Shively Labs
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S.O. 24450

Report of Test 6513-6-DA

for

BROADCASTING FOR THE CHALLENGED, INC.

WFBI 91.5 MHz GREENVILLE, MS

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6513-6-DA to meet the needs of WFBI and to comply with the requirements of the FCC construction permit, file number BMPED-20051207ABU.

RESULTS:

The measured azimuth pattern for the 6513-6-DA is shown in Figure 1. Figure 1A shows the Tabulation of the Vertical Polarization. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BMPED-20051207ABU indicates that the Vertical radiation component shall not exceed 50 kW at any azimuth and is restricted to the following values at the azimuths specified:

230 Degrees T: 7.96 kW

From Figure 1, the maximum radiation of the Vertical component occurs at 093 Degrees T to 112 Degrees T and at 315 Degrees T to 328 Degrees T. At the restricted azimuth of 230 Degrees T the Vertical component is 9.63 dB down from the maximum of 50 kW, or 5.45 kW.

The R.M.S. of the Vertical component is 0.796. The total Vertical power gain is 10.516. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.904. The R.M.S. of the measured composite pattern is 0.797. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.769. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6513-6-DA was mounted on a tower of exact scale to a Rohn Model CC tower at the WFBI site. The spacing of the antenna to the tower was varied to achieve the vertical pattern shown in Figure 1. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BMPED-20051207ABU, a single level of the 6513-6-DA was set up on the Howell Laboratories scale model antenna pattern measuring range. A scale of 4.5:1 was used.

SUPERVISION:

Mr. Surette was graduated from Lowell Technological Institute, Lowell, Massachusetts in 1973 with the degree of Bachelor of Science in Electrical Engineering. He has been directly involved with design and development of broadcast antennas, filter systems and RF transmission components since 1974, as an RF Engineer for six years with the original Shively Labs in Raymond, ME and for a short period of time with Dielectric Communications. He is currently an Associate Member of the AFCCE and a Senior Member of IEEE. He has authored a chapter on filters and combining systems for the latest edition of the CRC Electronics Handbook and for the 9th Edition of the NAB Handbook.

EQUIPMENT:

The scale model pattern range consists of a wooden rotating pedestal equipped with a position indicator. The scale model bay is placed on the top of this pedestal and is used in the transmission mode at approximately 20 feet above ground level. The receiving corner reflector is spaced 50 feet away from the rotating pedestal at the same level above ground as the transmitting model. The transmitting and receiving signals are carried to a control building by means of RG-9/U double shielded coax cable.

The control building is equipped with:

Hewlett Packard Model 8753 Network Analyzer
PC Based Controller
Hewlett Packard 7550A Graphics Plotter

The test equipment is calibrated to ANSI/NCSL Z540-1-1994.

TEST PROCEDURES:

The corner reflector is mounted so that the horizontal and vertical azimuth patterns are measured independently by rotating the corner reflector by 90 degrees. The network analyzer was set to 411.75 MHz. Calibrated pads are used to check the linearity of the measuring system. For example, 6 dB padding yields a scale reading of 50 from an unpadded reading of 100 in voltage. From the recorded patterns, the R.M.S. values are calculated and recorded as shown in Figure 1.

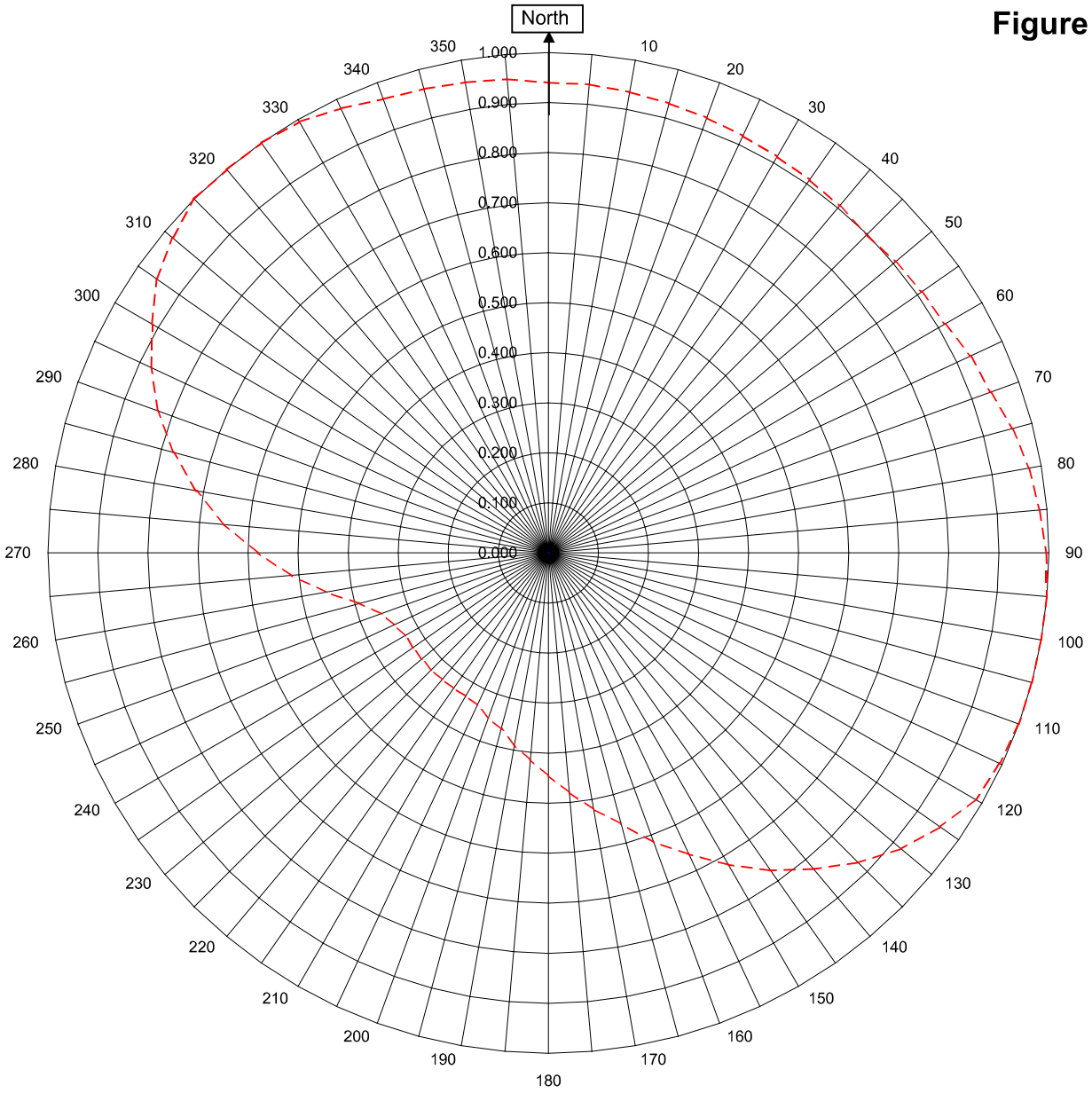
Respectfully submitted by:

Robert A. Surette
Manager of RF Engineering
S/O 24450
February 2, 2006

Shively Labs

Shively Labs, a division of Howell Laboratories, Inc. Bridgton, ME (207)647-3327

Figure 1



WFBI Greenville, MS

24450

February 2, 2006

Horizontal RMS	0.000
Vertical RMS	0.796
H/V Composite RMS	0.797

Frequency	91.5 / 411.75 mHz
Plot	Relative Field
Scale	4.5 : 1

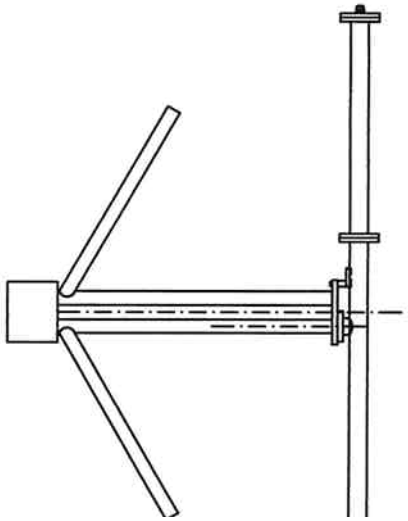
Antenna Model	6513-6-DA
Pattern Type	Directional Azimuth

See Figure 2 for Mechanical Details

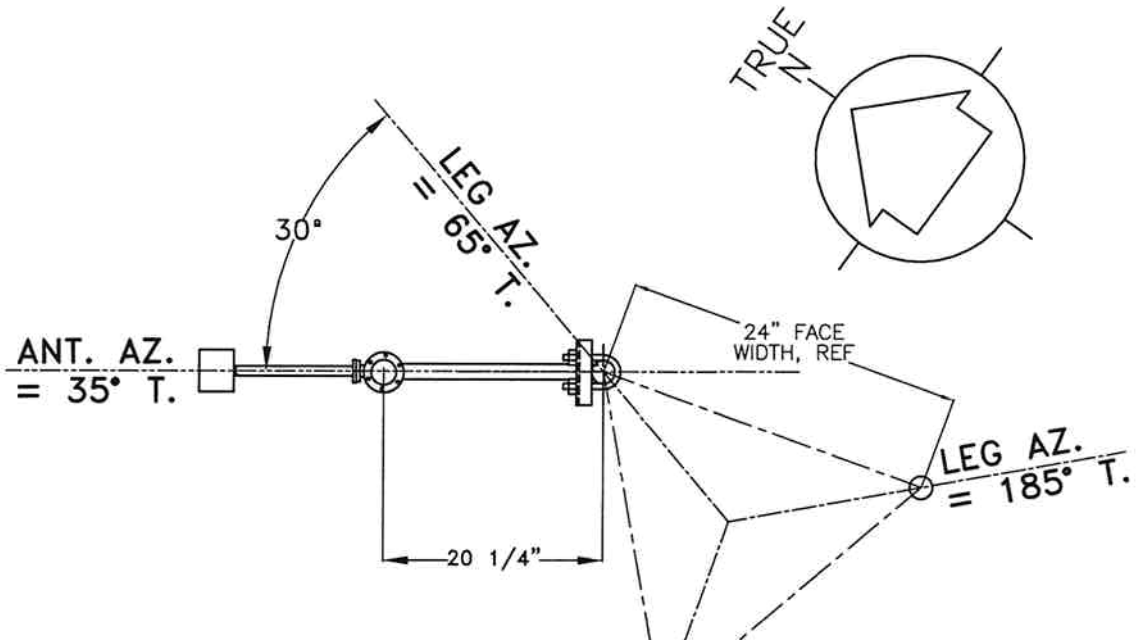
Figure 1a

Tabulation of Vertical Azimuth Pattern
WFBI Greenville, MS

Azimuth	Rel Field	Azimuth	Rel Field
0	0.940	180	0.445
10	0.935	190	0.390
20	0.925	200	0.350
30	0.915	210	0.330
40	0.905	220	0.330
45	0.900	225	0.330
50	0.905	230	0.330
60	0.915	240	0.330
70	0.940	250	0.355
80	0.975	260	0.450
90	0.995	270	0.580
100	1.000	280	0.715
110	1.000	290	0.830
120	0.985	300	0.915
130	0.920	310	0.980
135	0.875	315	1.000
140	0.825	320	1.000
150	0.720	330	0.995
160	0.615	340	0.965
170	0.520	350	0.955



SIDE VIEW



TOP VIEW
TOWER: ROHN

2 1/4" DIA
TOWER LEG, REF TYP

SHIVELY LABS
A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE, USA

91.7 MHz.

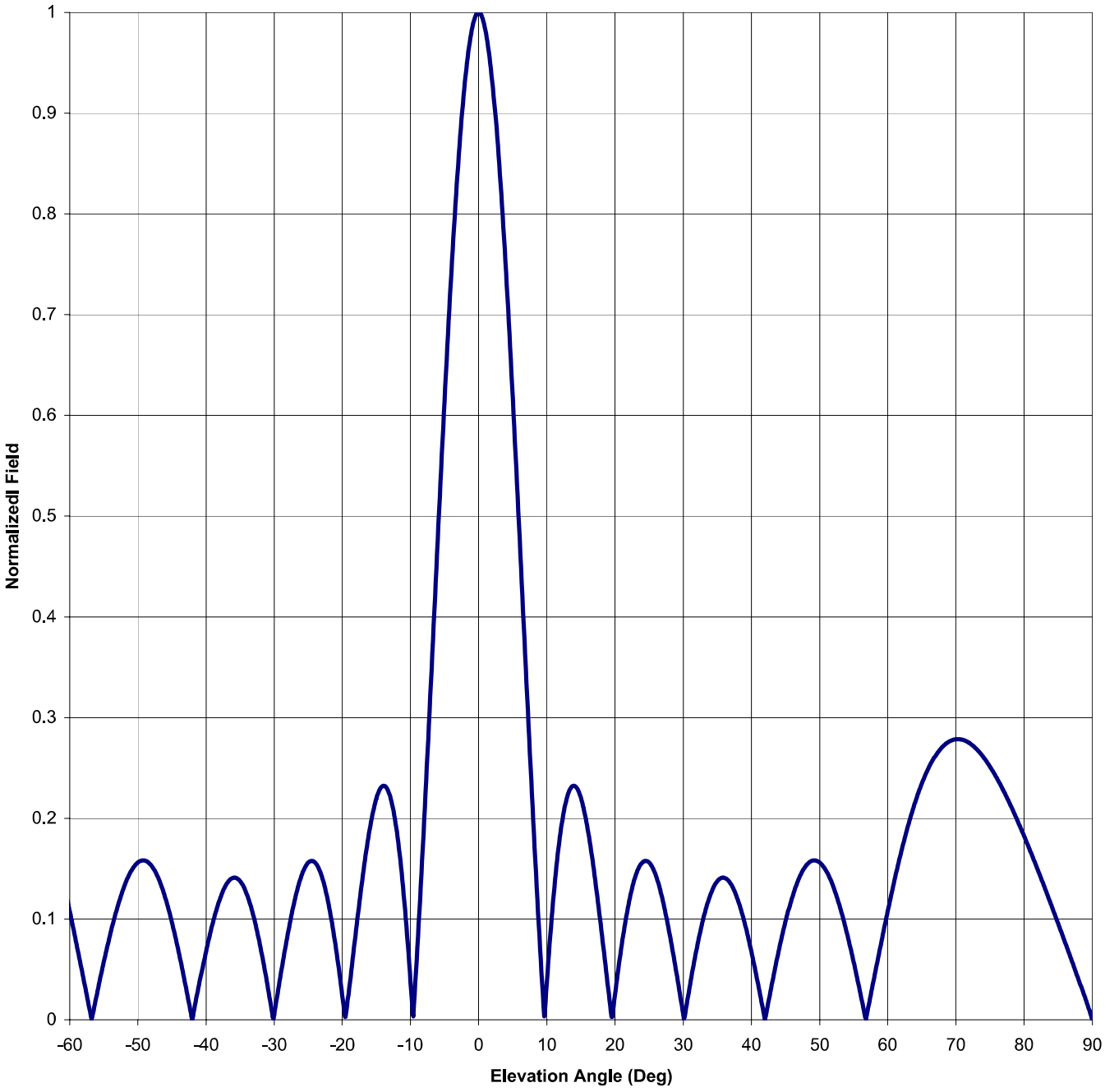
MODEL 6513-6-DIRECTIONAL ANTENNA
FM STATION

ANTENNA HEADING: 35° TRUE NORTH

01/25/06

FIGURE 2

Antenna Mfg.:	**Shively Labs**			**Date: 2/2/2006**
Antenna Type:	**6513-6-DA**			
Station:	**WFBI**	**Beam Tilt**	**0**	
Frequency:	**91.5**	**Gain (Max)**	**10.516**	**10.218 dB**
Channel #:	**218**	**Gain (Horizon)**	**10.516**	**10.218 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs **Date:** 2/2/2006

Antenna Type: 6513-6-DA

Station: WFBI **Beam Tilt** 0

Frequency: 91.5 **Gain (Max)** 10.516 10.218 dB

Channel #: 218 **Gain (Horizon)** 10.516 10.218 dB

Figure: 3

Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field
-90	0.000	-44	0.068	0	1.000	46	0.122
-89	0.021	-43	0.035	1	0.983	47	0.141
-88	0.040	-42	0.000	2	0.931	48	0.153
-87	0.059	-41	0.035	3	0.849	49	0.158
-86	0.077	-40	0.068	4	0.742	50	0.156
-85	0.096	-39	0.097	5	0.615	51	0.147
-84	0.114	-38	0.119	6	0.477	52	0.132
-83	0.132	-37	0.135	7	0.335	53	0.112
-82	0.149	-36	0.141	8	0.197	54	0.086
-81	0.166	-35	0.138	9	0.071	55	0.057
-80	0.182	-34	0.124	10	0.038	56	0.026
-79	0.198	-33	0.102	11	0.124	57	0.008
-78	0.213	-32	0.072	12	0.186	58	0.041
-77	0.227	-31	0.035	13	0.222	59	0.075
-76	0.240	-30	0.005	14	0.232	60	0.108
-75	0.251	-29	0.046	15	0.220	61	0.139
-74	0.261	-28	0.085	16	0.189	62	0.167
-73	0.269	-27	0.118	17	0.144	63	0.193
-72	0.275	-26	0.143	18	0.089	64	0.215
-71	0.278	-25	0.156	19	0.031	65	0.234
-70	0.279	-24	0.156	20	0.025	66	0.250
-69	0.276	-23	0.142	21	0.075	67	0.262
-68	0.271	-22	0.115	22	0.115	68	0.271
-67	0.262	-21	0.075	23	0.142	69	0.276
-66	0.250	-20	0.025	24	0.156	70	0.279
-65	0.234	-19	0.031	25	0.156	71	0.278
-64	0.215	-18	0.089	26	0.143	72	0.275
-63	0.193	-17	0.144	27	0.118	73	0.269
-62	0.167	-16	0.189	28	0.085	74	0.261
-61	0.139	-15	0.220	29	0.046	75	0.251
-60	0.108	-14	0.232	30	0.005	76	0.240
-59	0.075	-13	0.222	31	0.035	77	0.227
-58	0.041	-12	0.186	32	0.072	78	0.213
-57	0.008	-11	0.124	33	0.102	79	0.198
-56	0.026	-10	0.038	34	0.124	80	0.182
-55	0.057	-9	0.071	35	0.138	81	0.166
-54	0.086	-8	0.197	36	0.141	82	0.149
-53	0.112	-7	0.335	37	0.135	83	0.132
-52	0.132	-6	0.477	38	0.119	84	0.114
-51	0.147	-5	0.615	39	0.097	85	0.096
-50	0.156	-4	0.742	40	0.068	86	0.077
-49	0.158	-3	0.849	41	0.035	87	0.059
-48	0.153	-2	0.931	42	0.000	88	0.040
-47	0.141	-1	0.983	43	0.035	89	0.021
-46	0.122	0	1.000	44	0.068	90	0.000
-45	0.097			45	0.097		

FIGURE 4

S.O. 24450

VALIDATION OF GAIN CALCULATION

WFBI 91.5 MHz GREENVILLE, MS

MODEL 6513-6-DA

Elevation Gain of 6513-6-DA equals 6.664

Vertical Azimuth Gain equals $1/(RMS)^2$
$1/(0.796)^2 = 1.578$

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
6.664 x 1.578 = 10.516

ERP divided by Vertical Gain equals Antenna Input Power
50 kW ÷ 10.516 = 4.755 kW