BUILDING A SPECTRUM AUCTION SYSTEM
NONPACKAGEBIDDING

1995 FIRST AUCTION
BID ENTRY CHANGES
NEW BID INCREMENT CALCS
WEB BASED BIDDING
ANNOUNCE
AUCTION 31
DESIGN

1995 FIRST
AUCTION

BID ENTRY
CHANGES

NEW BID
INCREMENT
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WEB BASED
BIDDING

NON-PACKAGE BIDDING

TIE
BREAKING

SMOOTHED
ANCHORING
PRICING

CORE
REDESIGN

PACKAGE BIDDING
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INTEGRATED SPECTRUM AUCTION SYSTEM

PACKAG EBIDDING

ISAS
ISAS PACKAGE
BIDDING
AUCTION
DESIGN
## Auction Mechanism

<table>
<thead>
<tr>
<th>ISAS</th>
<th>AUCTION 51</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Simultaneous Multiple Round</td>
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</tr>
<tr>
<td>• Activity and Eligibility Rules</td>
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</tr>
</tbody>
</table>
| • Closing Rules:  
  • Discretionary  
  • 1 or 2 Round Simultaneous | • Closing Rule:  
  • 2 Round Simultaneous |
Package Creation

**ISAS**

- Bidders can create any combination of two or more items subject to:
  - Items were selected on application form
  - Current eligibility

- Bidders can create a similar package from one of its existing packages

**AUCTION 51**

- Bidders can create any combination of two or more items subject to:
  - Items were selected on application form
  - Current eligibility
### Bidding Language

<table>
<thead>
<tr>
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</table>
| • XOR  
  • *All* bids of a bidder are mutually exclusive | • XOR of OR  
  – Bids of a bidder are mutually exclusive **between rounds** |
| • A bidder can win *at most one* of its bids | • A bidder can win any non-overlapping combination of bids placed in the same round |
Minimum Acceptable Bids

**ISAS**

- Minimum opening bid amount if not bid on
- MAB of an individual item is its *current price* plus a percentage
- MAB percentage calculated using smoothing
- MAB of a package is the sum of the MABs of the items in the package
- Fixed MAB percentage for global package (optional)

**AUCTION 51**

- The MAB of an item or package is the greater of:
  - Minimum opening bid amount of the item/package
  - Bidder’s previous high bid on the item/package plus x%
  - Current price estimate of the item/package plus z%
- CPE of a package is the sum of the CPEs of the items in the package
- Fixed MAB percentage for global package (optional)
## Increment Bids

### ISAS
- Variable number of increment bid amounts allowed
- Increment calculated as a fixed percentage of the MAB
- Increment bid amounts calculated as MAB + k*increment

### AUCTION 51
- Variable number of increment bid amounts allowed
- Increment calculated as a fixed percentage of the MAB
- Increment bid amounts calculated as MAB + k*increment
### Placing Bids

<table>
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<tr>
<th><strong>ISAS</strong></th>
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<tbody>
<tr>
<td>• Click-box</td>
<td>• Click-box</td>
</tr>
<tr>
<td>• Simultaneous submission</td>
<td>• Simultaneous submission</td>
</tr>
<tr>
<td>• Limited by current eligibility</td>
<td>• Limited by current eligibility</td>
</tr>
<tr>
<td>• Bid removals allowed within the same round</td>
<td>• Bid removals allowed within the same round</td>
</tr>
<tr>
<td>• Bid import function</td>
<td></td>
</tr>
</tbody>
</table>
## Activity Calculations

### ISAS

- Maximum bidding units a bidder can win considering:
  - Current provisionally winning bids
  - New bids made in the round
  - Old bids where the previous bid amount is ≥ to the current MAB

- Calculation requires a sort

### AUCTION 51

- Maximum bidding units a bidder can win considering:
  - Current provisionally winning bids
  - New bids made in the round
  - Renewed provisionally winning bids

- Calculation requires an optimization problem to be solved
### Activity Reqs & Waivers

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<tr>
<td>• Required activity calculated each round as a fraction of the bidder’s current eligibility</td>
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</tr>
<tr>
<td>• Waivers can be applied either proactively or automatically or both</td>
<td>• Waivers applied automatically</td>
</tr>
</tbody>
</table>
### Eligibility Reduction

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<tbody>
<tr>
<td>• Bidder’s not meeting required activity will have their eligibility reduced</td>
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</tr>
<tr>
<td>• Bidder’s can elect to reduce their eligibility</td>
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</tr>
<tr>
<td>• Reduced eligibility is calculated to bring a bidder in to compliance with its activity requirement</td>
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</table>
System Parameters

**ISAS**
- Number of packages created
- Number of bids submitted in a round
- Number of considered bids in the auction
  - Limits number of combinations that can be bid on but not the number of bids placed

**AUCTION 51**
- Number of packages created
Provisionally Winning Bids

ISAS

- Considered bids:
  - For each bidder, the highest bid made on each of its items/packages
  - FCC bids on each item
- Maximize revenue subject to constraints
- Ties broken randomly using selection numbers
- No withdrawals

AUCTION 51

- Considered bids:
  - For each bidder, all bids made in the auction
  - FCC bids on each item
- Maximize revenue subject to constraints
- Ties broken randomly using selection numbers
- No withdrawals
# Last and Best Bids

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<tr>
<td>• No provision for last and best bids</td>
<td>• Two sets of last and best bids</td>
</tr>
<tr>
<td></td>
<td>• Last and best bid sets are mutually exclusive</td>
</tr>
<tr>
<td></td>
<td>• Etc...</td>
</tr>
</tbody>
</table>
Ideas for Enhancements

- Interface customization
- Sophisticated system help
- Package creation tool
- Bidding tool
- Final proxy round