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S.O. 27758

Report of Test 6810-2R-SS-DA

for

6 JOHNSON ROAD LICENSES, INC.

WDVT 94.5 MHz Rutland, VT

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-2R-SS-DA to meet the needs of WDVT and to comply with the requirements of the FCC construction permit, file number BPH-20081118AAU.

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 BPH-20081118AAU indicates that the Horizontal radiation component shall not exceed 6.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

220 - 240 Degrees T: 0.298 kW

From Figure 1A, the maximum radiation of the Horizontal component occurs at 014 Degrees T to 091 Degrees T. At the restricted azimuth of 220 - 240 Degrees T the Horizontal component is 13.76 dB down from the maximum of 6.0 kW, or 0.252 kW.

The R.M.S. of the Horizontal component is 0.744. The total Horizontal power gain is 1.322. The R.M.S. of the Vertical component is 0.720. The total Vertical power gain is 1.295. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.771. The R.M.S. of the measured composite pattern is 0.744. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.655. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

<u>METHOD OF DIRECTIONALIZATION</u>:

One bay of the 6810-2R-SS-DA was mounted on a pole of precise scale to the 6-inch pole at the WDVT 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.

<u>METHOD OF MEASUREMENT</u>:

As allowed by the construction permit, file number BPH-20081118AAU, a single level of the 6810-2R-SS-DA was set up on the Howell Laboratories scale model antenna pattern measuring range. A scale of 4.5:1 was used.

<u>SUPERVISION</u>:

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 425.25 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 27758
September 15, 2009

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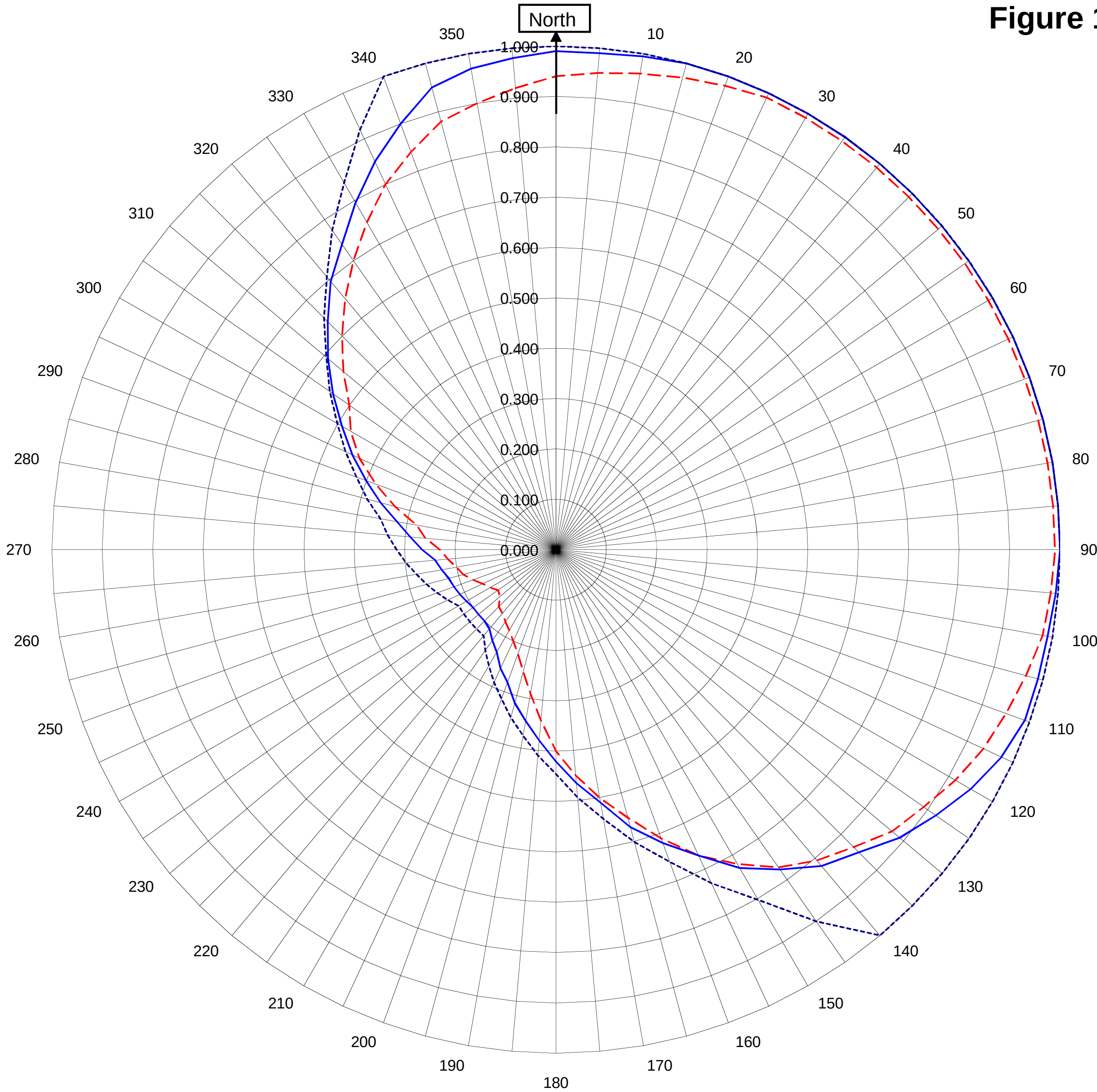
Figure 1a



WDVT Rutland, VT

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September 15, 2009

Horizontal RMS	0.744
Vertical RMS	0.720
H/V Composite RMS	0.744
……………FCC Composite RMS	0.771

Frequency	94.5 / 425.25 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-2R-SS-DA
Pattern Type	Directional Azimuth

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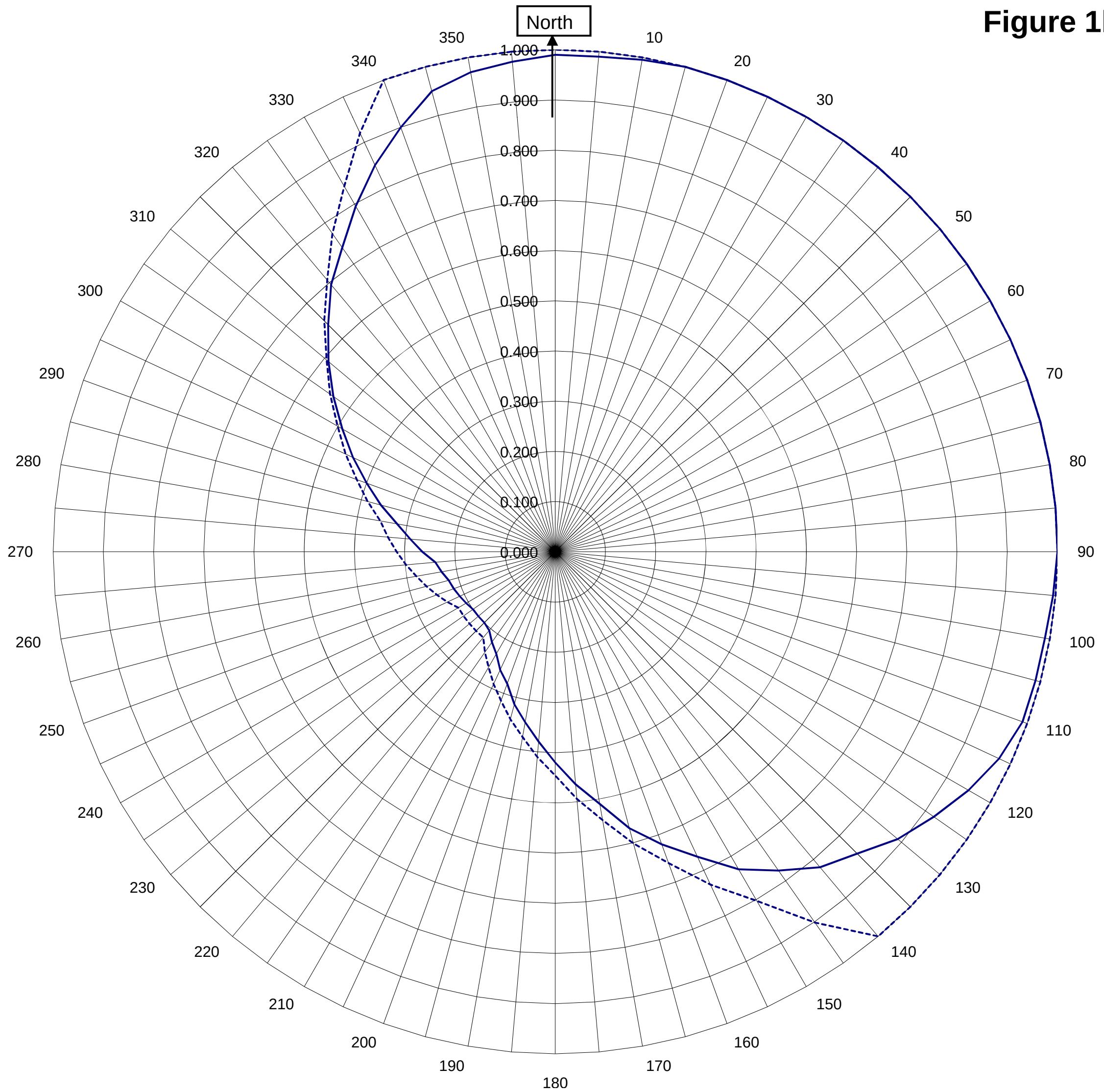
Figure 1b



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September 15, 2009

__________H/VComposite RMS	0.744
……………FCC Composite RMS	0.771

Frequency	94.5 / 425.25 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-2R-SS-DA
Pattern Type	Directional H/V Composite

Figure 1c

Tabulation of Horizontal Azimuth Pattern
WDVT Rutland, VT

Azimuth	Rel Field	Azimuth	Rel Field
0	0.990	180	0.420
10	0.995	190	0.345
20	1.000	200	0.280
30	1.000	210	0.235
40	1.000	220	0.205
45	1.000	225	0.200
50	1.000	230	0.200
60	1.000	240	0.205
70	1.000	250	0.215
80	1.000	260	0.230
90	1.000	270	0.265
100	0.990	280	0.320
110	0.990	290	0.400
120	0.950	300	0.490
130	0.890	310	0.590
135	0.850	315	0.640
140	0.820	320	0.695
150	0.730	330	0.795
160	0.620	340	0.900
170	0.510	350	0.970

Figure 1d

Tabulation of Vertical Azimuth Pattern
WDVT Rutland, VT

Azimuth	Rel Field	Azimuth	Rel Field
0	0.940	180	0.400
10	0.960	190	0.290
20	0.980	200	0.220
30	0.990	210	0.185
40	0.990	220	0.165
45	0.990	225	0.160
50	0.990	230	0.145
60	0.990	240	0.150
70	0.990	250	0.175
80	0.990	260	0.200
90	0.990	270	0.230
100	0.980	280	0.280
110	0.950	290	0.380
120	0.915	300	0.470
130	0.870	310	0.550
135	0.835	315	0.600
140	0.805	320	0.650
150	0.720	330	0.750
160	0.610	340	0.840
170	0.500	350	0.900

Figure 1e

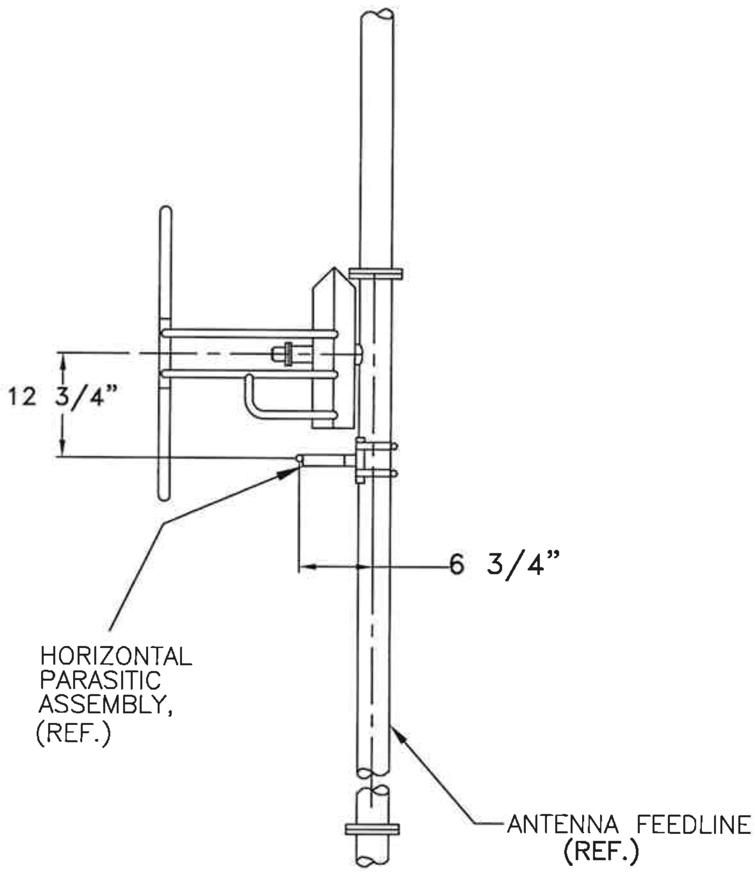
Tabulation of Composite Azimuth Pattern
WDVT Rutland, VT

Azimuth	Rel Field	Azimuth	Rel Field
0	0.990	180	0.420
10	0.995	190	0.345
20	1.000	200	0.280
30	1.000	210	0.235
40	1.000	220	0.205
45	1.000	225	0.200
50	1.000	230	0.200
60	1.000	240	0.205
70	1.000	250	0.215
80	1.000	260	0.230
90	1.000	270	0.265
100	0.990	280	0.320
110	0.990	290	0.400
120	0.950	300	0.490
130	0.890	310	0.590
135	0.850	315	0.640
140	0.820	320	0.695
150	0.730	330	0.795
160	0.620	340	0.900
170	0.510	350	0.970

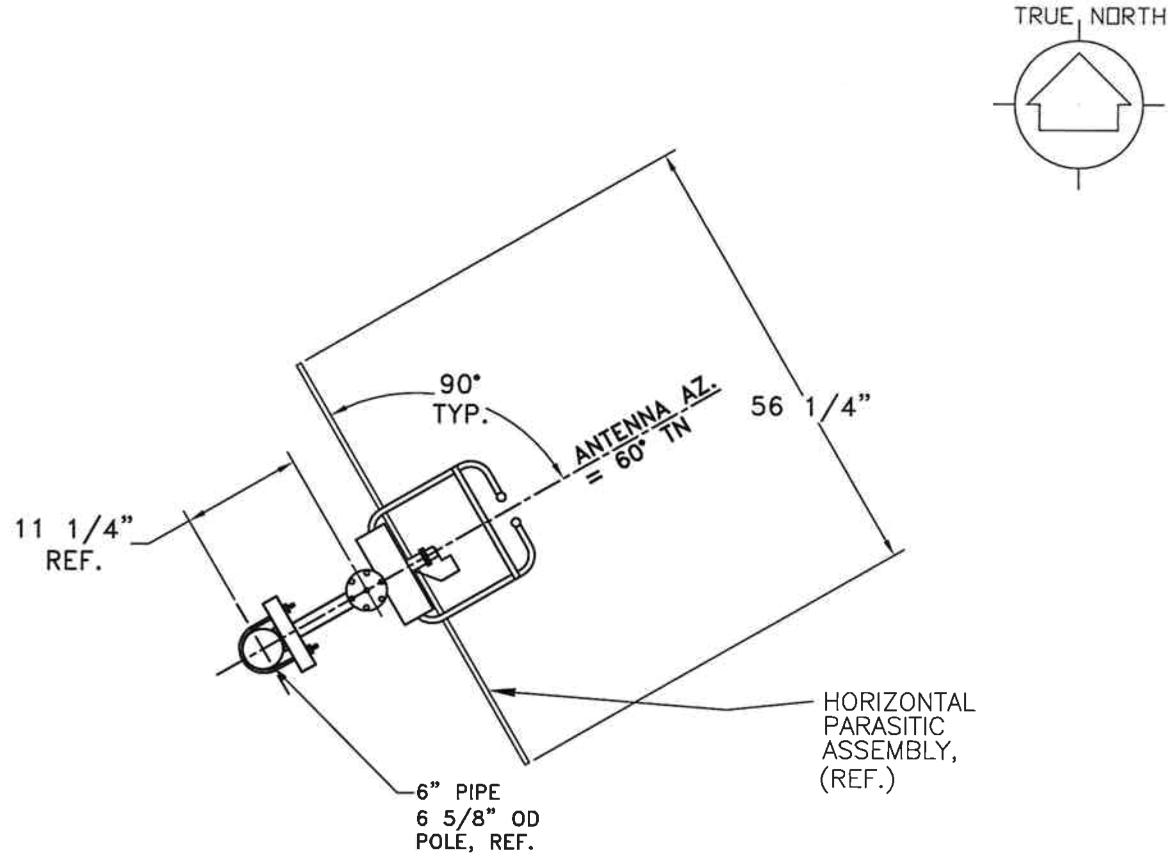
Figure 1f

Tabulation of FCC Directional Composite
WDVT Rutland, VT

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.446
10	1.000	190	0.375
20	1.000	200	0.316
30	1.000	210	0.266
40	1.000	220	0.223
50	1.000	230	0.223
60	1.000	240	0.223
70	1.000	250	0.251
80	1.000	260	0.281
90	1.000	270	0.316
100	1.000	280	0.354
110	1.000	290	0.421
120	1.000	300	0.501
130	1.000	310	0.595
140	1.000	320	0.707
150	0.803	330	0.841
160	0.660	340	1.000
170	0.543	350	1.000



SIDE VIEW



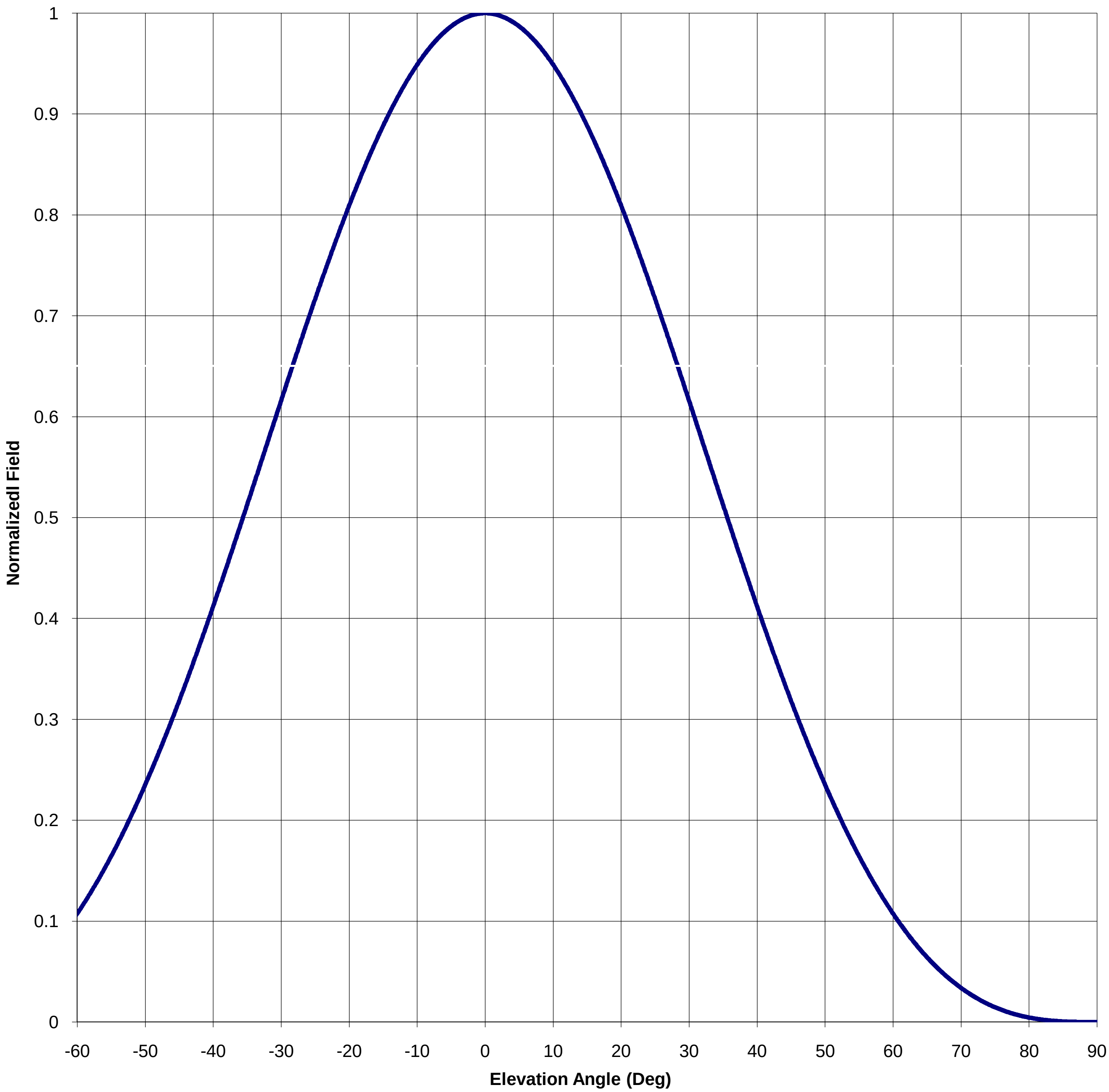
TOP VIEW

TOWER: POLE

ANTENNA HEADING 60° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER: 27758	FREQUENCY: 94.5 MHz.	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY: DAB
TITLE: MODEL-6810-2R-SS-DIRECTIONAL ANTENNA			
DATE: 9/15/09	FIGURE 2		

Antenna Mfg.:	Shively Labs			Date:	9/17/2009
Antenna Type:	6810-2R-SS-DA				
Station:	WDVT	Beam Tilt	0		
Frequency:	94.5	Gain (Max)	1.322	1.213	dB
Channel #:	233	Gain (Horizon)	1.322	1.213	dB
Figure:	Figure 3				



Antenna Mfg.:	**Shively Labs**			**Date: 9/17/2009**
Antenna Type:	**6810-2R-SS-DA**			
Station:	**WDVT**	**Beam Tilt**	**0**	
Frequency:	**94.5**	**Gain (Max)**	**1.322**	**1.213 dB**
Channel #:	**233**	**Gain (Horizon)**	**1.322**	**1.213 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	0.336	0	1.000	46	0.301
-89	0.000	-43	0.355	1	0.999	47	0.284
-88	0.000	-42	0.373	2	0.998	48	0.267
-87	0.000	-41	0.393	3	0.995	49	0.251
-86	0.000	-40	0.412	4	0.992	50	0.235
-85	0.001	-39	0.432	5	0.987	51	0.220
-84	0.001	-38	0.452	6	0.981	52	0.205
-83	0.002	-37	0.472	7	0.975	53	0.191
-82	0.002	-36	0.492	8	0.967	54	0.177
-81	0.003	-35	0.513	9	0.958	55	0.164
-80	0.004	-34	0.533	10	0.949	56	0.152
-79	0.006	-33	0.554	11	0.939	57	0.140
-78	0.008	-32	0.575	12	0.927	58	0.128
-77	0.010	-31	0.595	13	0.915	59	0.118
-76	0.012	-30	0.616	14	0.902	60	0.107
-75	0.015	-29	0.636	15	0.888	61	0.098
-74	0.018	-28	0.657	16	0.874	62	0.088
-73	0.021	-27	0.677	17	0.859	63	0.080
-72	0.025	-26	0.697	18	0.843	64	0.072
-71	0.029	-25	0.717	19	0.826	65	0.064
-70	0.034	-24	0.736	20	0.809	66	0.057
-69	0.039	-23	0.755	21	0.792	67	0.051
-68	0.044	-22	0.774	22	0.774	68	0.044
-67	0.051	-21	0.792	23	0.755	69	0.039
-66	0.057	-20	0.809	24	0.736	70	0.034
-65	0.064	-19	0.826	25	0.717	71	0.029
-64	0.072	-18	0.843	26	0.697	72	0.025
-63	0.080	-17	0.859	27	0.677	73	0.021
-62	0.088	-16	0.874	28	0.657	74	0.018
-61	0.098	-15	0.888	29	0.636	75	0.015
-60	0.107	-14	0.902	30	0.616	76	0.012
-59	0.118	-13	0.915	31	0.595	77	0.010
-58	0.128	-12	0.927	32	0.575	78	0.008
-57	0.140	-11	0.939	33	0.554	79	0.006
-56	0.152	-10	0.949	34	0.533	80	0.004
-55	0.164	-9	0.958	35	0.513	81	0.003
-54	0.177	-8	0.967	36	0.492	82	0.002
-53	0.191	-7	0.975	37	0.472	83	0.002
-52	0.205	-6	0.981	38	0.452	84	0.001
-51	0.220	-5	0.987	39	0.432	85	0.001
-50	0.235	-4	0.992	40	0.412	86	0.000
-49	0.251	-3	0.995	41	0.393	87	0.000
-48	0.267	-2	0.998	42	0.373	88	0.000
-47	0.284	-1	0.999	43	0.355	89	0.000
-46	0.301	0	1.000	44	0.336	90	0.000
-45	0.318			45	0.318		

S.O. 27758 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WDVT 94.5 MHz Rutland, VT

Model 6810-2R-SS-DA

Elevation Gain of Antenna 0.708

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

H RMS 0.744 V RMS 0.72 H/V Ratio 1.033

Elevation Gain of Horizontal Component 0.732

Elevation Gain of Vertical Component 0.685

Horizontal Azimuth Gain equals $1/(RMS)^2$. 1.807

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 1.891

Max. Vertical 0.99

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

Total Horizontal Power Gain = **1.322**

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

Total Vertical Power Gain = **1.295**

==

ERP divided by Horizontal Power Gain equals Antenna Input Power

6 kW ERP Divided by H Gain 1.322 equals 4.54 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

4.54 kW Times V Gain 1.295 equals 5.88 kW V ERP

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

(0.99)^2 Times 6.00 Equals 5.88 kW Vertical ERP

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