests in the same PCS application. While neither shareholder has enough shares to individually control Corporation Y, together they have the power to control Corporation Y. The two shareholders with these common investments (or identity in interest) are treated as though they are one person and Corporation Y would be deemed an affiliate of the applicant.

(A) Spousal affiliation. Both spouses are deemed to own or control or have the power to control interests owned or controlled by either of them, unless they are subject to a legal separation recognized by a court of competent jurisdiction in the United States. In calculating their net worth, investors who are legally separated must include their share of interests in property held jointly with a spouse.

(B) Kinship affiliation. Immediate family members will be presumed to own or control or have the power to control interests owned or controlled by other immediate family members. In this context "immediate family member" means father, mother, husband, wife, son, daughter, brother, sister, father- or mother-in-law, son- or daughter-in-law, brother- or sister-in-law, step-father or -mother, step-brother or -sister, step-son or -daughter, half brother or sister. This presumption may be rebutted by showing that the family members are estranged, the family ties are remote, or the family members are not closely involved with each other in business matters.

Example. A owns a controlling interest in Corporation X. A's sister-in-law, B, has an attributable interest in a PCS application. Because A and B have a presumptive kinship affiliation, A's interest in Corporation Y is attributable to B, and thus to the applicant, unless B rebuts the presumption with the necessary showing.

(iv) Affiliation through stock ownership.

(A) An applicant is presumed to control or have the power to control a concern if he or she owns or controls or has the power to control 50 percent or more of its voting stock.

(B) An applicant is presumed to control or have the power to control a concern even though he or she owns, controls or has the power to control less than 50 percent of the concern's voting stock, if the block of stock he or she owns, controls or has the power to control is large as compared with any other outstanding block of stock.

(C) If two or more persons each owns, controls or has the power to control less than 50 percent of the voting stock of a concern, such minority holdings are equal or approximately equal in size, and the aggregate of these minority holdings is large as compared with any other stock holding, the presumption arises that each one of these persons individually controls or has the power to control the concern; however, such presumption may be rebutted by a showing that such control or power to control, in fact, does not exist.

(v) Affiliation arising under stock options, convertible debentures, and agreements to merge. Stock options, convertible debentures, and agreements to merge (including agreements in principle) are generally considered to have a present effect on the power to control the concern. Therefore, in making a size determination, such options, debentures, and agreements are generally treated as though the rights held thereunder had been exercised. However, an affiliate cannot use such options and debentures to appear to terminate its control over another concern before it actually does so.

Example 1. If company B holds an option to purchase a controlling interest in company A, who holds an attributable interest in a PCS application, the situation is treated as though company B had exercised its rights and had come owner of a controlling interest in company A. The gross revenues of company B must be taken into account in determining the size of the applicant.

Example 2. If a large company, BigCo, holds 70% (70 of 100 outstanding shares) of the voting stock of company A, who holds an attributable interest in a PCS application, and gives a third party, SmallCo, an option to purchase 50 of the 70 shares owned by BigCo,

BigCo will be deemed to be an affiliate of company A, and thus the applicant, until SmallCo actually exercises its option to purchase such shares. In order to prevent BigCo from circumventing the intent of the rule which requires such options to be considered on a fully diluted basis, the option is not considered to have present effect in this case.

Example 3. If company A has entered into an agreement to merge with company B in the future, the situation is treated as though the merger has taken place.

(vi) Affiliation under voting trusts.

(A) Stock interests held in trust shall be deemed controlled by any person who holds or shares the power to vote such stock, to any person who has the sole power to sell such stock, and to any person who has the right to revoke the trust at will or to replace the trustee at will.

(B) If a trustee has a familial, personal or extra-trust business relationship to the grantor or the beneficiary, the stock interests held in trust will be deemed controlled by the grantor or beneficiary, as appropriate.

(C) If the primary purpose of a voting trust, or similar agreement, is to separate voting power from beneficial ownership of voting stock for the purpose of shifting control of or the power to control a concern in order that such concern or another concern may meet the Commission's size standards, such voting trust shall not be considered valid for this purpose regardless of whether it is or is not recognized within the appropriate jurisdiction.

(vii) Affiliation through common management. Affiliation generally arises where officers, directors, or key employees serve as the majority or otherwise as the controlling element of the board of directors and/or the management of another entity.

(viii) Affiliation through common facilities. Affiliation generally arises where one concern shares office space and/or employees and/or other facilities with another concern, particularly where such concerns are in the same or related industry or field of operations, or where such concerns were formerly affiliated, and through these sharing arrangements one concern has control, or potential control, of the other concern.

(ix) Affiliation through contractual relationships. Affiliation generally arises where one concern is dependent upon another concern for contracts and business to such a degree that one concern has control, or potential control, of the other concern.

(x) Affiliation under joint venture arrangements.

(A) A joint venture for size determination purposes is an association of concerns and/or individuals, with interests in any degree or proportion, formed by contract, express or implied, to engage in and carry out a single, specific business venture for joint profit for which purpose they combine their efforts, property, money, skill and knowledge, but not on a continuing or permanent basis for conducting business generally. The determination whether an entity is a joint venture is based upon the facts of the business operation, regardless of how the business operation may be designated by the parties involved. An agreement to share profits/losses proportionate to each party's contribution to the business operation is a significant factor in determining whether the business operation is a joint venture.

(B) The parties to a joint venture are considered to be affiliated with each other. Nothing in this subsection shall be construed to define a small business consortium, for purposes of determining status as a designated entity, as a joint venture under attribution standards provided in this section.

(xi) Exclusion from affiliation coverage. For purposes of this section, Indian tribes or Alaska Regional or Village Corporations organized pursuant to the Alaska Native Claims

Settlement Act (43 U.S.C. 1601 et seq.), or entities owned and controlled by such tribes or corporations, are not considered affiliates of an applicant (or licensee) that is owned and controlled by such tribes, corporations or entities, and that otherwise complies with the requirements of this section, except that gross revenues derived from gaming activities conducted by affiliate entities pursuant to the Indian Gaming Regulatory Act (25 U.S.C. 2701 et seq.) will be counted in determining such applicant's (or licensee's) compliance with the financial requirements of this section, unless such applicant establishes that it will not receive a substantial unfair competitive advantage because significant legal constraints restrict the applicant's ability to access such gross revenues.

(c) The Commission may set aside specific licenses for which only eligible designated entities, as specified by the Commission, may bid.

(d) The Commission may permit partitioning of service areas in particular services for eligible designated entities.

(e) Bidding credits.

(1) The Commission may award bidding credits (*i. e.*, payment discounts) to eligible designated entities. Competitive bidding rules applicable to individual services will specify the designated entities eligible for bidding credits, the licenses for which bidding credits are available, the amounts of bidding credits and other procedures.

(2) Size of bidding credits. A winning bidder that qualifies as a small business or a consortium of small businesses may use the following bidding credits corresponding to their respective average gross revenues for the preceding 3 years:

(i) Businesses with average gross revenues for the preceding years, 3 years not exceeding \$3 million are eligible for bidding credits of 35 percent;

(ii) Businesses with average gross revenues for the preceding years, 3 years not exceeding \$15 million are eligible for bidding credits of 25 percent; and

(iii) Businesses with average gross revenues for the preceding years, 3 years not exceeding \$40 million are eligible for bidding credits of 15 percent.

(f) Installment payments. The Commission may permit small businesses (including small businesses owned by women, minorities, or rural telephone companies that qualify as small businesses) and other entities determined to be eligible on a service-specific basis, which are high bidders for licenses specified by the Commission, to pay the full amount of their high bids in installments over the term of their licenses pursuant to the following:

(1) Unless otherwise specified by public notice, each eligible applicant paying for its license(s) on an installment basis must deposit by wire transfer in the manner specified in Section 1.2107(b) sufficient additional funds as are necessary to bring its total deposits to ten (10) percent of its winning bid(s) within ten (10) days after the Commission has declared it the winning bidder and closed the bidding. Failure to remit the required payment will make the bidder liable to pay a default payment pursuant to Section 1.2104(g)(2).

(2) Within ten (10) days of the conditional grant of the license application of a winning bidder eligible for installment payments, the licensee shall pay another ten (10) percent of the high bid, thereby commencing the eligible licensee's installment payment plan. If a winning bidder eligible for installment payments fails to submit this additional ten (10) percent of its high bid by the applicable deadline as specified by the Commission, it will be allowed to make payment within ten (10) business days after the payment deadline, provided that it also pays a late fee equal to five percent of the amount due. When a winning bidder eligible for installment payments fails to submit this additional ten (10) percent of its winning bid, plus

the late fee, by the late payment deadline, it is considered to be in default on its license(s) and subject to the applicable default payments. Licenses will be awarded upon the full and timely payment of second down payments and any applicable late fees.

(3) Upon grant of the license, the Commission will notify each eligible licensee of the terms of its installment payment plan and that it must execute a promissory note and security agreement as a condition of the installment payment plan. Unless other terms are specified in the rules of particular services, such plans will:

(i) Impose interest based on the rate of U.S. Treasury obligations (with maturities closest to the duration of the license term) at the time of licensing;

(ii) Allow installment payments for the full license term;

(iii) Begin with interest-only payments for the first two years; and

(iv) Amortize principal and interest over the remaining term of the license.

(4) A license granted to an eligible entity that elects installment payments shall be conditioned upon the full and timely performance of the licensee's payment obligations under the installment plan.

(i) Any licensee that fails to submit payment on an installment obligation will automatically have an additional ninety (90) days in which to submit its required payment without being considered delinquent. Any licensee making its required payment during this period will be assessed a late payment fee equal to five percent (5%) of the amount of the past due payment. Late fees assessed under this paragraph will accrue on the next business day following the payment due date. Payments made at the close of any grace period will first be applied to satisfy any lender advances as required under each licensee's "Note and Security Agreement." Afterwards, payments will be applied in the following order: late charges, interest charges, principal payments.

(ii) If any licensee fails to make the required payment at the close of the 90-day period set forth in paragraph (i) of this section, the licensee will automatically be provided with a subsequent 90-day grace period, except that no subsequent automatic grace period will be provided for payments from C or F block licensees that are not made within 90 days of the payment resumption date for those licensees, as explained in Amendment of the Commission's Rules Regarding Installment Payment Financing for Personal Communications Services (PCS) Licensees, Order on Reconsideration of the Second Report and Order, WT Docket No. 97-82, FCC 98-46 (rel. Mar. 24, 1998). Any licensee making a required payment during this subsequent period will be assessed a late payment fee equal to ten percent (10%) of the amount of the past due payment.

Licensees shall not be required to submit any form of request in order to take advantage of the initial 90-day non-delinquency period and subsequent automatic 90-day grace period. All licensees that avail themselves of the automatic grace period must pay the required late fee(s), all interest accrued during the non-delinquency and grace periods, and the appropriate scheduled payment with the first payment made following the conclusion of the grace period.

(iii) If an eligible entity making installment payments is more than one hundred and eighty (180) days delinquent in any payment, it shall be in default, except that C and F block licensees shall be in default if their payment due on the payment resumption date, referenced in paragraph (f)(4)(ii) of this section, is more than ninety (90) days delinquent.

(iv) Any eligible entity that submits an installment payment after the due date but fails to pay any late fee, interest or principal at the close of the 90-day non-delinquency period and subsequent automatic grace period, if such a grace period is available, will be declared in

default, its license will automatically cancel, and will be subject to debt collection procedures.

(g) The Commission may establish different upfront payment requirements for categories of designated entities in competitive bidding rules of particular auctionable services.

(h) The Commission may offer designated entities a combination of the available preferences or additional preferences.

(i) Designated entities must describe on their long-form applications how they satisfy the requirements for eligibility for designated entity status, and must list and summarize on their long-form applications all agreements that effect designated entity status, such as partnership agreements, shareholder agreements, management agreements and other agreements, including oral agreements, which establish that the designated entity will have both *de facto* and *de jure* control of the entity. Such information must be maintained at the licensee's facilities or by their designated agents for the term of the license in order to enable the Commission to audit designated entity eligibility on an ongoing basis.

(j) The Commission may, on a service-specific basis, permit consortia, each member of which individually meets the eligibility requirements, to qualify for any designated entity provisions.

(k) The Commission may, on a service-specific basis, permit publicly-traded companies that are owned by members of minority groups or women to qualify for any designated entity provisions.

(l) Audits.

(1) Applicants and licensees claiming eligibility under this section shall be subject to audits by the Commission, using in-house and contract resources. Selection for audit may be random, on information, or on the basis of other factors.

(2) Consent to such audits is part of the certification included in the short-form application (FCC Form 175). Such consent shall include consent to the audit of the applicant's or licensee's books, documents and other material (including accounting procedures and practices) regardless of form or type, sufficient to confirm that such applicant's or licensee's representations are, and remain, accurate. Such consent shall include inspection at all reasonable times of the facilities, or parts thereof, engaged in providing and transacting business, or keeping records regarding FCC-licensed service and shall also include consent to the interview of principals, employees, customers and suppliers of the applicant or licensee.

(m) Gross revenues. Gross revenues shall mean all income received by an entity, whether earned or passive, before any deductions are made for costs of doing business (*e.g.*, cost of goods sold), as evidenced by audited financial statements for the relevant number of most recently completed calendar years or, if audited financial statements were not prepared on a calendar-year basis, for the most recently completed fiscal years preceding the filing of the applicant's short-form (FCC Form 175). If an entity was not in existence for all or part of the relevant period, gross revenues shall be evidenced by the audited financial statements of the entity's predecessor-in-interest or, if there is no identifiable predecessor-in-interest, unaudited financial statements certified by the applicant as accurate. When an applicant does not otherwise use audited financial statements, its gross revenues may be certified by its chief financial officer or its equivalent and must be prepared in accordance with Generally Accepted Accounting Principles.

Sec. 1.2111 Assignment or transfer of control: unjust enrichment.

(a) Reporting requirement. An applicant seeking approval for a transfer of control or assignment (otherwise permitted under the Commission's Rules) of a license within three years of receiving a new license through a competitive bidding procedure must, together with its application for transfer of control or assignment, file with the Commission's statement indicating that its license was obtained through competitive bidding. Such applicant must also file with the Commission the associated contracts for sale, option agreements, management agreements, or other documents disclosing the local consideration that the applicant would receive in return for the transfer or assignment of its license. This information should include not only a monetary purchase price, but also any future, contingent, in-kind, or other consideration (*e.g.*, management or consulting contracts either with or without an option to purchase; below market financing).

(b) Unjust enrichment payment: set-aside. As specified in this paragraph an applicant seeking approval for a transfer of control or assignment (otherwise permitted under the Commission's Rules) of a license acquired by the transferor or assignor pursuant to a set-aside for eligible designated entities under Section 1.2110(c), or who proposes to take any other action relating to ownership or control that will result in loss of status as an eligible designated entity, must seek Commission approval and may be required to make an unjust enrichment payment (Payment) to the Commission by cashier's check or wire transfer before consent will be granted. The Payment will be based upon a schedule that will take account of the term of the license, any applicable construction benchmarks, and the estimated value of the set-aside benefit, which will be calculated as the difference between the amount paid by the designated entity for the license and the value of comparable non-set-aside license in the free market at the time of the auction. The Commission will establish the amount of the Payment and the burden will be on the applicants to disprove this amount. No payment will be required if:

(1) The license is transferred or assigned more than five years after its initial issuance, unless otherwise specified; or

(2) The proposed transferee or assignee is an eligible designated entity under Section 1.2110(c) or the service-specific competitive bidding rules of the particular service, and so certifies.

(c) Unjust enrichment payment: installment financing.

(1) If a licensee that utilizes installment financing under this section seeks to assign or transfer control of its license to an entity not meeting the eligibility standards for installment payments, the licensee must make full payment of the remaining unpaid principal and any unpaid interest accrued through the date of assignment or transfer as a condition of approval.

(2) If a licensee that utilizes installment financing under this section seeks to make any change in ownership structure that would result in the licensee losing eligibility for installment payments, the licensee shall first seek Commission approval and must make full payment of the remaining unpaid principal and any unpaid interest accrued through the date of such change as a condition of approval. A licensee's (or other attributable entity's) increased gross revenues or increased total assets due to nonattributable equity investments, debt financing, revenue from operations or other investments, business development or expanded service shall not be considered to result in the licensee losing eligibility for installment payments.

(3) If a licensee seeks to make any change in ownership that would result in the licensee qualifying for a less favorable installment plan under this section, the licensee shall seek Commission approval and must adjust its payment plan to reflect its new eligibility status. A licensee may not switch its payment plan to a more favorable plan.

(d) Unjust enrichment payment: bidding credits. (1) A licensee that utilizes a bidding credit, and that during the initial term seeks to assign or transfer control of a license to an entity that does not meet the eligibility criteria for a bidding credit, will be required to reimburse the U.S. Government for the amount of the bidding credit, plus interest based on the rate for ten year U.S. Treasury obligations applicable on the date the license was granted, as a condition of Commission approval of the assignment or transfer. If, within the initial term of the license, a licensee that utilizes a bidding credit seeks to assign or transfer control of a license to an entity that is eligible for a lower bidding credit, the difference between the bidding credit obtained by the assigning party and the bidding credit for which the acquiring party would qualify, plus interest based on the rate for ten year U.S. Treasury obligations applicable on the date the license is granted, must be paid to the U.S. Government as a condition of Commission approval of the assignment or transfer. If, within the initial term of the license, a licensee that utilizes a bidding credit seeks to make any ownership change that would result in the licensee losing eligibility for a bidding credit (or qualifying for a lower bidding credit), the amount of the bidding credit (or the difference between the bidding credit originally obtained and the bidding credit for which the restructured licensee would qualify), plus interest based on the rate for ten year U.S. Treasury obligations applicable on the date the license is granted, must be paid to the U.S. Government as a condition of Commission approval of the assignment or transfer.

(2) Payment schedule.

(i) The amount of payments made pursuant to paragraph (d)(1) of this section will be reduced over time as follows:

(A) A transfer in the first two years of the license term will result in a forfeiture of 100 percent of the value of the bidding credit (or in the case of very small businesses transferring to small businesses, 100 percent of the difference between the bidding credit received by the former and the bidding credit for which the latter is eligible);

(B) A transfer in year 3 of the license term will result in a forfeiture of 75 percent of the value of the bidding credit;

(C) A transfer in year 4 of the license term will result in a forfeiture of 50 percent of the value of the bidding credit;

(D) A transfer in year 5 of the license term will result in a forfeiture of 25 percent of the value of the bidding credit; and

(E) for a transfer in year 6 or thereafter, there will be no payment.

(ii) These payments will have to be paid to the United States Treasury as a condition of approval of the assignment, transfer, or ownership change.

(e) Unjust enrichment: partitioning and disaggregation.

(1) Installment payments. Licensees making installment payments, that partition their licenses or disaggregate their spectrum to entities not meeting the eligibility standards for installment payments, will be subject to the provisions concerning unjust enrichment as set forth in this section.

(2) Bidding credits. Licensees that received a bidding credit that partition their licenses or disaggregate their spectrum to entities not meeting the eligibility standards for such a bidding

credit, will be subject to the provisions concerning unjust enrichment as set forth in this section.

(3) Apportioning unjust enrichment payments. Unjust enrichment payments for partitioned license areas shall be calculated based upon the ratio of the population of the partitioned license area to the overall population of the license area and by utilizing the most recent census data. Unjust enrichment payments for disaggregated spectrum shall be calculated based upon the ratio of the amount of spectrum disaggregated to the amount of spectrum held by the licensee.

Sec. 1.2112 Ownership disclosure requirements for short- and long-form applications.

(a) Each application for a license or authorization or for consent to assign or transfer control of a license or authorization shall disclose fully the real party or parties in interest and must include in an exhibit the following information:

(1) A list of any FCC-regulated business 10 percent or more of whose stock, warrants, options or debt securities are owned by the applicant or an officer, director, attributable stockholder or key management personnel of the applicant. This list must include a description of each such business' principal business and a description of each such business' relationship to the applicant;

(2) A list of any party holding a 10 percent or greater interest in the applicant, including the specific amount of the interest;

(3) A list of any party holding a 10 percent or greater interest in any entity holding or applying for any FCC-regulated business in which a 10 percent or more interest is held by another party which holds a 10 percent or more interest in the applicant (*e.g.*, If company A owns 10 percent of Company B (the applicant) and 10 percent of Company C then Companies A and C must be listed on Company B's application);

(4) A list of the names, addresses, and citizenship of any party holding 10 percent or more of each class of stock, warrants, options or debt securities together with the amount and percentage held;

(5) A list of the names, addresses, and citizenship of all controlling interests of the applicants, as set forth in Section 1.2110;

(6) In the case of a general partnership, the name, address and citizenship of each partner, and the share or interest participation in the partnership;

(7) In the case of a limited partnership, the name, address and citizenship of each limited partner whose interest in the applicant is equal to or greater than 10 percent (as calculated according to the percentage of equity paid in and the percentage of distribution of profits and losses);

(8) In the case of a limited liability corporation, the name, address and citizenship of each of its members; and

(9) A list of all parties holding indirect ownership interests in the applicant, as determined by successive multiplication of the ownership percentages for each link in the vertical ownership chain, that equals 10 percent or more of the applicant, except that if the ownership percentage for an interest in any link in the chain exceeds 50 percent or represents actual control, it shall be treated and reported as if it were a 100 percent interest.

(b) In addition to the information required under paragraph (a) of this section, each applicant for a license or authorization claiming status as a small business shall, as an exhibit to its long-form application:

(1) Disclose separately and in the aggregate the gross revenues, computed in accordance with Section 1.2110, for each of the following: the applicant and its affiliates, the applicant's attributable investors, affiliates of its attributable investors, and, if a consortium of small businesses, the members comprising the consortium;

(2) List and summarize all agreements or instruments (with appropriate references to specific provisions in the text of such agreements and instruments) that support the applicant's eligibility as a small business under the applicable designated entity provisions, including the establishment of *de facto* and *de jure* control; such agreements and instruments include articles of incorporation and bylaws, shareholder agreements, voting or other trust agreements, franchise agreements, and any other relevant agreements (including letters of intent), oral or written; and

(3) List and summarize any investor protection agreements, including rights of first refusal, supermajority clauses, options, veto rights, and rights to hire and fire employees and to appoint members to boards of directors or management committees.

Sec. 1.2113 Construction prior to grant of application.

Subject to the provisions of this section, applicants for licenses awarded by competitive bidding may construct facilities to provide service prior to grant of their applications, but must not operate such facilities until the FCC grants an authorization. If the conditions stated in this section are not met, applicants must not begin to construct facilities for licenses subject to competitive bidding.

(a) When applicants may begin construction. An applicant may begin construction of a facility upon release of the Public Notice listing the post-auction long-form application for that facility as acceptable for filing.

(b) Notification to stop. If the FCC for any reason determines that construction should not be started or should be stopped while an application is pending, and so notifies the applicant, orally (followed by written confirmation) or in writing, the applicant must not begin construction or, if construction has begun, must stop construction immediately.

(c) Assumption of risk. Applicants that begin construction pursuant to this section before receiving an authorization do so at their own risk and have no recourse against the United States for any losses resulting from:

(1) Applications that are not granted;

(2) Errors or delays in issuing public notices;

(3) Having to alter, relocate or dismantle the facility; or,

(4) Incurring whatever costs may be necessary to bring the facility into compliance with applicable laws, or FCC rules and orders.

(d) Conditions. Except as indicated, all pre-grant construction is subject to the following conditions:

(1) The application does not include a request for a waiver of one or more FCC rules;

(2) For any construction or alteration that would exceed the requirements of Section 17.7 of this chapter, the licensee has notified the appropriate Regional Office of the Federal Aviation Administration (FAA Form 7460-I), filed a request for antenna height clearance and obstruction marking and lighting specifications (FCC Form 854) with the FCC, PRB, Support Services Branch, Gettysburg, PA 17325;

(3) The applicant has indicated in the application that the proposed facility would not have a significant environmental effect, in accordance with Sections 1.1301 through 1.1319;

(4) Under applicable international agreements and rules in this part, individual coordination of the proposed channel assignment(s) with a foreign administration is not required; and

(5) Any service-specific restrictions not listed herein.

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The following documents can be found at an FCC web site:

<http://www.fcc.gov/wtb/auctions/collusio/collusio.html>

*Items with an asterisk are reproduced in this Bidder Information Package.

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Memorandum Opinion and Order, FCC 94-295, 9 FCC Rcd. 7684 (1994), 59 Fed. Reg. 64159 (Dec. 13, 1994).

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D. Summary listing of documents from the Commission and the Wireless Telecommunications Bureau addressing application of the anti-collusion rules

To date, discussion concerning the anti-collusion rules may be found in the following Commission and Bureau documents:

The following documents can be found at an FCC web site:
<http://www.fcc.gov/wtb/auctions/collusio/collusio.html>

Commission Decisions:

Second Report and Order in PP Docket No. 93-253, FCC 94-61, 9 FCC Rcd. 2348, 2386-2388 (1994), paragraphs 221-226.

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Letters from the Office of General Counsel and the Wireless Telecommunications Bureau:

Letter to Gary M. Epstein and James H. Barker from William E. Kennard, General Counsel, Federal Communications Commission (released October 25, 1994).

Letter to Alan F. Ciamporzero from William E. Kennard, General Counsel, Federal Communications Commission (released October 25, 1996).

Letter to R. Michael Senkowski from Rosalind K. Allen, Acting Chief, Commercial Radio Division, Wireless Telecommunications Bureau (released December 1, 1994).

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NOTE: Many of these documents can be retrieved from the FCC web site (<http://www.fcc.gov>), where documents may be located by using our search engine (select the link "search"). All of these documents can be ordered in hard copy from the Commission's contractor, International Transcription Service, Inc. at 202-857-3800.

Documents retrieved from the FCC web site are available in more than one format: .pdf, .txt, and .wp. (The key to the extensions is the following: .pdf = Acrobat Reader, .txt = Text, and .wp = Word Perfect.) In order to review a document in its entirety, including footnotes, it is necessary to access the document in Word Perfect or Acrobat Reader.