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S.O. 28515

Report of Test 6810-3-DA

for

AUGUSTA RADIO FELLOWSHIP INSTITUTE, INC.

WSJA 91.3 MHz York, AL

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-3-DA to meet the needs of WSJA and to comply with the requirements of the FCC construction permit, file number BNPED-20071012AOS.

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 1C-Tabulation of the Horizontal Polarization for the Measured Azimuth Pattern
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 BNPED-20071012AOS indicates that the Horizontal radiation component shall not exceed 5.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

45 Degrees T: 0.158 kW

From Figure 1A, the maximum radiation of the Horizontal component occurs at 204 Degrees T to 271 Degrees T. At the restricted azimuth of 45 Degrees T the Horizontal component is 14.75 dB down from the maximum of 5.0 kW, or 0.167 kW.

The R.M.S. of the Horizontal component is 0.704. The total Horizontal power gain is 3.209. The R.M.S. of the Vertical component is 0.690. The total Vertical power gain is 3.146. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.821. The R.M.S. of the measured composite pattern is 0.706. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.698. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-3-DA was mounted on a tower of precise scale to the 36-inch face tower at the WSJA site. The spacing of the antenna to the tower was varied to achieve the vertical pattern shown in Figure 1A. A horizontal parasitic element was placed directly under the bay. The position of this horizontal parasitic element was changed until the horizontal pattern shown in Figure 1A was achieved. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BNPED-20071012AOS, a single level of the 6810-3-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 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

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 410.85 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 28515
September 3, 2010

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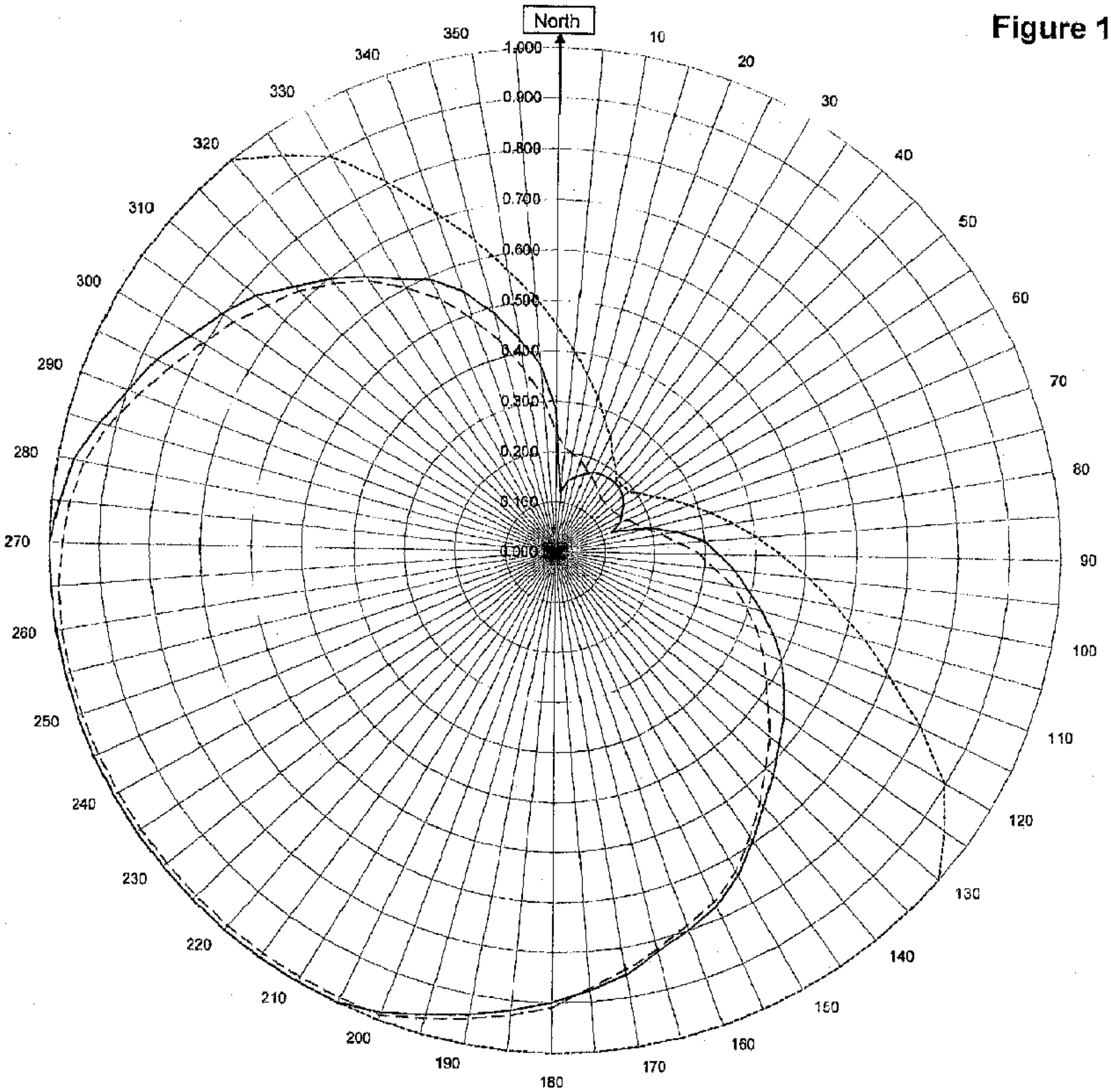
Figure 1A



WSJA York, AL

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September 3, 2010

Horizontal RMS	0.704
Vertical RMS	0.690
H/V Composite RMS	0.706
FCC Composite RMS	0.821

Frequency	91.3 / 410.85 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-3-DA
Pattern Type	Directional Azimuth

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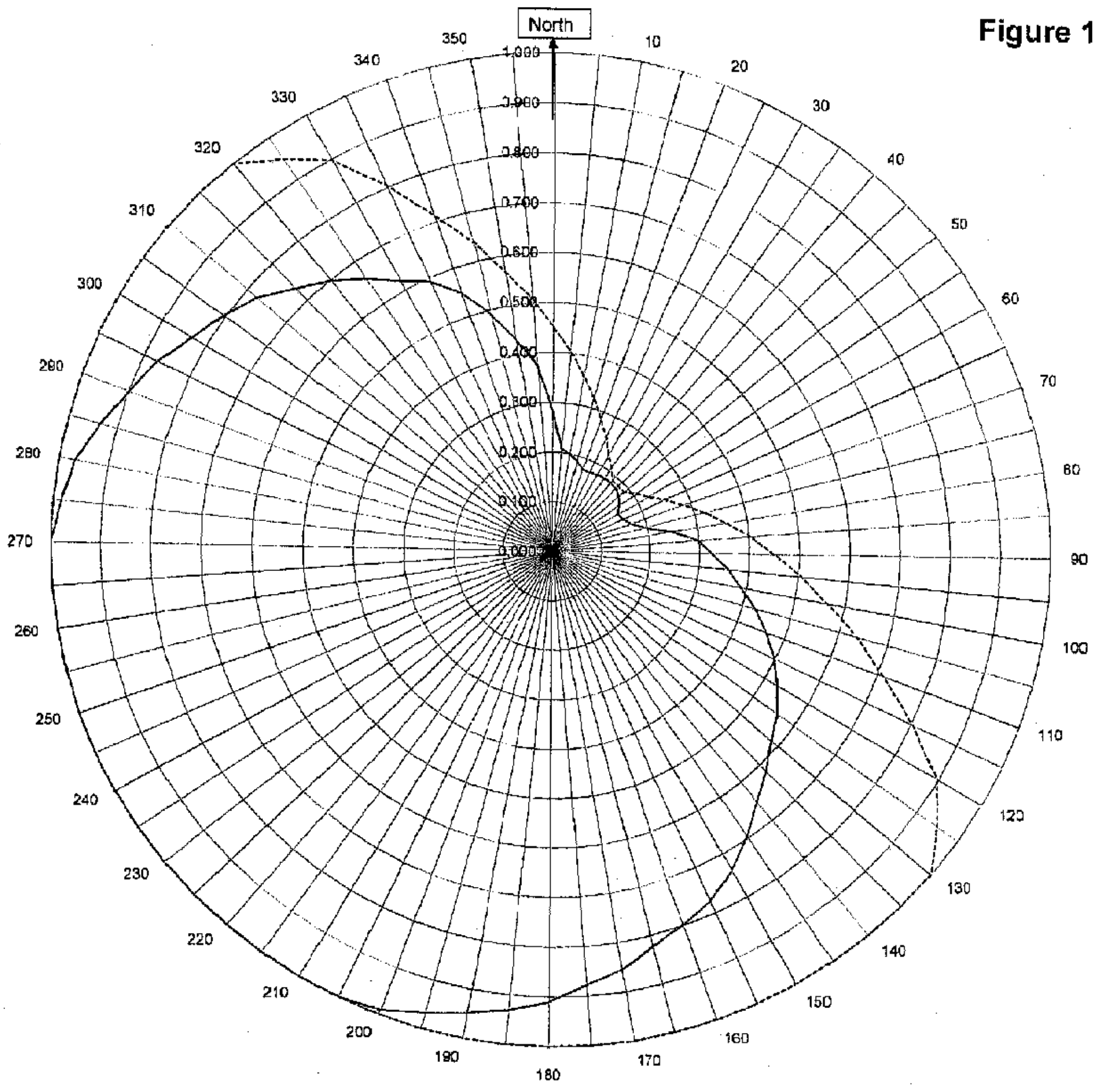
Figure 1B



WSJA York, AL

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September 3, 2010

________H/VComposite RMS	0.706
..............FCC Composite RMS	0.821

Frequency	91.3 / 410.85 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-3-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WSJA York, AL

Azimuth	Rel Field
0	0.283
10	0.144
20	0.165
30	0.181
40	0.184
45	0.183
50	0.177
60	0.155
70	0.120
80	0.249
90	0.327
100	0.390
110	0.465
120	0.529
130	0.585
135	0.619
140	0.653
150	0.739
160	0.799
170	0.855

Azimuth	Rel Field
180	0.900
190	0.940
200	0.984
210	1.000
220	1.000
225	1.000
230	1.000
240	1.000
250	1.000
260	1.000
270	1.000
280	0.968
290	0.899
300	0.832
310	0.775
315	0.732
320	0.698
330	0.620
340	0.549
350	0.430

Figure 1D

Tabulation of Vertical Azimuth Pattern
WSJA York, AL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.240	180	0.910
10	0.200	190	0.948
20	0.178	200	0.990
30	0.159	210	0.990
40	0.142	220	0.990
45	0.140	225	0.990
50	0.140	230	0.990
60	0.150	240	0.990
70	0.170	250	0.990
80	0.218	260	0.990
90	0.290	270	0.975
100	0.363	280	0.945
110	0.430	290	0.875
120	0.489	300	0.805
130	0.563	310	0.745
135	0.599	315	0.720
140	0.643	320	0.686
150	0.729	330	0.600
160	0.789	340	0.490
170	0.845	350	0.370

Figure 1E

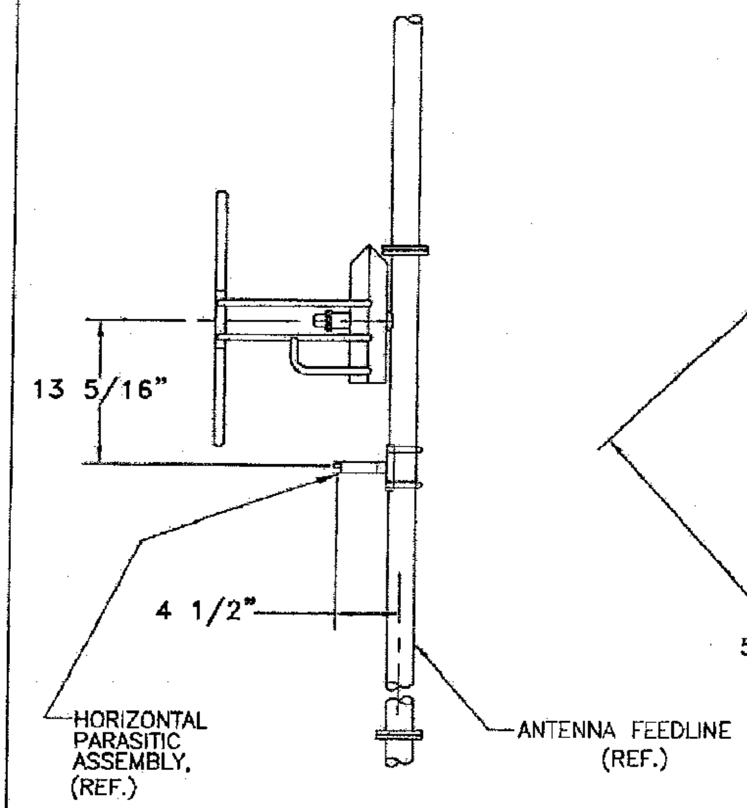
Tabulation of Composite Azimuth Pattern
WSJA York, AL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.283	180	0.910
10	0.200	190	0.948
20	0.178	200	0.990
30	0.181	210	1.000
40	0.184	220	1.000
45	0.183	225	1.000
50	0.177	230	1.000
60	0.155	240	1.000
70	0.170	250	1.000
80	0.249	260	1.000
90	0.327	270	1.000
100	0.390	280	0.968
110	0.465	290	0.899
120	0.529	300	0.832
130	0.585	310	0.775
135	0.619	315	0.732
140	0.653	320	0.698
150	0.739	330	0.620
160	0.799	340	0.549
170	0.855	350	0.430

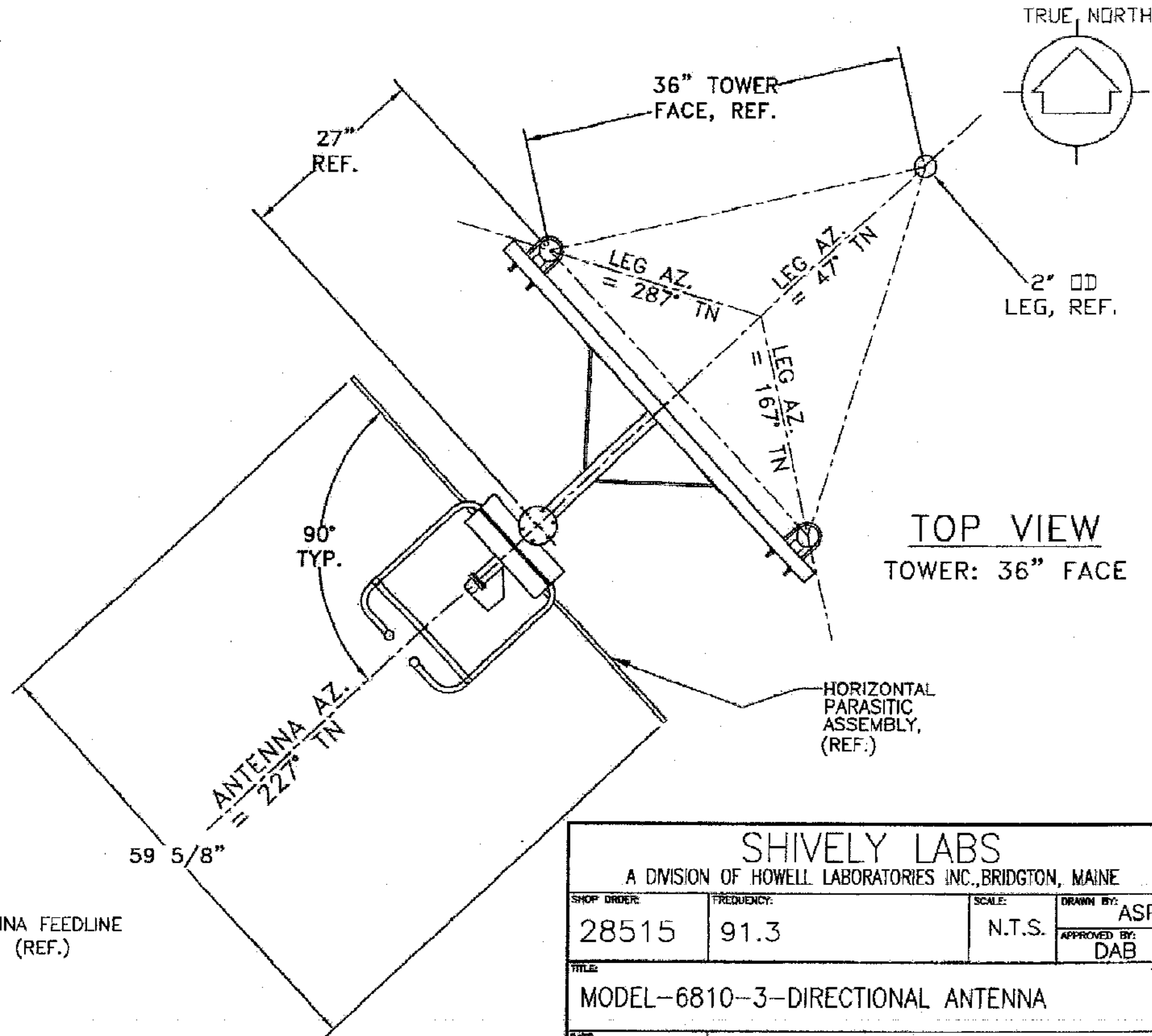
Figure 1F

Tabulation of FCC Directional Composite
WSJA York, AL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.451	180	1.000
10	0.359	190	1.000
20	0.285	200	1.000
30	0.227	210	1.000
40	0.190	220	1.000
50	0.190	230	1.000
60	0.227	240	1.000
70	0.285	250	1.000
80	0.359	260	1.000
90	0.451	270	1.000
100	0.567	280	1.000
110	0.713	290	1.000
120	0.897	300	1.000
130	1.000	310	1.000
140	1.000	320	1.000
150	1.000	330	0.897
160	1.000	340	0.713
170	1.000	350	0.567



SIDE VIEW



TOP VIEW

TOWER: 36" FACE

ANTENNA HEADING 227° TRUE NORTH

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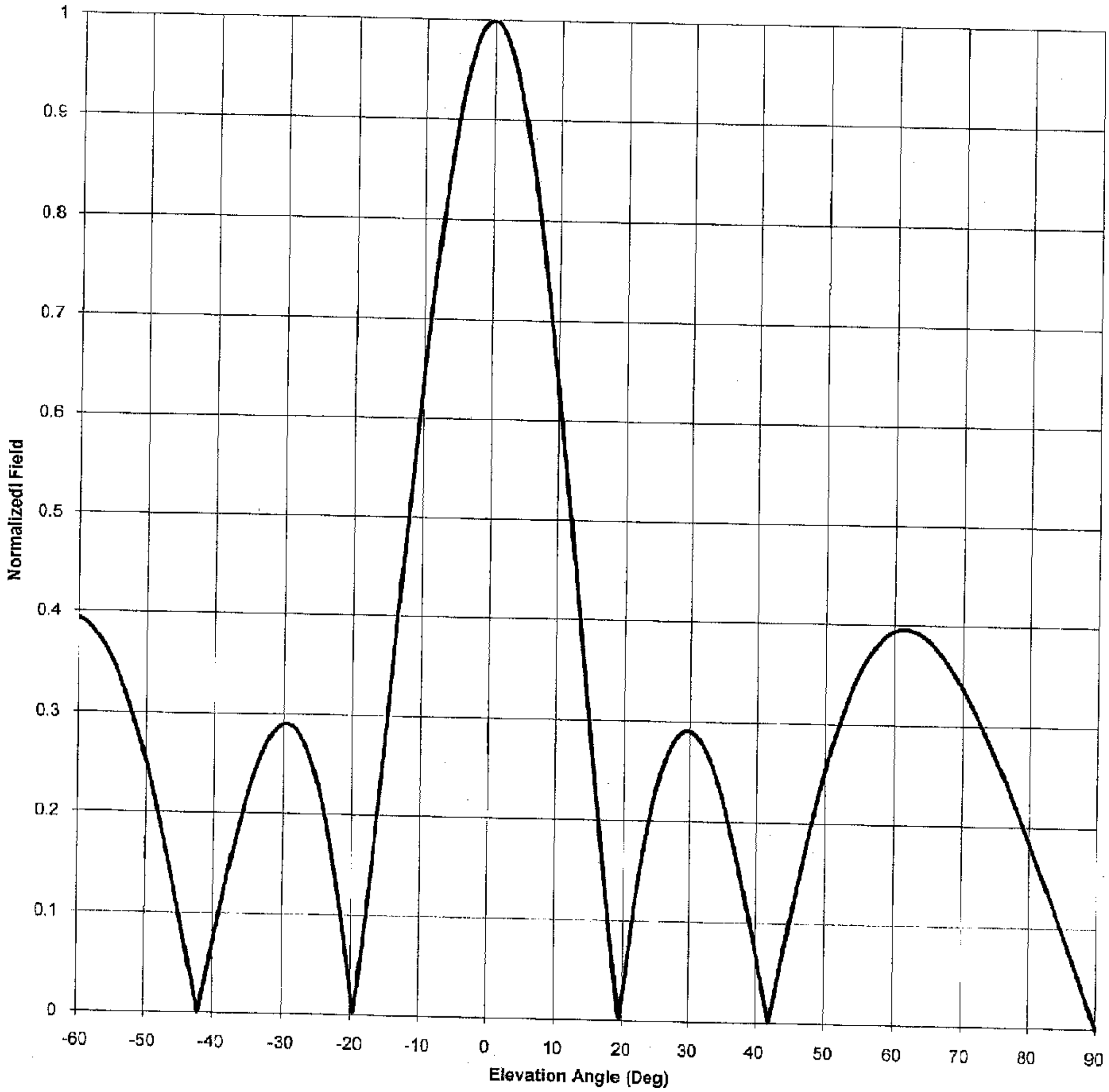
SHOP ORDER: 28515	FREQUENCY: 91.3	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY: DAB
TITLE: MODEL-6810-3-DIRECTIONAL ANTENNA			
DATE: 9/22/10	FIGURE 2		

Antenna Mfg.:	Shively Labs				Date: 9/3/2010
Antenna Type:	6810-3-DA				
Station:	WSJA	Beam Tilt	0		
Frequency:	91.3	Gain (Max)	3.209	5.064 dB	
Channel #:	217	Gain (Horizon)	3.209	5.064 dB	
Figure:	3				



S.O. 28515 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WSJA 91.3 MHz York, AL

Model 6810-3-DA

Elevation Gain of Antenna 1.559

Horizontal RMS value divided by the Vertical RMS value equals the Horiz. - Vert. Ratio

H RMS 0.704 V RMS 0.69 H/V Ratio 1.020

Elevation Gain of Horizontal Component 1.591

Elevation Gain of Vertical Component 1.528

Horizontal Azimuth Gain equals $1/(RMS)^2$. 2.018

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 2.059
Max. Vertical 0.99

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

Total Horizontal Power Gain = **3.209**

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

Total Vertical Power Gain = **3.146**

==

ERP divided by Horizontal Power Gain equals Antenna Input Power

5 kW ERP Divided by H Gain 3.209 equals 1.56 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

1.56 kW Times V Gain 3.146 equals 4.90 kW V ERP

Maximum Value of the Vertical Component squared times the Maximum ERP equals the Vertical ERP

(0.99)^2 Times 5.00 Equals 4.90 kW Vertical ERP

NOTE: Calculating the ERP of the Vertical Component by two methods validates the total power gain calculations