

**Plans and Procedures for the Experimental Testing of the FCC Package Bidding  
System for the 700 MHz Band Auction**

Submitted by Cybernomics Inc. under Subcontract FCC-00-003

# Plan and Procedures for the Experimental Testing of the FCC Package Bidding System for the 700 MHz Band Auction

## I. Overview

Cybernomics Inc., in consultation with Computech, has designed a test environment and protocol to verify the algorithms and rules of the FCC Package Auction for the 700 MHz Band Auction. The test environment uses human bidders to submit strategic bids into the auction system designed by the FCC and implemented by Computech. The bidders have an incentive to discover and exploit any weaknesses in the system, since they will be paid based on the success of the bids they make in the auction vis-à-vis other participants. In addition, they will be given a monetary bounty for any errors they find in the software implementation of the auction rules. Thus, real people with real incentives will be providing Cybernomics and Computech with feedback on the system operation.

In addition to the human subject checking procedure, Cybernomics is building a backend system to check the solution and eligibility constraints obtained by the Computech system. The backend system will use a different solver than that used by Computech.

Our plan is to have subjects trained in the rules of the auction and then have them participate in a series of auctions. At the end of each day Cybernomics will supply Computech with a summary of the results of the experiments and comments by subjects. Any discrepancies between what the system provides and what the backend or subjects' calculate will be the first items in the report.

## II. Backend Checking Procedure

Cybernomics is developing a backend system that will take the round bids in a standard format and calculate the optimal set of winning bids (bids that maximize revenue and allow each license to be assigned to at most one bidder). The solver used by Cybernomics is based on an off-the-shelf package XA (a professional linear/integer programming system). In addition to XA, Cybernomics has written code to check for minimum bids and eligibility. We will be using a dual Pentium III 500 Mhz processor with 500MB of memory to run the backend. We will post our calculation results on the website <http://linus.econlab.arizona.edu/Test> after each round.

## III. Experimental Procedure

The Computech system will be tested in the Economic Science Laboratory (ESL) at the University of Arizona using methods in Experimental Economics. The auctions that will be conducted at ESL will use human subjects who will participate in a series of auctions. The subjects will be motivated to participate by being paid based on the success of the bids they make in the auction. Each subject will be paid the difference

between their private value for any license they obtain, minus the cost of winning that license in the auction. The private values of each license to each subject will be induced. That is, each license and several packages of licenses will have monetary values for the subjects. They get these values if they win the licenses. Of course they must pay their bids for the license package they win. In the table below, we supply the values for 15 bidders in two environments. Values are stated in experimental dollars that can be redeemed in our experiment at a rate of 1,000,000 experimental dollars equals one US dollar. Thus, in Table 1, subject 9 has a value of 200,000,000 experimental dollars for license 10MHz- Northeast.

*Table 1*  
*Value Parameters (Values are stated in US Dollars)*

**Warm-up Case**

**Subjects →**

<b>License</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10-NE	100	100	100	100	100	100	100	100	200	100	100	100	100	100	100
10-MA	50	50	50	50	50	150	50	50	50	50	50	50	50	50	50
10-SE	150	150	150	250	150	150	150	150	150	150	150	150	150	150	150
10-GL	100	100	100	100	100	100	100	100	100	100	200	100	100	100	100
10-CM	75	75	75	75	75	75	75	75	75	75	75	175	75	75	75
10-P	120	120	120	120	220	120	120	120	120	120	120	120	120	120	120
20-NE	270	170	170	170	170	170	170	170	170	170	170	170	170	170	170
20-MA	200	200	200	200	200	200	300	200	200	200	200	200	200	200	200
20-SE	300	300	300	300	300	300	300	300	300	300	300	300	300	400	300
20-GL	50	50	50	50	50	50	50	150	50	50	50	50	50	50	50
20-CM	75	75	175	75	75	75	75	75	75	75	75	75	75	75	75
20-P	100	200	100	100	100	100	100	100	100	100	100	100	100	100	100
10-NE,SE,GL	NA	NA	NA	NA	NA	NA	NA	NA	NA	350	NA	NA	NA	NA	NA
10-P, 20-NE,MA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	490	NA	NA
20-CM,P	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	275

**Boundary Case**

<b>License</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10-NE	78	56	27	16	23	33	87	12	61	56	51	61	92	95	20
10-MA	99	107	4	103	87	22	33	69	128	90	2	57	122	138	58
10-SE	37	86	100	29	49	51	34	12	33	74	41	44	7	45	32
10-GL	47	150	83	79	1	14	2	151	69	195	124	151	54	129	55
10-CM	127	39	130	243	173	95	116	8	281	46	53	10	32	24	52
10-P	56	52	39	60	29	38	65	78	100	77	54	97	82	71	44
20-NE	120	124	73	22	125	122	129	91	101	64	87	115	19	146	71
20-MA	48	81	70	61	108	111	46	52	82	71	19	72	118	44	41
20-SE	96	44	43	76	48	95	87	93	52	50	16	29	80	98	92
20-GL	27	180	88	137	43	7	60	193	134	72	190	197	88	9	137





