Shively Labs
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S.O. 27847

Report of Test 6810-4-DA

for

CENTRAL FLORIDA EDUCATIONAL FOUNDATION, INC.

WHYZ 91.1 MHz Palm Coast, FL

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-4-DA to meet the needs of WHYZ and to comply with the requirements of the FCC construction permit, file number BMPED-20090416AUX.

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 BMPED-20090416AUX indicates that the Horizontal radiation component shall not exceed 9.2 kW at any azimuth and is restricted to the following values at the azimuths specified:

300 Degrees T: 3.0 kW

EXHIBIT B
APPLICATION FOR STATION LICENSE
CENTRAL FLORIDA
EDUCATIONAL FOUNDATION, INC.
WHYZ (FM) RADIO STATION
CH 216C3 - 91.1 MHZ - 9.2 KW (DA)
PALM COAST, FLORIDA
August 2010

From Figure 1A, the maximum radiation of the Horizontal component occurs at 209 Degrees T to 231 Degrees T. At the restricted azimuth of 300 Degrees T the Vertical component is 4.9 dB down from the maximum of 9.2 kW, or 3.0 kW. At the restricted azimuth of 300 Degrees T, the horizontal field is below the vertical field at this azimuth and therefore also meets the restriction.

The R.M.S. of the Horizontal component is 0.811. The total Horizontal power gain is 3.421. The R.M.S. of the Vertical component is 0.772. The total Vertical power gain is 3.408. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.921. The R.M.S. of the measured composite pattern is 0.835. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.783. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-4-DA was mounted on a tower of precise scale to the Rohn-55 tower at the WHYZ site. The spacing of the antenna to the tower was varied and a vertical parasitic element attached to the interbay feedline to achieve the vertical pattern shown in Figure 1A. The spacing of the antenna to the tower was varied until the horizontal pattern in Figure 1A was achieved. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BMPED-20090416AUX, a single level of the 6810-4-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 409.95 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 27847
November 5, 2009

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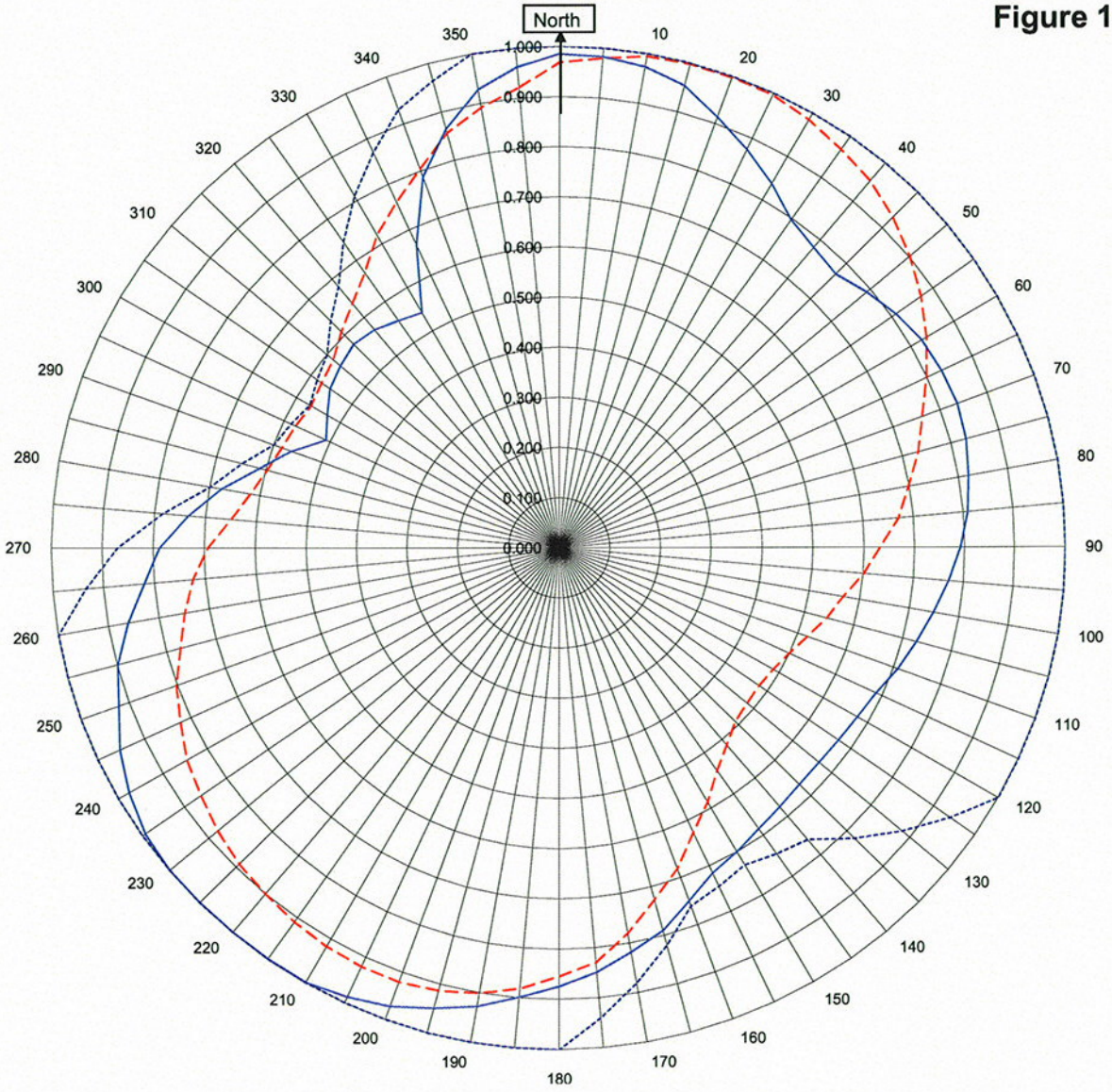
Figure 1a



WHYZ Palm Coast, FL

27847

November 5, 2009

Horizontal RMS	0.811
Vertical RMS	0.772
H/V Composite RMS	0.835
.....FCC Composite RMS	0.921

Frequency	91.1 / 409.95 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-4-DA Pattern 03-A
Pattern Type	Directional Azimuth

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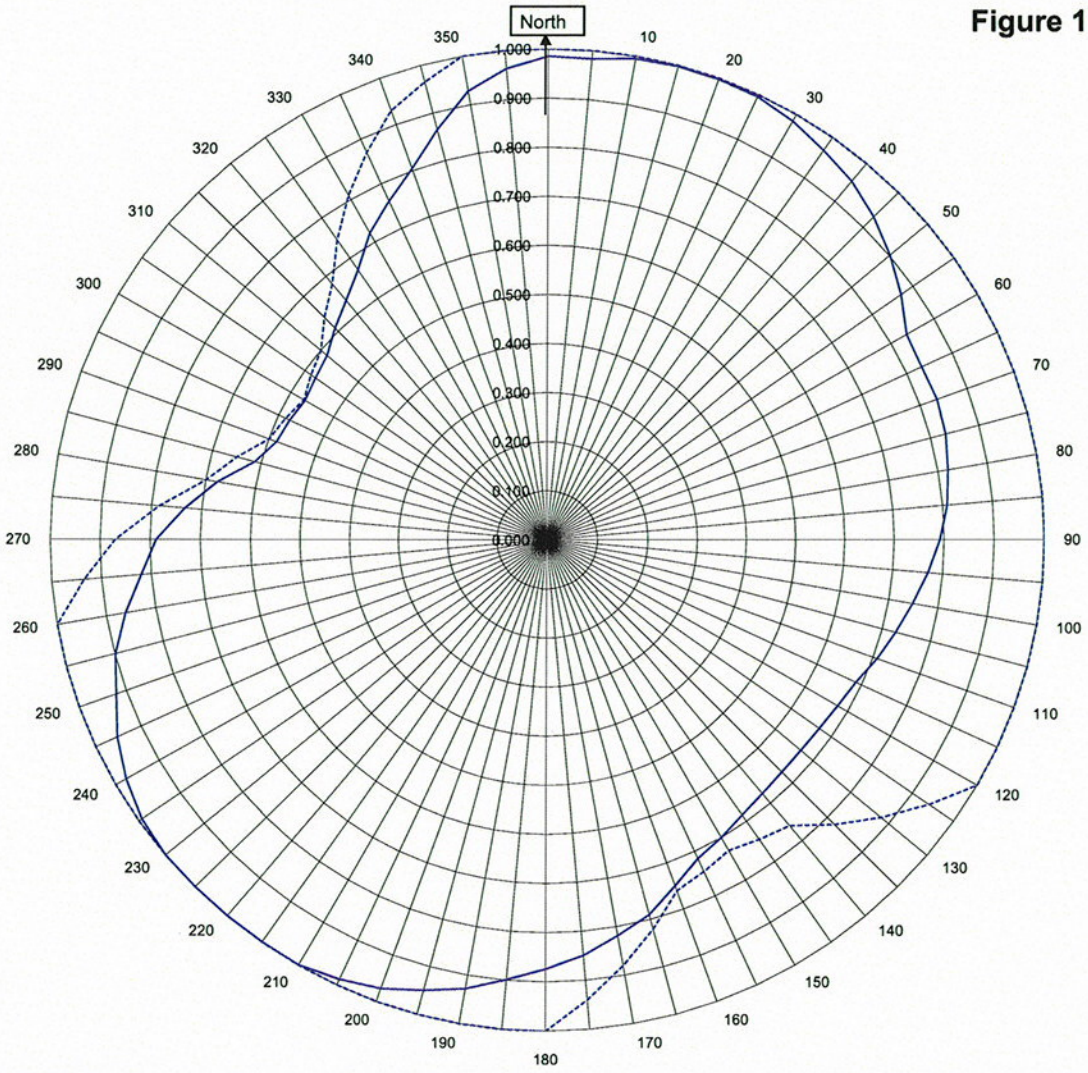
Figure 1b



WHYZ Palm Coast, FL

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November 5, 2009

_____H/VComposite RMS	0.835
.....FCC Composite RMS	0.921

Frequency	91.1 / 409.95 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-4-DA Pattern 03-A
Pattern Type	Directional H/V Composite

Figure 1c

Tabulation of Horizontal Azimuth Pattern 03-A
WHYZ Palm Coast, FL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.985	180	0.874
10	0.974	190	0.928
20	0.914	200	0.972
30	0.837	210	1.000
40	0.780	220	1.000
45	0.771	225	1.000
50	0.791	230	1.000
60	0.825	240	0.976
70	0.836	250	0.922
80	0.820	260	0.862
90	0.791	270	0.788
100	0.748	280	0.677
110	0.708	290	0.564
120	0.676	300	0.530
130	0.667	310	0.565
135	0.668	315	0.575
140	0.675	320	0.568
150	0.700	330	0.542
160	0.749	340	0.787
170	0.818	350	0.928

Figure 1d

Tabulation of Vertical Azimuth Pattern 03-A
WHYZ Palm Coast, FL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.968	180	0.853
10	0.995	190	0.901
20	0.998	200	0.920
30	0.985	210	0.917
40	0.953	220	0.900
45	0.930	225	0.892
50	0.902	230	0.878
60	0.836	240	0.846
70	0.761	250	0.803
80	0.698	260	0.750
90	0.631	270	0.693
100	0.567	280	0.620
110	0.519	290	0.583
120	0.486	300	0.567
130	0.482	310	0.584
135	0.491	315	0.610
140	0.513	320	0.636
150	0.585	330	0.721
160	0.680	340	0.804
170	0.780	350	0.892

Figure 1e

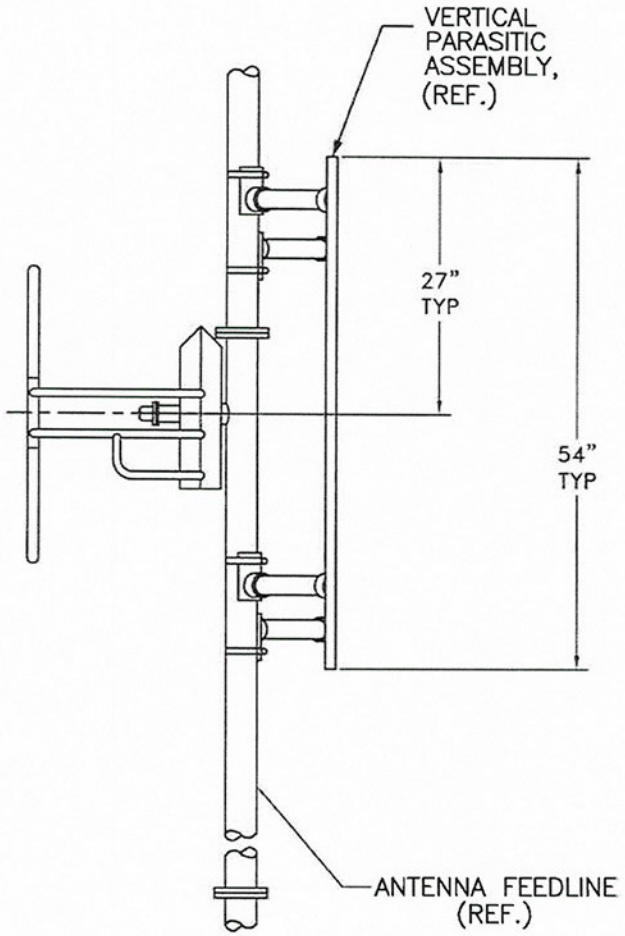
Tabulation of Composite Azimuth Pattern 03-A
WHYZ Palm Coast, FL

Azimuth	Rel Field	Azimuth	Rel Field
0	0.985	180	0.874
10	0.995	190	0.928
20	0.998	200	0.972
30	0.985	210	1.000
40	0.953	220	1.000
45	0.930	225	1.000
50	0.902	230	1.000
60	0.836	240	0.976
70	0.836	250	0.922
80	0.820	260	0.862
90	0.791	270	0.788
100	0.748	280	0.677
110	0.708	290	0.583
120	0.676	300	0.567
130	0.667	310	0.584
135	0.668	315	0.610
140	0.675	320	0.636
150	0.700	330	0.721
160	0.749	340	0.804
170	0.818	350	0.928

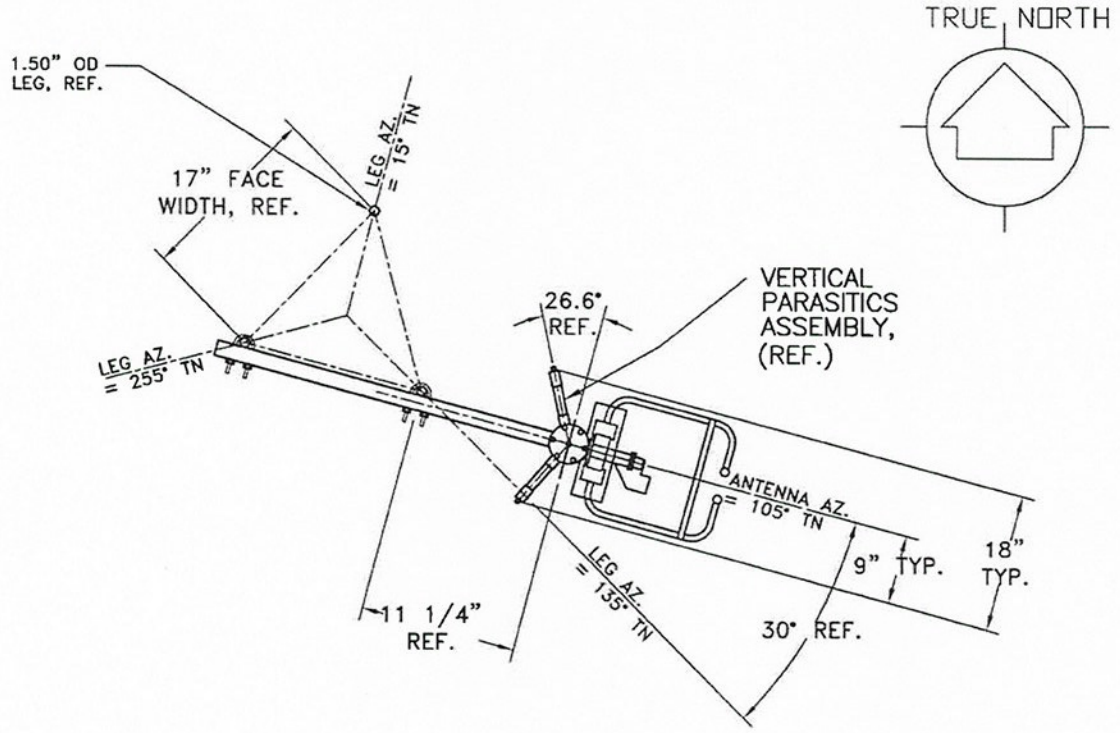
Figure 1f

Tabulation of FCC Directional Composite
WHYZ Palm Coast, FL

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	1.000
10	1.000	190	1.000
20	1.000	200	1.000
30	1.000	210	1.000
40	1.000	220	1.000
50	1.000	230	1.000
60	1.000	240	1.000
70	1.000	250	1.000
80	1.000	260	1.000
90	1.000	270	0.870
100	1.000	280	0.700
110	1.000	290	0.600
120	1.000	300	0.570
130	0.880	310	0.600
140	0.760	320	0.680
150	0.730	330	0.810
160	0.760	340	0.930
170	0.880	350	1.000



SIDE VIEW



TOP VIEW

TOWER MAKE: ROHN 55

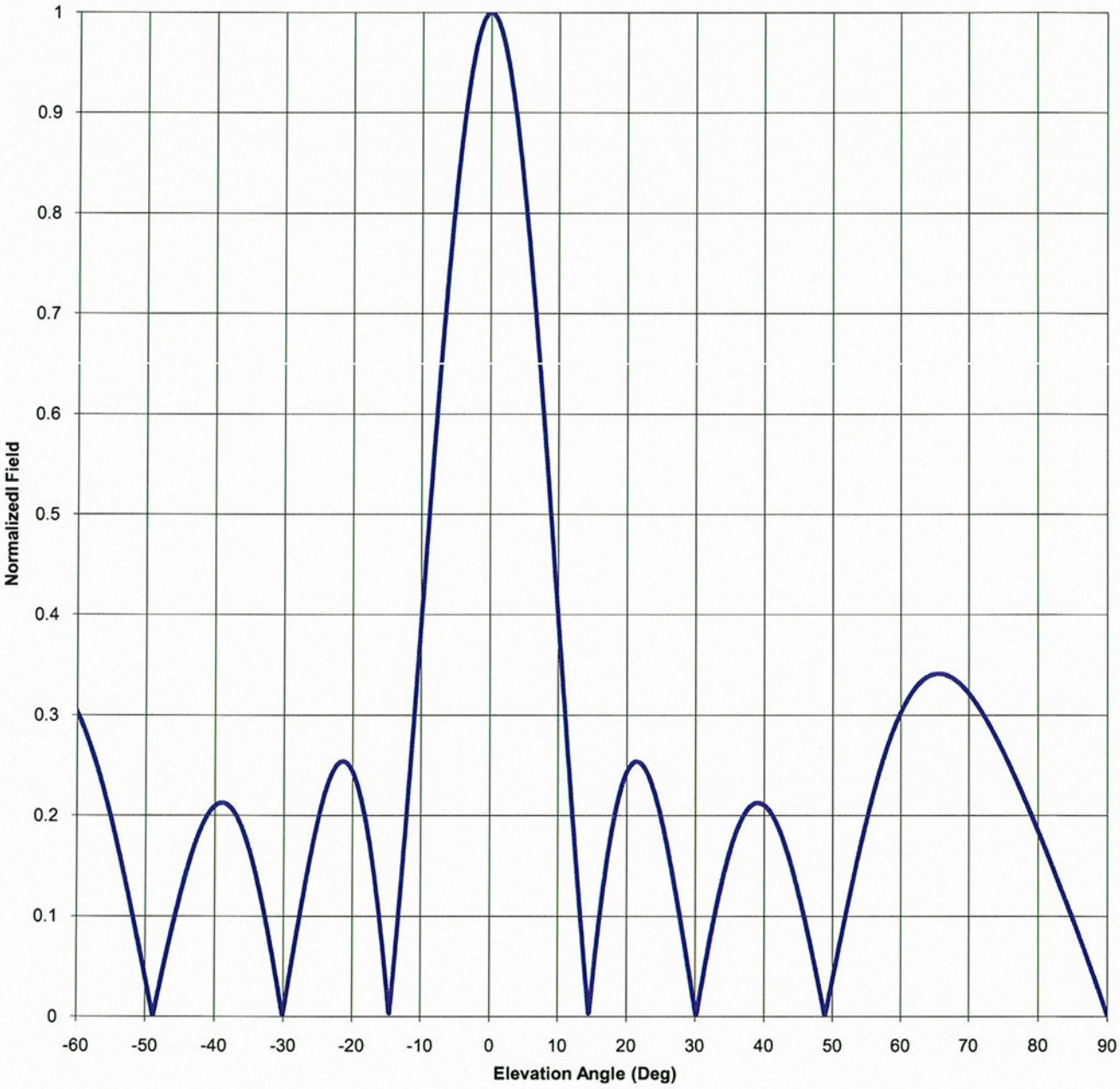
ANTENNA HEADING 105° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE			
SHOP ORDER: 27847	PROGRAM: 91.1	SCALE: N.T.S.	DRAWN BY: ASP
			APPROVED BY: DAB
TITLE: MODEL-6810-4-DIRECTIONAL ANTENNA			
DATE: 11/5/09	FIGURE 2		

Antenna Mfg.: Shively Labs
Antenna Type: 6810-4-DA
Station: WHYZ
Frequency: 91.1
Channel #: 216
Figure: 3

Date: 11/9/2009

Beam Tilt	0	
Gain (Max)	3.421	5.342 dB
Gain (Horizon)	3.421	5.342 dB



Antenna Mfg.: Shively Labs
Antenna Type: 6810-4-DA
Station: WHYZ
Frequency: 91.1
Channel #: 216
Figure: 3

Date: 11/9/2009

Beam Tilt	**0**	
Gain (Max)	**3.421**	**5.342 dB**
Gain (Horizon)	**3.421**	**5.342 dB**

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	0.148	0	1.000	46	0.093
-89	0.021	-43	0.170	1	0.992	47	0.062
-88	0.040	-42	0.188	2	0.970	48	0.029
-87	0.059	-41	0.202	3	0.933	49	0.004
-86	0.078	-40	0.210	4	0.883	50	0.038
-85	0.096	-39	0.213	5	0.820	51	0.072
-84	0.114	-38	0.210	6	0.748	52	0.106
-83	0.132	-37	0.201	7	0.666	53	0.138
-82	0.150	-36	0.186	8	0.579	54	0.168
-81	0.167	-35	0.165	9	0.487	55	0.197
-80	0.185	-34	0.139	10	0.393	56	0.223
-79	0.201	-33	0.108	11	0.299	57	0.247
-78	0.218	-32	0.073	12	0.208	58	0.268
-77	0.234	-31	0.035	13	0.121	59	0.287
-76	0.249	-30	0.006	14	0.040	60	0.303
-75	0.263	-29	0.047	15	0.032	61	0.316
-74	0.277	-28	0.089	16	0.096	62	0.326
-73	0.290	-27	0.128	17	0.149	63	0.334
-72	0.302	-26	0.165	18	0.192	64	0.339
-71	0.312	-25	0.197	19	0.223	65	0.341
-70	0.322	-24	0.223	20	0.244	66	0.341
-69	0.329	-23	0.242	21	0.253	67	0.339
-68	0.335	-22	0.252	22	0.252	68	0.335
-67	0.339	-21	0.253	23	0.242	69	0.329
-66	0.341	-20	0.244	24	0.223	70	0.322
-65	0.341	-19	0.223	25	0.197	71	0.312
-64	0.339	-18	0.192	26	0.165	72	0.302
-63	0.334	-17	0.149	27	0.128	73	0.290
-62	0.326	-16	0.096	28	0.089	74	0.277
-61	0.316	-15	0.032	29	0.047	75	0.263
-60	0.303	-14	0.040	30	0.006	76	0.249
-59	0.287	-13	0.121	31	0.035	77	0.234
-58	0.268	-12	0.208	32	0.073	78	0.218
-57	0.247	-11	0.299	33	0.108	79	0.201
-56	0.223	-10	0.393	34	0.139	80	0.185
-55	0.197	-9	0.487	35	0.165	81	0.167
-54	0.168	-8	0.579	36	0.186	82	0.150
-53	0.138	-7	0.666	37	0.201	83	0.132
-52	0.106	-6	0.748	38	0.210	84	0.114
-51	0.072	-5	0.820	39	0.213	85	0.096
-50	0.038	-4	0.883	40	0.210	86	0.078
-49	0.004	-3	0.933	41	0.202	87	0.059
-48	0.029	-2	0.970	42	0.188	88	0.040
-47	0.062	-1	0.992	43	0.170	89	0.021
-46	0.093	0	1.000	44	0.148	90	0.000
-45	0.122			45	0.122		

S.O. 27847 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WHYZ 91.1 MHz Palm Coast, FL

Model 6810-4-DA Pattern 03-A

Elevation Gain of Antenna 2.142

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

H RMS 0.811 V RMS 0.772 H/V Ratio 1.051

Elevation Gain of Horizontal Component 2.250

Elevation Gain of Vertical Component 2.039

Horizontal Azimuth Gain equals $1/(RMS)^2$. 1.520

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 1.671
Max. Vertical 0.998

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

Total Horizontal Power Gain = **3.421**

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

Total Vertical Power Gain = **3.408**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

9.2 kW ERP Divided by H Gain 3.421 equals 2.69 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

2.69 kW Times V Gain 3.408 equals 9.16 kW V ERP

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

(0.998)^2 Times 9.20 Equals 9.16 kW Vertical ERP

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