Shively Labs
a division of Howell Laboratories,Inc.
- An Employee-Owned Company -

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S.O. 27199

Report of Test 6810-1R-DA

for

HUDSON VALLEY COMMUNITY RADIO, INC.

WDFH 90.3 MHz Ossining, NY

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-1R-DA to meet the needs of WDFH and to comply with the requirements of the FCC construction permit, file number BMPED-20070814ABF.

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-20070814ABF indicates that the Horizontal radiation component shall not exceed 0.053 kW at any azimuth and is restricted to the following values at the azimuths specified:

180 Degrees T through 190 Degrees T: 0.017 kW

250 Degrees T through 260 Degrees T: 0.011 kW

From Figure 1A, the maximum radiation of the Horizontal component occurs at 345 Degrees T to 031 Degrees T. At the restricted azimuth of 180 Degrees T through 190 Degrees T the Vertical component is 9.55 dB down from the maximum of 0.053 kW, or 0.006 kW. At the restricted azimuth of 250 Degrees T through 260 Degrees T the Horizontal component is 7.17 dB down from the maximum of 0.053 kW, or 0.0102 kW.

The R.M.S. of the Horizontal component is 0.734. The total Horizontal power gain is 0.867. The R.M.S. of the Vertical component is 0.723. The total Vertical power gain is 0.850. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.882. The R.M.S. of the measured composite pattern is 0.751. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.750. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

The 6810-1R-DA was mounted on a pole of precise scale to the 8-inch pole at the WDFH site. The spacing of the antenna to the pole 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 BMPED-20070814ABF, a single level of the 6810-1R-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 406.35 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 27199
December 31, 2008

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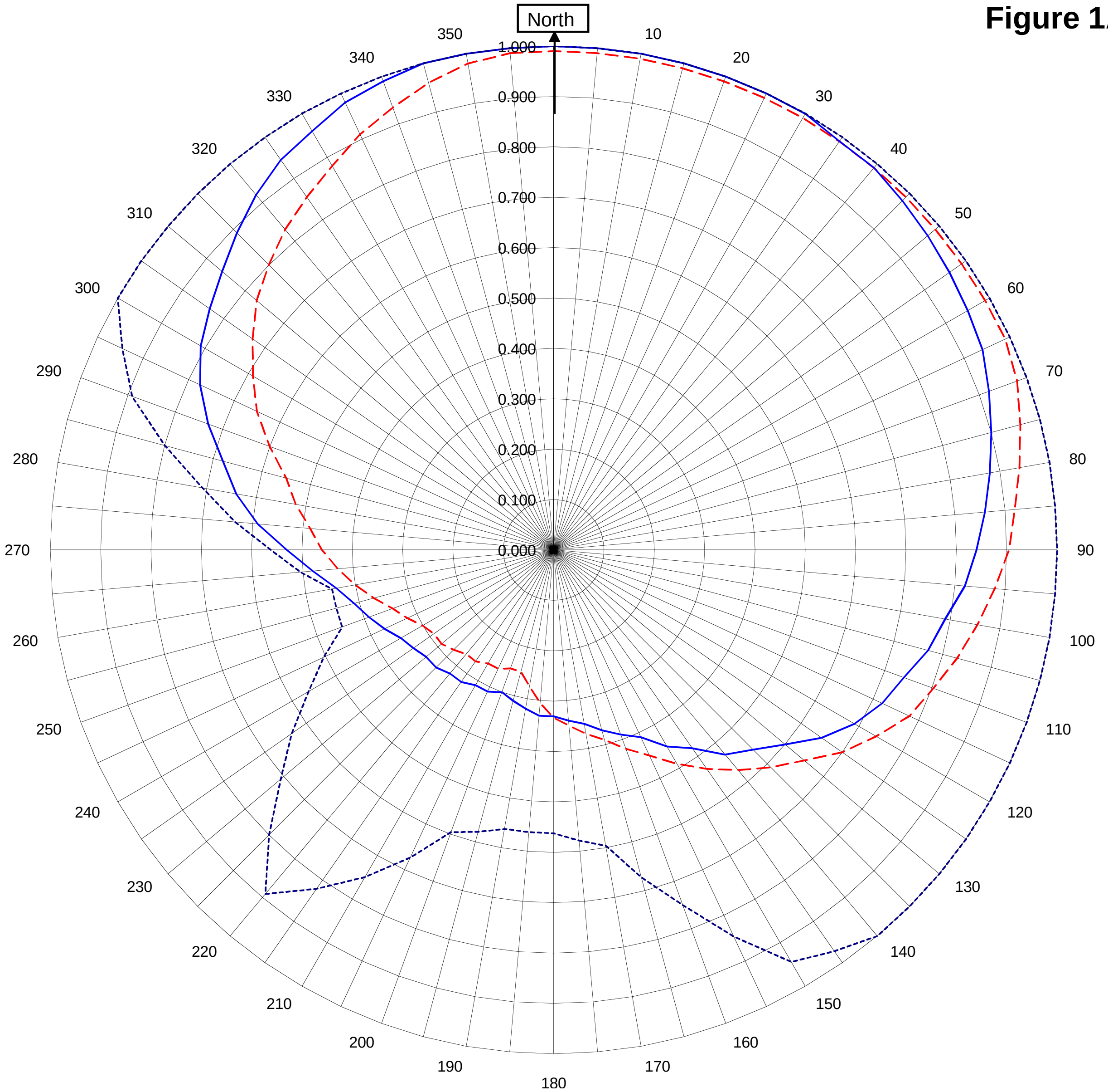
Figure 1A



WDFH Ossining, NY

27199

December 29, 2008

Horizontal RMS	0.734
Vertical RMS	0.723
H/V Composite RMS	0.751
...............FCC Composite RMS	0.882

Frequency	90.3 / 406.35 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-1R-DA Patt 15-B
Pattern Type	Directional Azimuth

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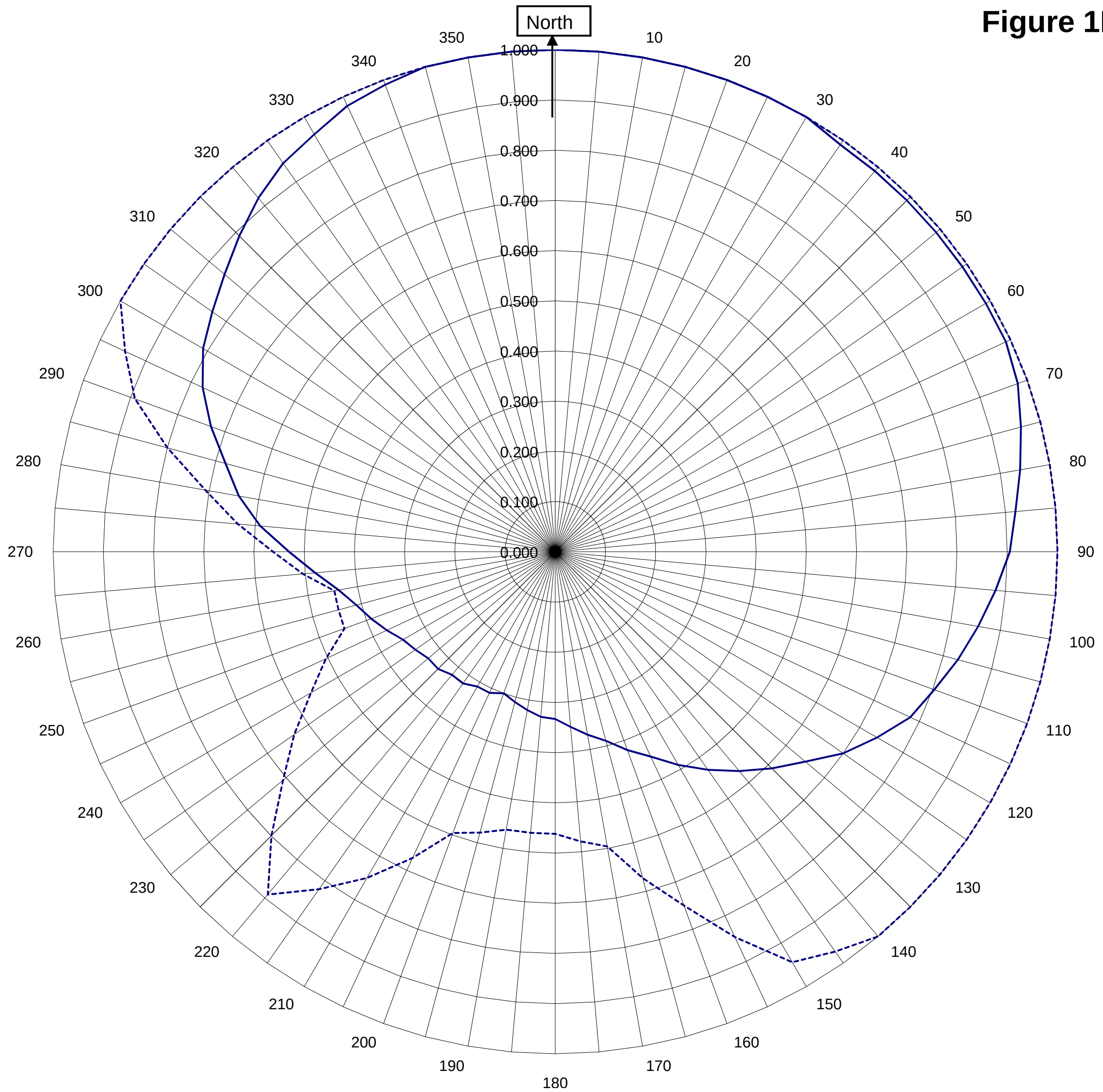
Figure 1B



WDFH Ossining, NY

27199

December 29, 2008

___________H/VComposite RMS	0.751
……………FCC Composite RMS	0.882

Frequency	90.3 / 406.35 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-1R-DA Patt 15-B
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WDFH Ossining, NY

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.330
10	1.000	190	0.320
20	1.000	200	0.300
30	1.000	210	0.310
40	0.990	220	0.320
45	0.980	225	0.330
50	0.970	230	0.330
60	0.950	240	0.350
70	0.920	250	0.390
80	0.880	260	0.438
90	0.840	270	0.530
100	0.790	280	0.640
110	0.740	290	0.730
120	0.690	300	0.810
130	0.600	310	0.860
135	0.560	315	0.890
140	0.530	320	0.920
150	0.450	330	0.960
160	0.390	340	0.990
170	0.350	350	1.000

Figure 1D

Tabulation of Vertical Azimuth Pattern
WDFH Ossining, NY

Azimuth	Rel Field	Azimuth	Rel Field
0	0.990	180	0.333
10	0.990	190	0.275
20	0.990	200	0.250
30	0.990	210	0.260
40	0.990	220	0.270
45	0.990	225	0.280
50	0.990	230	0.290
60	0.990	240	0.300
70	0.980	250	0.340
80	0.940	260	0.400
90	0.905	270	0.460
100	0.855	280	0.520
110	0.803	290	0.600
120	0.740	300	0.690
130	0.650	310	0.770
135	0.610	315	0.800
140	0.570	320	0.830
150	0.490	330	0.880
160	0.420	340	0.934
170	0.370	350	0.980

Figure 1E

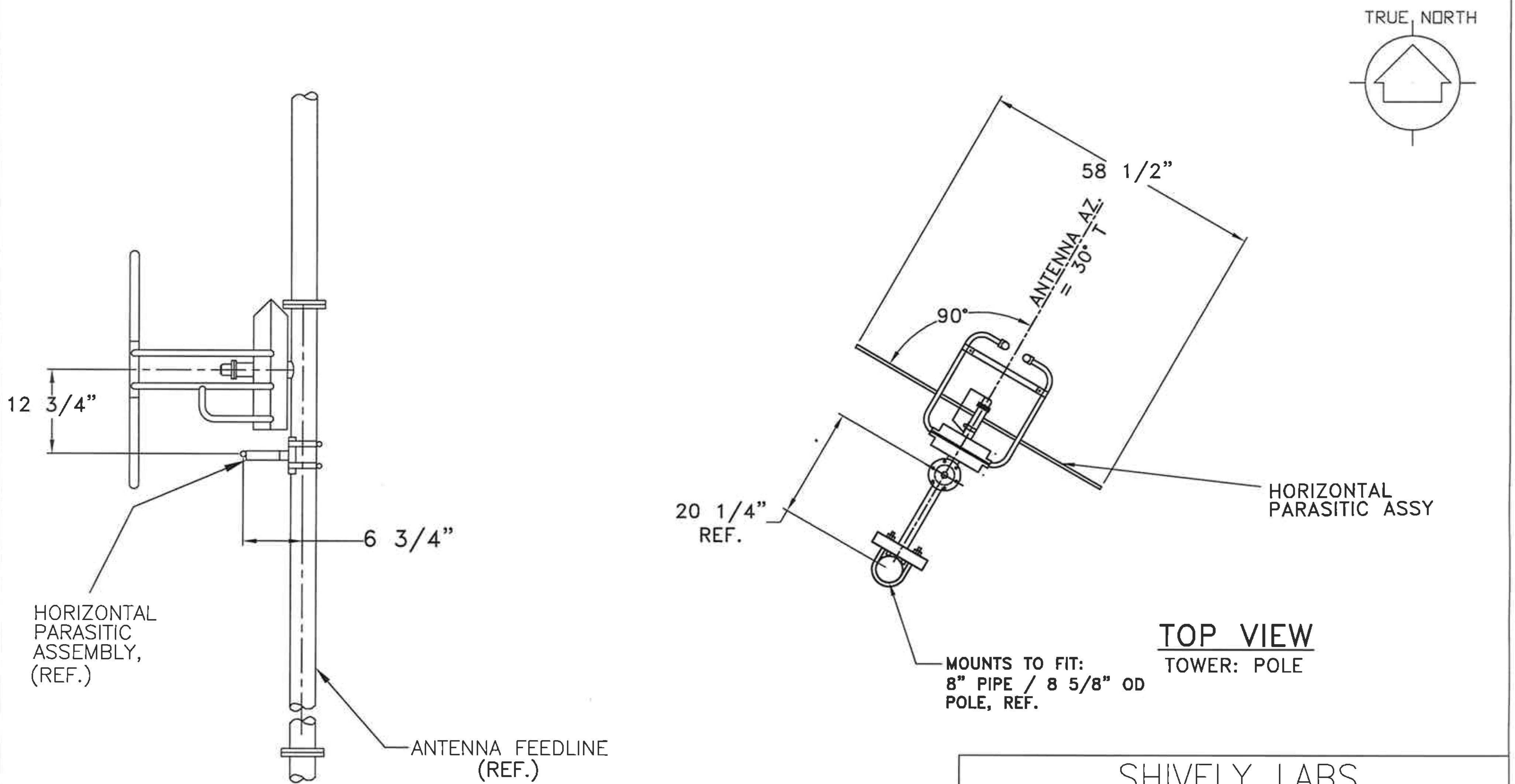
Tabulation of Composite Azimuth Pattern
WDFH Ossining, NY

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.333
10	1.000	190	0.320
20	1.000	200	0.300
30	1.000	210	0.310
40	0.990	220	0.320
45	0.990	225	0.330
50	0.990	230	0.330
60	0.990	240	0.350
70	0.980	250	0.390
80	0.940	260	0.438
90	0.905	270	0.530
100	0.855	280	0.640
110	0.803	290	0.730
120	0.740	300	0.810
130	0.650	310	0.860
135	0.610	315	0.890
140	0.570	320	0.920
150	0.490	330	0.960
160	0.420	340	0.990
170	0.370	350	1.000

Figure 1F

Tabulation of FCC Directional Composite
WDFH Ossining, NY

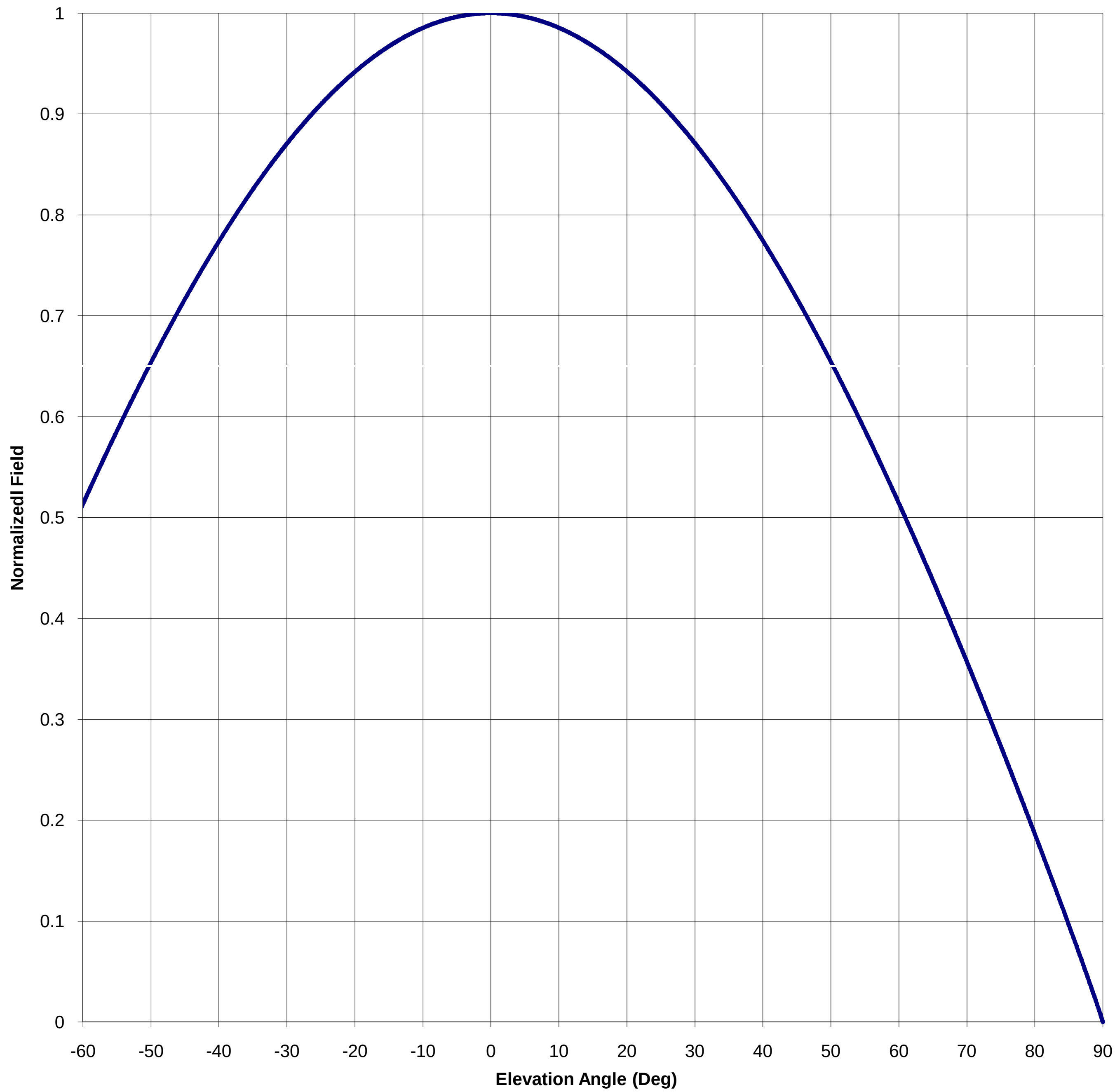
Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.562
10	1.000	190	0.562
20	1.000	200	0.596
30	1.000	210	0.750
40	1.000	220	0.891
50	1.000	230	0.708
60	1.000	240	0.562
70	1.000	250	0.447
80	1.000	260	0.447
90	1.000	270	0.562
100	1.000	280	0.708
110	1.000	290	0.891
120	1.000	300	1.000
130	1.000	310	1.000
140	1.000	320	1.000
150	0.944	330	1.000
160	0.750	340	1.000
170	0.596	350	1.000



ANTENNA HEADING 30° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER: 27199	FREQUENCY: 90.3 MHz.	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY: DAB
TITLE: MODEL-6810-1R-DIRECTIONAL ANTENNA			
DATE: 12/29/08	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date:**	**12/31/2008**
Antenna Type:	**6810-1R-DA**				
Station:	**WDFH**	**Beam Tilt**	**0**		
Frequency:	**90.3**	**Gain (Max)**	**0.867**	**-0.618**	**dB**
Channel #:	**202**	**Gain (Horizon)**	**0.867**	**-0.618**	**dB**
Figure:	**3**				



Antenna Mfg.:	Shively Labs				Date: 12/31/2008
Antenna Type:	6810-1R-DA				
Station:	WDFH	Beam Tilt	0		
Frequency:	90.3	Gain (Max)	0.867	-0.618	dB
Channel #:	202	Gain (Horizon)	0.867	-0.618	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	0.729	0	1.000	46	0.705
-89	0.021	-43	0.741	1	1.000	47	0.693
-88	0.040	-42	0.752	2	0.999	48	0.680
-87	0.059	-41	0.763	3	0.999	49	0.667
-86	0.078	-40	0.774	4	0.998	50	0.654
-85	0.096	-39	0.785	5	0.996	51	0.641
-84	0.114	-38	0.796	6	0.995	52	0.628
-83	0.133	-37	0.806	7	0.993	53	0.614
-82	0.151	-36	0.816	8	0.991	54	0.600
-81	0.168	-35	0.826	9	0.988	55	0.586
-80	0.186	-34	0.835	10	0.985	56	0.572
-79	0.204	-33	0.845	11	0.982	57	0.558
-78	0.221	-32	0.854	12	0.979	58	0.544
-77	0.239	-31	0.862	13	0.975	59	0.529
-76	0.256	-30	0.871	14	0.971	60	0.514
-75	0.273	-29	0.879	15	0.967	61	0.499
-74	0.290	-28	0.887	16	0.963	62	0.484
-73	0.307	-27	0.895	17	0.958	63	0.469
-72	0.324	-26	0.903	18	0.953	64	0.453
-71	0.341	-25	0.910	19	0.948	65	0.437
-70	0.357	-24	0.917	20	0.942	66	0.422
-69	0.373	-23	0.924	21	0.936	67	0.406
-68	0.390	-22	0.930	22	0.930	68	0.390
-67	0.406	-21	0.936	23	0.924	69	0.373
-66	0.422	-20	0.942	24	0.917	70	0.357
-65	0.437	-19	0.948	25	0.910	71	0.341
-64	0.453	-18	0.953	26	0.903	72	0.324
-63	0.469	-17	0.958	27	0.895	73	0.307
-62	0.484	-16	0.963	28	0.887	74	0.290
-61	0.499	-15	0.967	29	0.879	75	0.273
-60	0.514	-14	0.971	30	0.871	76	0.256
-59	0.529	-13	0.975	31	0.862	77	0.239
-58	0.544	-12	0.979	32	0.854	78	0.221
-57	0.558	-11	0.982	33	0.845	79	0.204
-56	0.572	-10	0.985	34	0.835	80	0.186
-55	0.586	-9	0.988	35	0.826	81	0.168
-54	0.600	-8	0.991	36	0.816	82	0.151
-53	0.614	-7	0.993	37	0.806	83	0.133
-52	0.628	-6	0.995	38	0.796	84	0.114
-51	0.641	-5	0.996	39	0.785	85	0.096
-50	0.654	-4	0.998	40	0.774	86	0.078
-49	0.667	-3	0.999	41	0.763	87	0.059
-48	0.680	-2	0.999	42	0.752	88	0.040
-47	0.693	-1	1.000	43	0.741	89	0.021
-46	0.705	0	1.000	44	0.729	90	0.000
-45	0.717			45	0.717		

S.O. 27199 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WDFH 90.3 MHz Ossining, NY

Model 6810-1R-DA

Elevation Gain of Antenna 0.46

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

H RMS 0.734 V RMS 0.723 H/V Ratio 1.015

Elevation Gain of Horizontal Component	0.467
Elevation Gain of Vertical Component	0.453
Horizontal Azimuth Gain equals $1/(RMS)^2$.	1.856
Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$.	1.875

Max. Vertical 0.99

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

Total Horizontal Power Gain = **0.867**

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

Total Vertical Power Gain = **0.850**

==

ERP divided by Horizontal Power Gain equals Antenna Input Power

0.053 kW ERP Divided by H Gain 0.867 equals 0.06 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.06 kW Times V Gain 0.850 equals 0.05 kW V ERP

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

(0.99)^2 Times 0.05 Equals 0.05 kW Vertical ERP

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