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S.O. 29770

Report of Test 6513-2-DA

For

ALABAMA CHRISTIAN RADIO INC.

WJHO 89.7 MHz ALEXANDER CITY, AL.

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6513-2-DA antenna to meet the needs of WJHO and to comply with the requirements of the FCC construction permit, file number BMPED-20120309ACA. This test characterizes only the radiation characteristics of the antenna when mounted on the tower as described. It does not represent or imply any guarantee of specific coverage which can be influenced by factors beyond the scope of this test.

RESULTS:

The following Figures are the results of the measurements from our pattern range:

Figure 1A - Measured Azimuth Pattern with the FCC Composite
Figure 1B - Measured Composite Azimuth Pattern with the FCC Composite
Figure 1D - Tabulation of the Vertical Polarization for the Measured Azimuth Pattern
Figure 1E - Tabulation of the Measured Composite Azimuth Pattern
Figure 1F - Tabulation of the FCC Composite

The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BMPED-20120309ACA indicates that the Vertical radiation component shall not exceed 10.5 kW at any azimuth and is restricted to the following values at the azimuths specified:

240 Degrees T: 1.15 kW

260 Degrees T: 1.05 kW

From Figure 1A, the maximum radiation of the Vertical component occurs at 28 Degrees T to 91 Degrees T. At the restricted azimuth of 240 Degrees T the Vertical component is 10.43 dB down from the maximum of 10.5 kW, or 0.951 kW and at the restricted azimuth of 260 Degrees T the vertical component is 10.87 dB down from the maximum of 10.5 kW, or 0.859 kW.

The R.M.S. of the Vertical component is 0.768. The total Vertical power gain is 3.364. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.791. The R.M.S. of the measured composite pattern is 0.769. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.672. Therefore this pattern complies with the FCC requirement of 73.316(c) (2) (ix) (A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6513-2-DA was mounted on a tower of precise scale to the 24-inch face tower at the WLHO site. The spacing of the antenna to the tower was varied to achieve the vertical pattern shown in Figure 1A. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BMPED-20120309ACA, a single level of the 6513-2-DA antenna was set up on the Shively Labs 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 and 10th Editions 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

All testing is carried out in strict accordance with approved procedures under our ISO9001:2008.

TEST PROCEDURES:

The receiving antenna system is mounted so that the horizontal and vertical azimuth patterns are measured independently. The network analyzer was set to 403.65 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 1A.

Respectfully submitted by:

Robert A. Surette
Director of Sales Engineering
S/O 29770
Date May 7, 2012

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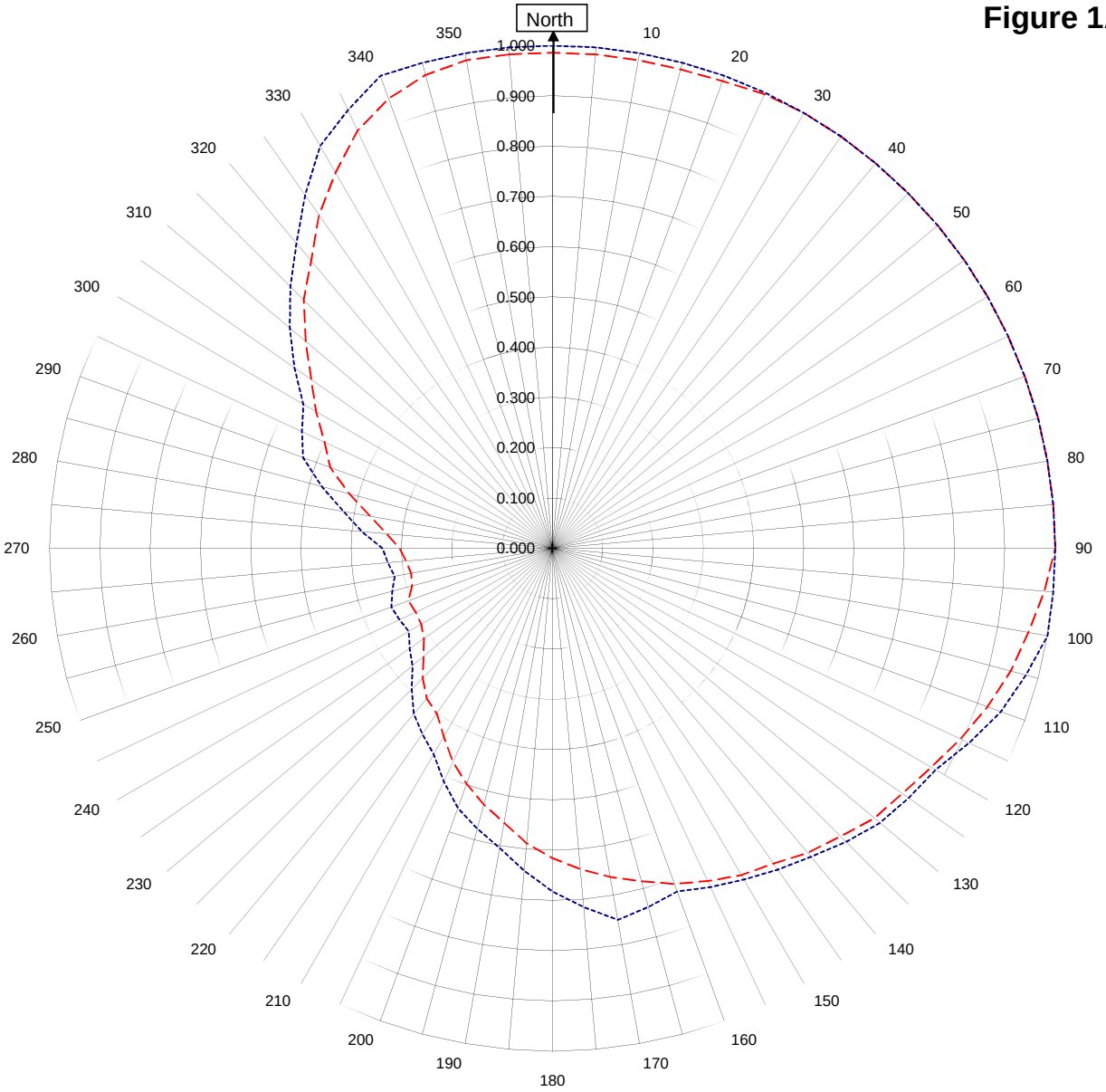
Figure 1A



WJHO Alexander City , AL

29770

May 7, 2012

Horizontal RMS	0.000
Vertical RMS	0.768
H/V Composite RMS	0.769
FCC Composite RMS	0.791

Frequency	89.7 / 403.65 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6513-2-DA
Pattern Type	Directional Azimuth

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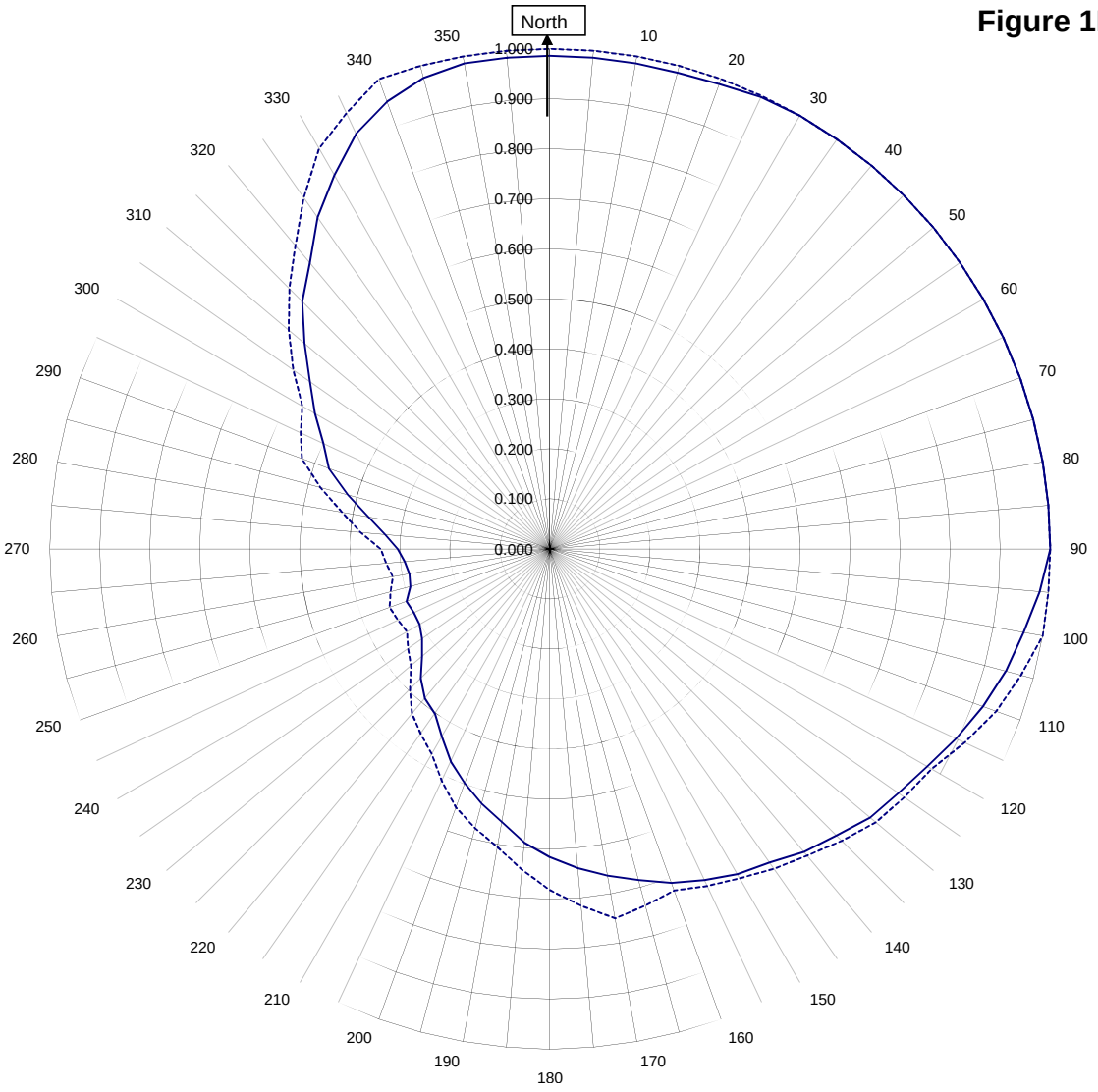
Figure 1B



WJHO Alexander City , AL

29770

May 7, 2012

_____H/VComposite RMS	0.769
……FCC Composite RMS	0.791

Frequency	89.7 / 403.65 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6513-2-DA
Pattern Type	Directional H/V Composite

Figure 1D

Tabulation of Vertical Azimuth Pattern
WJHO Alexander City , AL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.986	180	0.616
10	0.986	190	0.554
20	0.989	200	0.498
30	1.000	210	0.433
40	1.000	220	0.389
45	1.000	225	0.365
50	1.000	230	0.335
60	1.000	240	0.301
70	1.000	250	0.305
80	1.000	260	0.286
90	1.000	270	0.304
100	0.961	280	0.368
110	0.921	290	0.470
120	0.870	300	0.543
130	0.835	310	0.641
135	0.810	315	0.700
140	0.790	320	0.747
150	0.750	330	0.863
160	0.710	340	0.952
170	0.663	350	0.986

Figure 1E

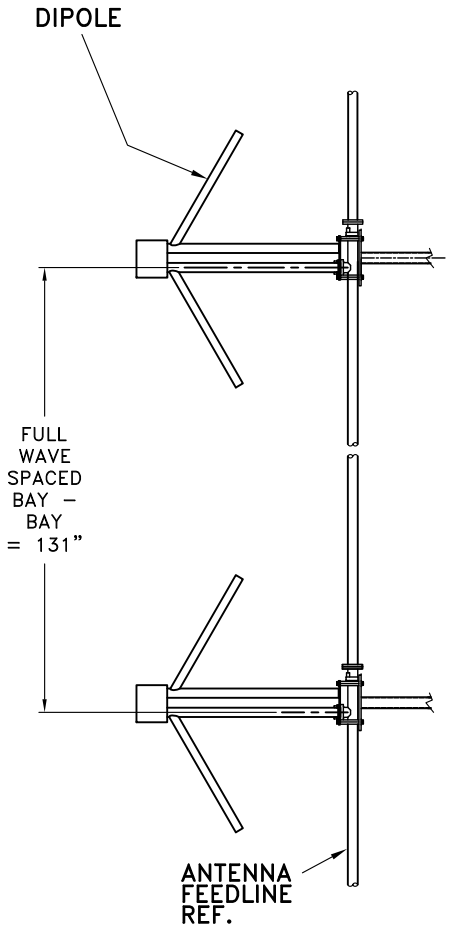
Tabulation of Composite Azimuth Pattern
WJHO Alexander City , AL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.986	180	0.616
10	0.986	190	0.554
20	0.989	200	0.498
30	1.000	210	0.433
40	1.000	220	0.389
45	1.000	225	0.365
50	1.000	230	0.335
60	1.000	240	0.301
70	1.000	250	0.305
80	1.000	260	0.286
90	1.000	270	0.304
100	0.961	280	0.368
110	0.921	290	0.470
120	0.870	300	0.543
130	0.835	310	0.641
135	0.810	315	0.700
140	0.790	320	0.747
150	0.750	330	0.863
160	0.710	340	0.952
170	0.663	350	0.986

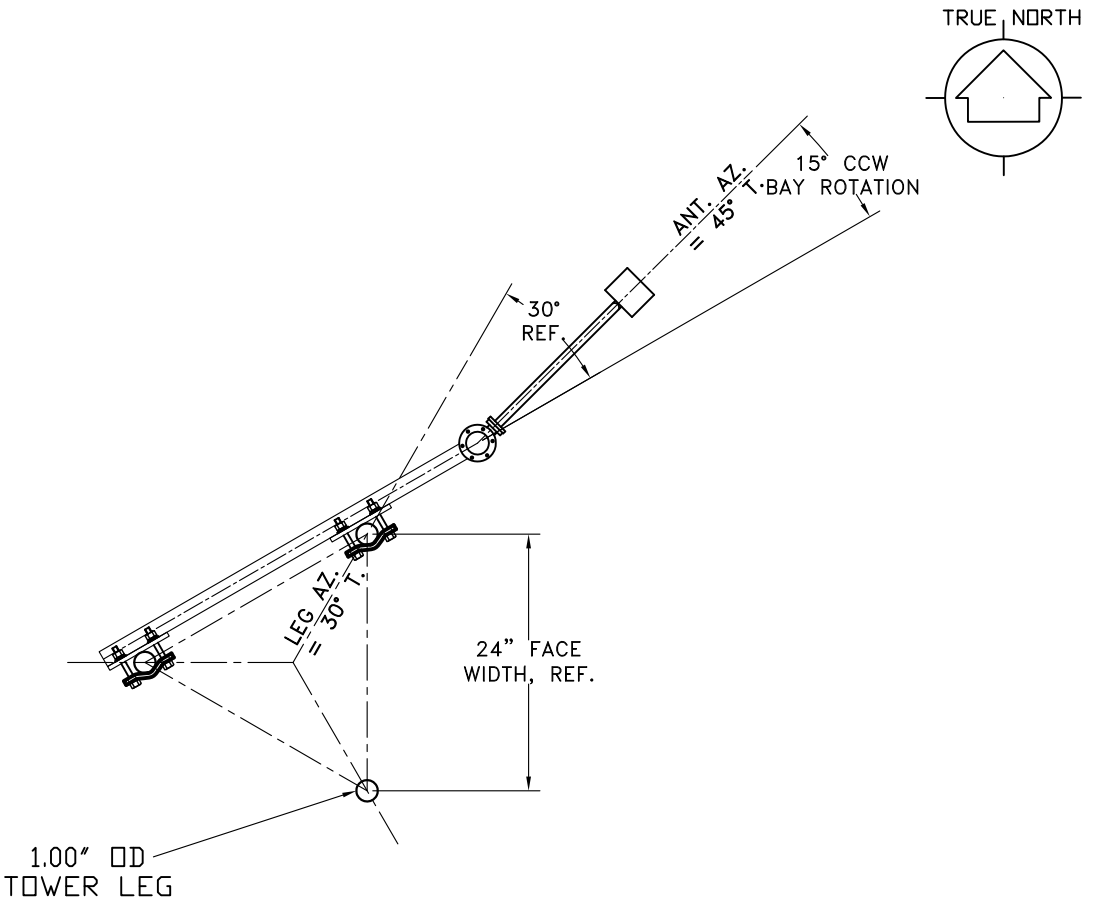
Figure 1F

Tabulation of FCC Directional Composite
WJHO Alexander City , AL

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.682
10	1.000	190	0.605
20	1.000	200	0.550
30	1.000	210	0.473
40	1.000	220	0.429
50	1.000	230	0.363
60	1.000	240	0.330
70	1.000	250	0.341
80	1.000	260	0.319
90	1.000	270	0.338
100	1.000	280	0.422
110	0.949	290	0.528
120	0.880	300	0.572
130	0.850	310	0.682
140	0.800	320	0.792
150	0.760	330	0.924
160	0.726	340	1.000
170	0.750	350	1.000



SIDE VIEW



TOP VIEW
TOWER: PIROD 24

ANTENNA HEADING: 45° TRUE NORTH

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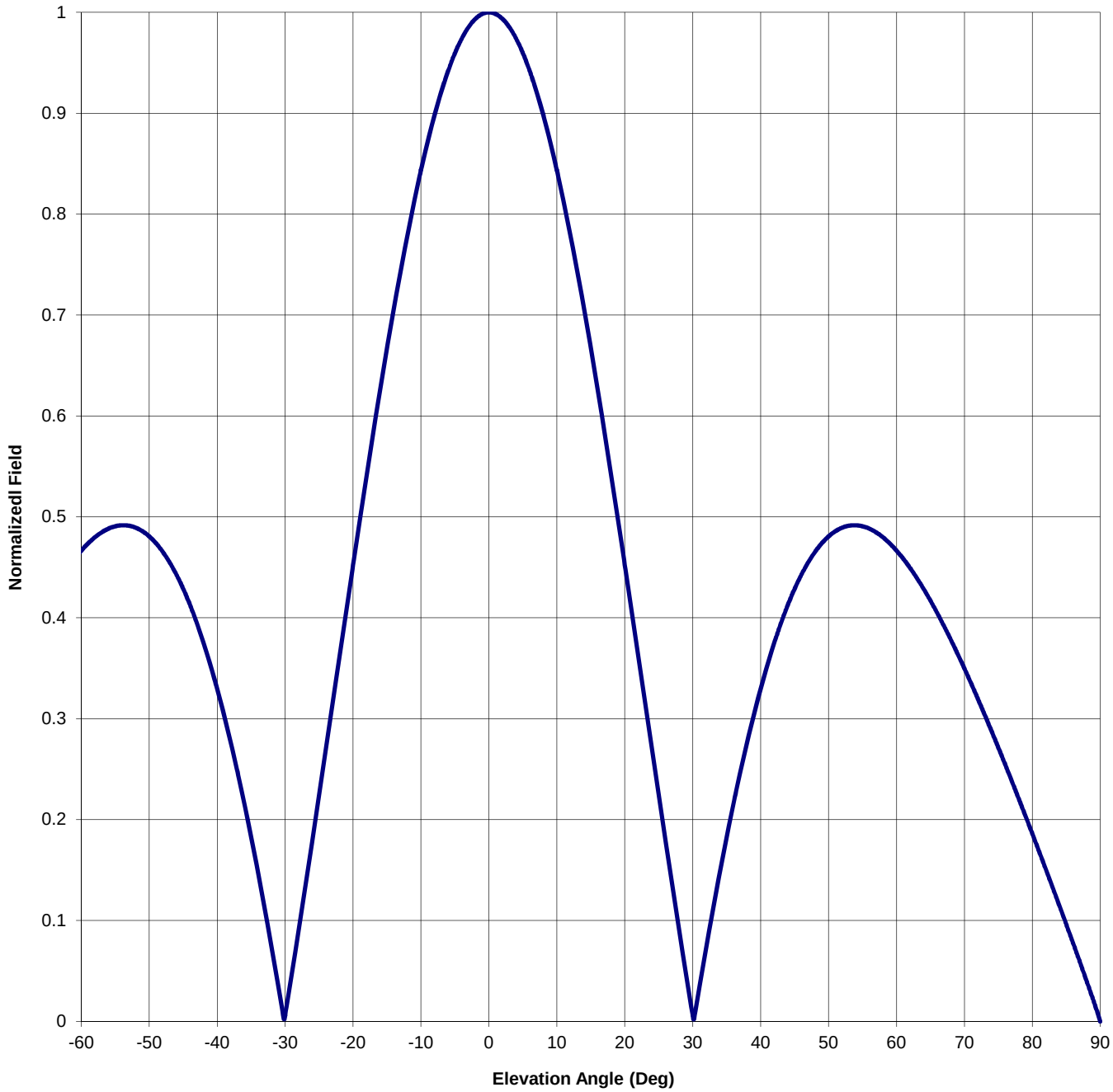
SHOP ORDER: 29770B	FREQUENCY: 89.7	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY: DAB
TITLE: MODEL 6513-2-DIRECTIONAL ANTENNA FM STATION			
DATE: 3-29-12	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date:**	**5/7/2012**
Antenna Type:	**6510-2-DA**				
Station:	**WJHO**	**Beam Tilt**	**0**		
Frequency:	**89.7**	**Gain (Max)**	**3.364**	**5.269**	**dB**
Channel #:	**209**	**Gain (Horizon)**	**3.364**	**5.269**	**dB**
Figure:	**Figure 3**				



Antenna Mfg.: Shively Labs **Date:** 5/7/2012

Antenna Type: 6510-2-DA

Station: WJHO **Beam Tilt** 0

Frequency: 89.7 **Gain (Max)** 3.364 5.269 dB

Channel #: 209 **Gain (Horizon)** 3.364 5.269 dB

Figure: 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	0.413	0	1.000	46	0.443
-89	0.021	-43	0.395	1	0.998	47	0.455
-88	0.040	-42	0.375	2	0.993	48	0.465
-87	0.059	-41	0.353	3	0.985	49	0.474
-86	0.078	-40	0.330	4	0.974	50	0.481
-85	0.096	-39	0.304	5	0.960	51	0.486
-84	0.114	-38	0.276	6	0.942	52	0.489
-83	0.132	-37	0.247	7	0.922	53	0.491
-82	0.150	-36	0.216	8	0.898	54	0.492
-81	0.168	-35	0.183	9	0.872	55	0.491
-80	0.186	-34	0.148	10	0.844	56	0.488
-79	0.203	-33	0.112	11	0.813	57	0.485
-78	0.221	-32	0.074	12	0.779	58	0.480
-77	0.238	-31	0.035	13	0.744	59	0.474
-76	0.255	-30	0.006	14	0.706	60	0.467
-75	0.271	-29	0.048	15	0.667	61	0.458
-74	0.288	-28	0.091	16	0.627	62	0.449
-73	0.304	-27	0.135	17	0.585	63	0.439
-72	0.319	-26	0.179	18	0.541	64	0.429
-71	0.335	-25	0.224	19	0.497	65	0.417
-70	0.350	-24	0.270	20	0.453	66	0.405
-69	0.364	-23	0.316	21	0.407	67	0.392
-68	0.378	-22	0.361	22	0.361	68	0.378
-67	0.392	-21	0.407	23	0.316	69	0.364
-66	0.405	-20	0.453	24	0.270	70	0.350
-65	0.417	-19	0.497	25	0.224	71	0.335
-64	0.429	-18	0.541	26	0.179	72	0.319
-63	0.439	-17	0.585	27	0.135	73	0.304
-62	0.449	-16	0.627	28	0.091	74	0.288
-61	0.458	-15	0.667	29	0.048	75	0.271
-60	0.467	-14	0.706	30	0.006	76	0.255
-59	0.474	-13	0.744	31	0.035	77	0.238
-58	0.480	-12	0.779	32	0.074	78	0.221
-57	0.485	-11	0.813	33	0.112	79	0.203
-56	0.488	-10	0.844	34	0.148	80	0.186
-55	0.491	-9	0.872	35	0.183	81	0.168
-54	0.492	-8	0.898	36	0.216	82	0.150
-53	0.491	-7	0.922	37	0.247	83	0.132
-52	0.489	-6	0.942	38	0.276	84	0.114
-51	0.486	-5	0.960	39	0.304	85	0.096
-50	0.481	-4	0.974	40	0.330	86	0.078
-49	0.474	-3	0.985	41	0.353	87	0.059
-48	0.465	-2	0.993	42	0.375	88	0.040
-47	0.455	-1	0.998	43	0.395	89	0.021
-46	0.443	0	1.000	44	0.413	90	0.000
-45	0.429			45	0.429		

S.O. 29770 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

6513-2-DA

WJHO ALEXANDER CITY, AL.

Elevation Gain of Antenna 1.984

V RMS 0.768

Vertical Azimuth Gain equals $1/(RMS)^2$ 1.695

***Total Vertical Power Gain is the Elevation Gain Times the Azimuth Gain**

Total Vertical Power Gain **3.364**

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ERP divided by Vertical Power Gain equals Antenna Input Power

10.5	kW ERP	Divided by V Gain	3.364	Equals	**3.122**	kW Antenna Input Power