



Federal Communications Commission: All About Auctions

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**Federal Communications Commission
Wireless Telecommunications Bureau**

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If you have any questions about the FCC auctions process, please contact the Auctions and Industry Analysis Division, FCC at 418-0660.

Electronic Simultaneous Multiple . . . What?!

Auctions Explained

The Commission's auctions of electromagnetic spectrum assign licenses using a unique auction methodology called "electronic simultaneous multiple-round auctions." A simultaneous multiple-round auction is similar to a traditional auction, except that, rather than selling licenses one at a time, a large set of related licenses are auctioned simultaneously and bidders can bid on any license offered. The auction closes when all bidding activity has stopped on all licenses.

The following discussion summarizes the alternative competitive bidding designs the Commission explored when developing its auction methodology, and demonstrates the advantages of simultaneous multiple round auctions. There are several auction design elements which, in combination, produce many different auction types. The two most important elements are: (a) the number of auction rounds (single or multiple); and (b) the order in which licenses are auctioned (sequentially or simultaneously).

Single versus Multiple Round Bidding

Auctions may have single or multiple bidding rounds. Single round auctions are often referred to as sealed bid auctions. In a single round auction, bidders may place only one bid for an item and the item is awarded to the high bidder. In multiple round auctions however, bidders have the opportunity to top the high bids from the previous round. A common form of a multiple round auction is the oral auction, also known as an open outcry or English auction in which bids are submitted orally in an auction hall. Most people are familiar with this type of auction which is used to sell anything from antiques to cattle.

The principal advantage of a multiple round auction for assigning spectrum is the information that it provides bidders about the value other bidders place on licenses. This information increases the likelihood that licenses will be assigned to the bidders that value them the most and will generally yield more revenue than auctions where there is much uncertainty about common factors that affect the value of a license to all bidders, i.e., who bid and how much was bid. In a single round (or sealed bid) auction, bidders must guess about the value that other bidders place on a license, thus, the party who values the license most highly may guess wrong and not submit the highest bid. In a multiple round auction, bidders need not guess about the value the second highest bidder places on the license because bidders have the opportunity to raise their bids if they are willing to pay more than the current high bidder. Multiple round bidding is also more likely than single round bidding to be perceived by participants and observers as open and fair. No bidder can realistically argue that it did not have the opportunity to obtain a license if it was willing to pay enough.

Auction theory shows that multiple round bidding tends to increase revenue by reducing the incentive for bidders to be overly cautious during bidding while trying to avoid the winner's curse—meaning the highest bidder would bid too much and regret its purchase. Multiple round bidding provides information about other bidders' estimates of common information thus reducing bidders' incentive to bid cautiously so as to avoid

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Auctions Theory

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falling victim to the winner's curse and regretting their purchases.

Sequential versus Simultaneous Bidding

The magnitude of the advantages of simultaneous multiple round bidding depends on the degree of interdependence among licenses. Licenses are interdependent either because they are substitutes or because they are complements. With substitutes, the lower the price of one license, the less a bidder would be willing to pay for another. Perfect substitutes are highly interdependent because the price of one puts an absolute cap on the amount a bidder is willing to pay for another. If, for example, licenses A or B are perfect substitutes and a bidder knew that license A could be purchased for \$100, that bidder would be willing to pay no more than \$100 for license B. With complementary licenses, on the other hand, the lower the price of one, the more a bidder would be willing to pay for another. One way to think about complementary licenses is that they are worth more as part of a package than individually. Often when bidders use this complementary

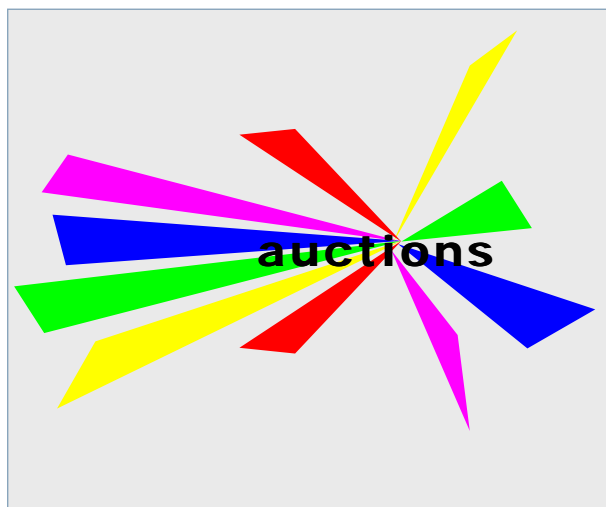
strategy, it is known as the aggregation of licenses.

The greater efficiency of simultaneous multiple round auctions in awarding interdependent licenses follows in part from the fact that they reduce the need for bidders to guess about outcomes in later auction rounds. With sequential auctions, bidders in initial rounds must guess about prices in later rounds. A bidder may pay a lot for a license in an early round on the mistaken expectation of a low price for a complementary license (or a high price for a substitute) in a later round.

Alternatively, a bidder may bid very little for a license in an early round in the hope that a close substitute will sell for less in a later round. Either situation could result in award of licenses to those who do not value them the most.

By providing more information to bidders about the value of interdependent licenses, simultaneous auctions are also

likely to raise more revenues by alleviating the winner's curse and making a more successful auction program.



Auctions Automation - - Flexible and Responsive

For years the Federal Government used auctions to dispose of foreclosed properties, furniture, equipment, and other government-owned assets. These auctions were conducted manually either through sealed bid or oral outcry auction methodologies. When the Commission began to design auctions for the airwaves, it became apparent that manual auction methods could not adequately allocate large numbers of interdependent licenses where often thousands of interdependent licenses were being auctioned to hundreds of bidders at the same time. The solution - The FCC Automated Auction System (“AAS”).

The AAS provides the necessary tools to conduct efficient auctions. Using it, the Commission can process tens of thousands of bids by hundreds of bidders on thousands of licenses. The system accommodates the needs of bidders by

allowing them to bid from their offices using a personal computer and a modem through a private and secure wide area network (“WAN”). The system can also accommodate on-site bidders and telephonic bidding. It manages both the administrative and technical aspects of the auction process with day-to-day operations that are simple and straightforward. This comprehensive software system provides the Commission with the ability to track auction participants from their initial inquiry through the auction bidding process.

The Wireless Telecommunications Bureau built the system from the ground up using a unique combination of innovative solutions to meet the complex requirements of the auctions program. State-of-the-art information technology was used including hardware, software, and telecommunica-

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AAS Bidders' Screen

The screenshot displays the AAS Bidders' Screen interface. At the top, it shows the remaining time for round 1 to close as 00:01:39. The auction details include: Auction: 74-Wireless Comm Srvc, Stage: 1, Round: 1, Waivers Remaining: 5, and Waivers Used: 0. The bidder information is John E Guy, FCC Account Num: 4565566914, and Fax: (202)555-1212.

Options	Market/ Freq	Bid-Units	High Bidder	High Bid Amount	Minimum Bid Accepted	Enter Your Bid Here
Withdraw High Bids	ME01-A	86,729,440	FCC999999	0.	0.	
	ME01-B	86,729,440	FCC999999	0.	0.	2,800
Remove Current Bids	ME02-A	290,270,170	FCC999999	0.	0.	50,000
Set Groups	ME02-B	290,270,170	FCC999999	0.	0.	60,000
	ME03-A	15,297,350	FCC999999	0.	0.	0
	ME03-B	15,297,350	FCC999999	0.	0.	0
	ME04-A	79,423,190	FCC999999	0.	0.	0
	ME04-B	79,423,190	FCC999999	0.	0.	0
	ME05-A	77,454,330	FCC999999	0.	0.	0
	ME05-B	77,454,330	FCC999999	0.	0.	0

At the bottom of the screen, there are several summary fields: Activity: 667,269,790., Group Total: \$112,800., Group Number: 1, Maximum Eligibility Amt: 760,000,000., and Activity Amt Required: 608,000,000. There are also buttons for Refresh, Export, Import, End, Print Screen, Sort, Bid Verification, Close, and Submit.

AAS

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tions solutions in a client/server environment.

To do this, the Commission brought together the talents of economists, industry analysts, game theorists, programmers, and lawyers to formalize the requirements of the system. Auctions for different types of communications services have necessitated using very different auction rules. The auctions system, therefore, is designed to be flexible to administer different types of auctions and adapt to changes in the auction rules. In addition, a solid database design was critical to the overall success of this system, with special consideration given to providing data integrity and high performance. The technical challenges posed by the design requirements were significant, and great care was taken to create a flexible, parameter-driven system powerful enough to adapt to a changing environment.

The Commission's simultaneous multiple-round auctions methodology and the AAS design have produced world-wide interest. The Commission has demonstrated the system to representatives of Argentina, Brazil, Canada, Hungary, Peru, Russia, South Africa and Vietnam. Mexico licensed the Commission's copyrighted system and has used it successfully in a spectrum auction. In addition, in 1997, the Commission was awarded a bronze medal from the Smithsonian Institution for recognition of the visionary use of information technology and had a copy of the software sealed in a time capsule.

As with any automated product, requirements change. The AAS is designed to meet these challenges. For example, future releases of the auction system will allow simultaneous auctions of tens of thousands of licenses concurrently, and will interface with a newly designed licensing system.

AAS Results Screen

The screenshot shows a Netscape browser window displaying the 'Federal Communications Commission Round Results & Reports' page. The page title is 'The following are results for the All Bids report for auction 14 in round 2.' Below the title is a 'Download' button. A table of results is displayed with the following columns: Auction Id, Round No, Market, Frequency Block, FCC Account No., Company/Name, Bid Amount, Date, Time, Bidder No., and Net Amount. The table contains four rows of data.

Auction Id	Round No	Market	Frequency Block	FCC Account No.	Company/Name	Bid Amount	Date	Time	Bidder No.	Net Amount
14	2	ME14	A	0541443350	CFW Communications Company	25,000.00	04/15/97	14:58:50	1221	25,000.00
14	2	ME14	B	0510345941	Compuport Data Company, Inc.	2,301.00	04/15/97	14:45:09	1228	1,490.00
14	2	ME14	B	0541443350	CFW Communications Company	75,000.00	04/15/97	14:58:50	1221	75,000.00
14	2	ME15	A	0510345941	Compuport Data Company, Inc.	3,277.00	04/15/97	14:45:09	1228	3,430.00

Countdown to Auction

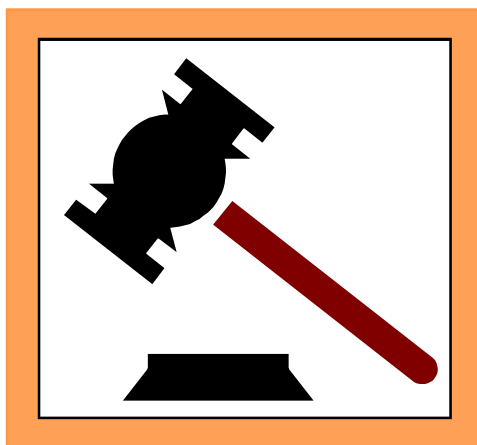
The rule making is only one of many steps on the path from allocation to licensing by auction. What follows is a condensed chronological summary of the pre-auction phase and the timing of each step.

180 Days before an Auction: First Announcement. The Wireless Telecommunications Bureau releases a Public Notice announcing upcoming auctions. This Public Notice is the first time the Commission alerts the industry of an upcoming auction. The industry needs the six-month notice to have adequate time to raise capital, assess market conditions, and evaluate the availability of equipment. Because release of the Public Notice often precedes the Report and Order which will prescribe specific service rules, the information provided is limited to the spectrum to be auctioned and key auction dates (e.g., short form filing deadline, upfront payment date, and auction start date).

180 - 120 Days: Auction Team Established. A multi-disciplined team is established for each spectrum auction including attorneys, economists, automation specialists, and auctions personnel. The Auction Team is required to complete several milestones during this period, including completing and incorporating automation initiatives; assessing spectrum and incumbency; and assessing spectrum value and determining estimates for upfront payments, minimum opening bids, and/or reserves.

120 Days: Ask for Comment. The Wireless Telecommunications Bureau releases a Public Notice seeking comment on the auction activity rules, upfront payment amounts, minimum opening bids and/or reserves. This is in accordance with requirements of the Budget Act of 1997.

90 Days: Announce Terms and Conditions. The Wireless Telecommunications Bureau releases a Public Notice providing potential participants with the procedures, terms, and conditions for the auction event.



It is only after completion of the Report and Order that the Team can complete and release the Public Notice announcing the procedures, terms, and conditions. The Commission adoption and release of a Report and Order starts the Contract with America clock, which requires a minimum of sixty days before short form

applications can be accepted. In addition, the Report and Order must be completed before the Auction Team can finalize the content included in the Bidder Information Package, send it to the printer, and distribute it to bidders. Timely completion of a rule making proceeding is a prerequisite to a timely and successful auction.

45 Days: Seminar. Conduct a pre-auction seminar for potential participants.

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Countdown

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30 Days: Short Form Filing Deadline (FCC Form 175). This is the first deadline faced by potential participants. Applicants may file this form either electronically or manually. This form captures basic information regarding the applicant's ownership structure and identifies the markets/licenses on which they intend to bid during the auction. Most bidders select "All" for all markets to maintain the most flexibility for alternative bidding strategies.

23 Days: Filing Status Public Notice Released. After the deadline for filing has been reached, the Operations Branch and the Legal Branch review all timely-filed short forms and deem applications accepted, incomplete, or rejected. The status of the applications is communicated to the industry through the release of the Filing Status Public Notice.

Upon completion of the Public Notice, an overnight package is sent to all applicants with the Public Notice enclosed. For applicants whose filings have been deemed incomplete, a letter is included which explains the reasons for the incomplete designation and includes the name of an FCC contact person if further explanation is required.

16 Days: Upfront Payment Deadline. Two weeks after the filing deadline and two weeks before the start of the auction, potential bidders must pay for the bidding units required to place bids in the auction. The Billing and Collections Branch provides accounting and reconciliation of the funds for the FCC. The software cross references the markets selected on an applicant's FCC Form 175 to the amount of bidding unit eligibility purchased.

Resubmission Deadline for Short Form Filings. FCC Form 175 short form applications which were deemed "incomplete" must be refiled by this deadline.

7 Days: Qualified Bidders Public Notice Released. This Public Notice lists the bidders qualified to participate in the auction, their bidding unit eligibility, and the markets selected on their FCC Form 175. In addition, the Public Notice contains information regarding the mock auction, the number and length of the bidding rounds for the first two days of the auction, and any other auction-specific information which must be communicated prior to auction commencement.

Qualified Bidders Registration. Following release of the Qualified Bidders Public Notice, the registration process begins. Two overnight mailings are sent to the contact people identified on the short form application. These mailings include confidential bidding access codes, Automated Auction System Software, Qualified Bidders Public Notice, bidding schedule, mock auction information, and any other documents necessary to participate in the auction. Timing for registration is critical. If the Qualified Bidders Public Notice is delayed, registration is delayed, and our ability to ensure that all bidders have the necessary information to participate is compromised.

5 Days: Mock Auction. As a service to the qualified bidders, the FCC sponsors a mock auction. The mock auction allows bidders to work with the software and become comfortable with the activity rules and the conduct of a simultaneous multiple-round auction.

Day 0: Auction.

Let's Talk Auctions

The list below provides definitions of common terms used during simultaneous multiple-round auctions.

Activity: A general reference regarding the level of bidder participation in an auction.

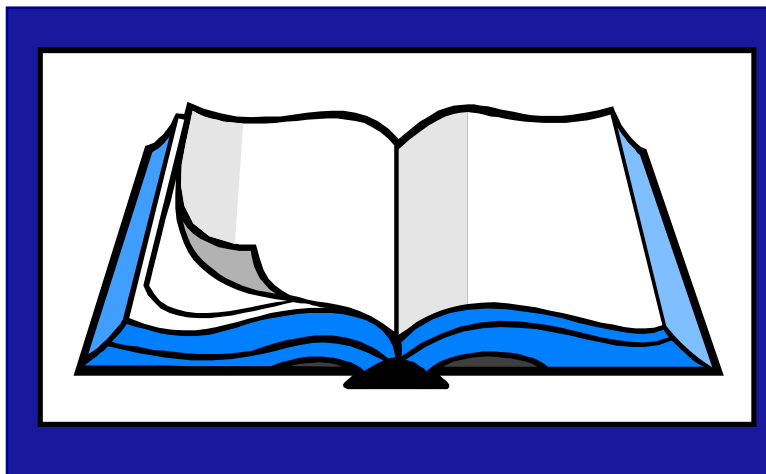
Activity Rules: To ensure that an auction closes within a reasonable period of time and to increase the information conveyed by bid prices during the auction, the Commission utilizes “activity rules” which prevent bidders from waiting until the end of the auction before participating. Bidders are required to bid actively or be active (have a standing high bid) on a certain percentage of their bidding units (purchased by upfront payment prior to the auction) in every round. The required level of activity increases in each stage of the auction.

Bidding Credit: A percentage discount applied to the high bid amount for a license if the bidder meets specific designated entity criteria established in the auction rules. Bidders must apply for bidding credits when they file the FCC Form 175.

Bid Increment: An FCC-determined minimum amount by which a bidder must increase a standing high bid. The bid increment is a fundamental

activity rule which helps ensure that the pace of an auction is sufficient. Without a bid increment, bidders could increase bids by nominal amounts (such as \$1.00 over the previous high bid), thereby increasing the time required for a license to reach its final value. Two frequently used methods of calculating a bid increment are:

Absolute Increment: A specific percentage amount (e.g., 10%) of the high bid.



Exponential Smoothing: This method bases the bid increment for each license on a weighted average of the activity on that license in the most recently completed round and the activity on that license in all previous rounds. Simply put, when

a license receives a substantial number of bids (three or more) the increment is higher, and when the number of bids decreases the increment is smaller.

Bidding Units (BUs): A unit of measure applied to the licenses being auctioned and to the bidders' eligibility level. Prior to an auction, licenses are assigned a specific number of bidding units for the purpose of calculating bidder compliance with the activity rules in each stage of the auction.

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Terms

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In addition, during the upfront payment phase, bidders must purchase a sufficient amount of bidding units to ensure they are eligible to place bids on the licenses they desire. In the majority of our auctions, each upfront payment dollar equates to one bidding unit.

Bid Withdrawal: Withdrawal of a high bid by the high bidder during the course of an ongoing auction. Bid withdrawals are subject to a withdrawal payment if the license ultimately sells for less than the withdrawn bid amount. The bid withdrawal activity rule serves as an enforcement mechanism for insincere bidding.

Eligibility Ratio: The ratio of total bidding units held by all bidders to the total bidding units for all licenses in the auction. The ratio will approach 1.0 as bidders drop eligibility. The eligibility ratio is a very informative predictor of an auction. A healthy eligibility ratio at the start of an auction is approximately 3 to 1, which basically means that there are three bidders for every license being auctioned. Examples of eligibility ratios for past auctions: PCS C Block auction 6.72 to 1, WCS auction 1.54 to 1.

FCC-Held Licenses: A license is listed as “FCC held” because either no bid has yet been placed on the license, or because a high bid has been withdrawn and no bidder has placed a subsequent bid on the license.

Maximum Eligibility: The total number of bidding units a bidder is eligible to use in a single round. A bidder’s maximum eligibility is initially established by the amount of its upfront payment.

Minimum Acceptable Bid: Once there is a

standing high bid on a license, a bid increment will be applied to that license to establish a minimum acceptable bid for the following round.

Net High Bid: The current high bid, adjusted by the percentage of a high bidder’s bidding credits.

Net Revenue: The total net high bids for all licenses in the auction.

Pop: Abbreviated term for population. One “pop” equals one person. The Commission currently uses the 1990 census as a measure of population.

Round: An auction round consists of a bidding period and a round results period.

Simultaneous Stopping Rule: An activity rule which states that an auction will close only after a round in which no new bids, withdrawals, or proactive waivers are received. The FCC retains the discretion to keep an auction open even if no new acceptable bids and no proactive waivers are submitted as specified in the auction rules.

Stages: Typically, an FCC simultaneous multiple round auction employs an activity rule which divides the auction into three stages. Each stage requires bidders to use a certain percentage of their total bidding units in order to maintain maximum eligibility (e.g., Stage I, 60% of their bidding units; Stage II, 80%; and Stage III, 98%). In a given stage, if a bidder’s activity falls below the required level, an automatic waiver will be submitted on the bidder’s behalf if the bidder

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Terms

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has waivers remaining. If a bidder has no waivers remaining or elects to override the automatic waiver function, its eligibility will be permanently reduced to bring it into compliance with the activity rule.

Stage Transition Percentage: A percentage calculated by dividing the total number of bidding units of licenses receiving high bids in the current round by the total number of bidding units for all licenses in the auction. Named the “Stage Transition Percentage” because this percentage is the primary factor in determining when an auction transitions to a subsequent stage.

Waiver (Activity Rule Waiver): Each bidder is provided a predetermined number of waivers at the start of an auction (e.g., five) that can be used during a bidding period to preserve bidding unit eligibility despite having an activity level below the required minimum. A waiver will preserve current eligibility in the next round and applies to an entire bidding round.

Proactive Waiver: A waiver submitted by the bidder during the bidding period. A proactive waiver (1) will preserve a bidder’s eligibility in a round when the bidder does not meet the activity requirement, and (2) will keep the auction open in the event that no bids are placed in the round in which the proactive waiver is placed.

Automatic Waiver: A waiver applied automatically by the bidding system if a round closes and a bidder is below the required activity level. An activity waiver will not keep the auction open in the event that no bids or proactive waivers are submitted during the bidding period.