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S.O. 32361

Report of Test 6810-2R-SS(0.5)-DA

for

Caron Broadcasting, Inc.

WLTE 95.9 MHz Pendleton, SC

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-2R-SS(0.5)-DA to meet the needs of WLTE and to comply with the requirements of the FCC construction permit, file number BMPH-20141020ABQ. 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 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 BMPH-20141020ABQ 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:

50 - 80 Degrees True: 0.820 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 185 Degrees True to 191 Degrees True and 278 Degrees True to 284 Degrees True. At the restricted azimuth of 50 - 80 Degrees True the Horizontal component is 13.073 dB down from the maximum of 6.0 kW, or 0.296 kW.

The R.M.S. of the Horizontal component is 0.731. The total Horizontal power gain is 1.362. The R.M.S. of the Vertical component is 0.704. The total Vertical power gain is 1.321. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.883. 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:

One bay of the 6810-2R-SS(0.5)-DA was mounted on a tower of precise scale to the Sabre 60" tower at the WLTE 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 BMPH-20141020ABQ, a single level of the 6810-2R-SS(0.5)-DA 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 a Life 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.

<u>EQUIPMENT</u>:

The 4.5:1 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 4395-A Network Analyzer

PC Based Controller

Output Standard Printer or 'pdf'

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

<u>TEST PROCEDURES</u>:

The receiving antenna system is mounted so that the horizontal and vertical azimuth patterns are measured independently. The network analyzer was set to 431.55 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 32361/31996
January 23, 2015

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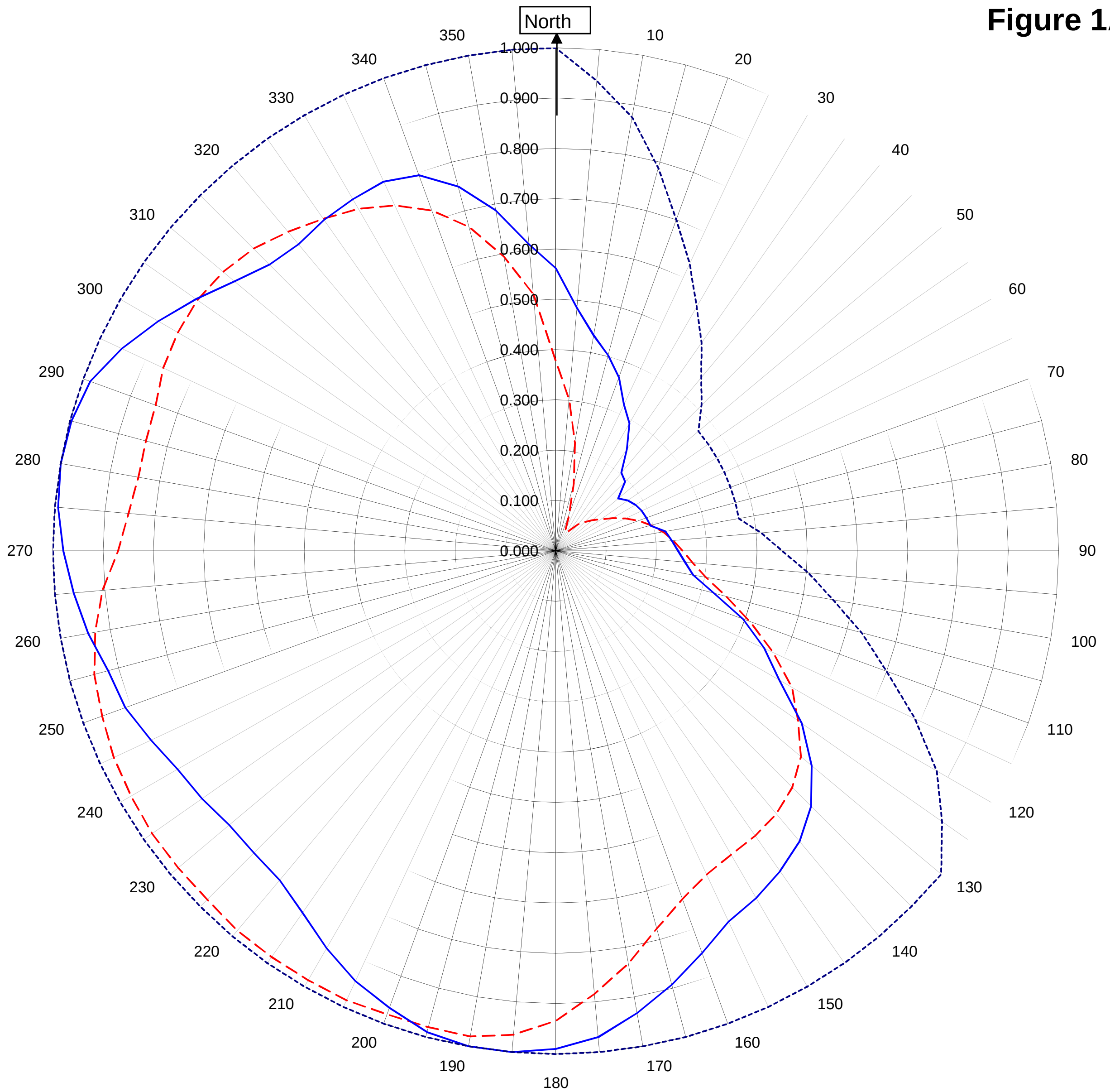
Figure 1A



WLTE PENDLETON, SC.

32361

January 22, 2015

___________Horizontal RMS	0.731
_ _ _ _ _ _ _ _ _ Vertical RMS	0.704
H/V Composite RMS	0.751
...............FCC Composite RMS	0.883

Frequency	95.9 / 431.55 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-2R-SS(0.5)-DA
Pattern Type	Directional Azimuth

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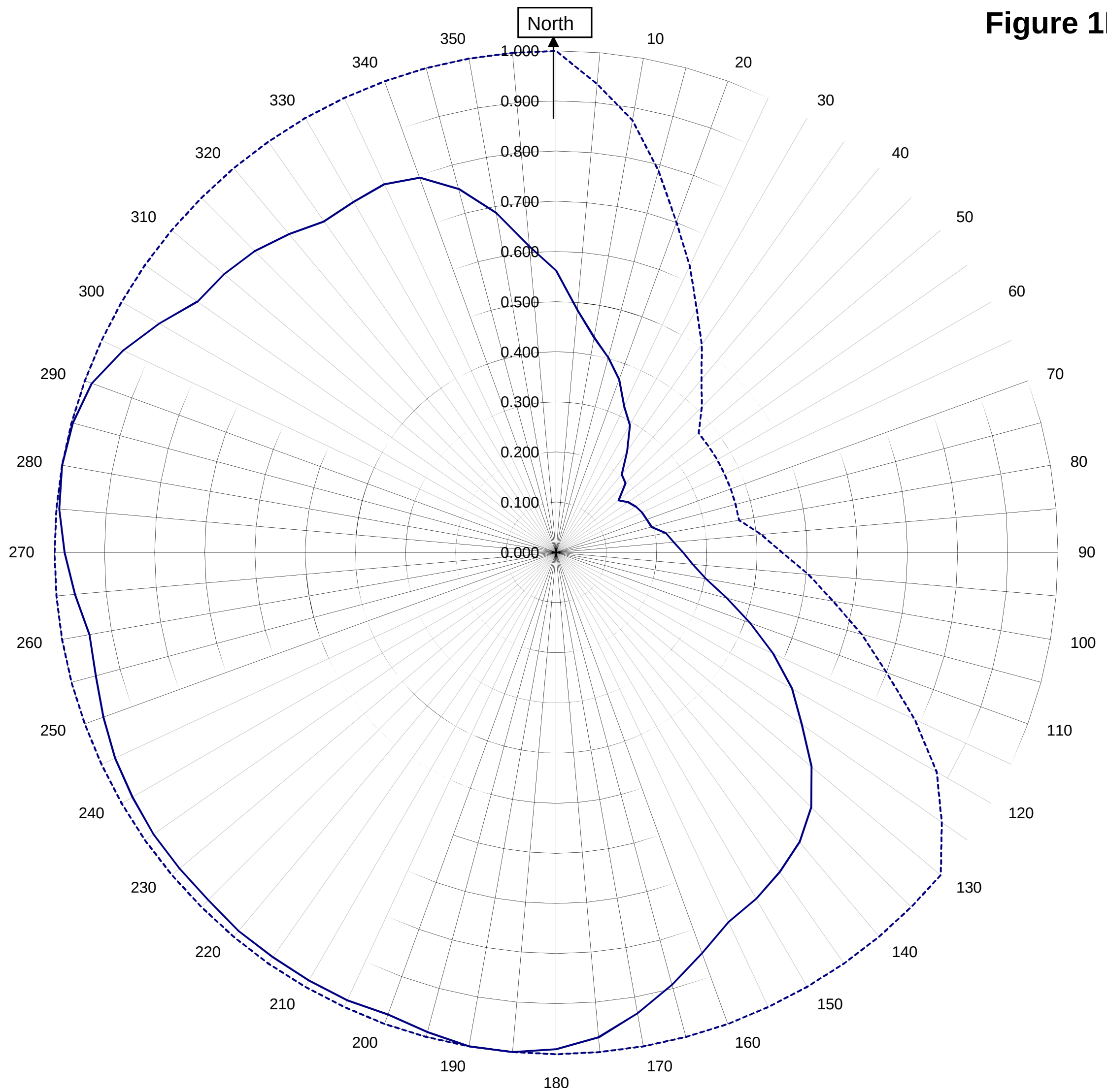
Figure 1B



WLTE   PENDLETON, SC.

32361

January 22, 2015

__________H/VComposite RMS	0.751
……………FCC Composite RMS	0.883

Frequency	95.9 / 431.55 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-2R-SS(0.5)-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WLTE PENDLETON, SC.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.562	180	0.990
10	0.435	190	1.000
20	0.367	200	0.967
30	0.293	210	0.912
40	0.203	220	0.854
45	0.195	225	0.849
50	0.162	230	0.848
60	0.183	240	0.868
70	0.192	250	0.911
80	0.222	260	0.944
90	0.243	270	0.980
100	0.278	280	1.000
110	0.396	290	0.985
120	0.513	300	0.913
130	0.664	310	0.834
135	0.718	315	0.805
140	0.754	320	0.796
150	0.797	330	0.807
160	0.850	340	0.795
170	0.933	350	0.687

Figure 1D

Tabulation of Vertical Azimuth Pattern
WLTE PENDLETON, SC.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.378	180	0.934
10	0.219	190	0.980
20	0.080	200	0.980
30	0.042	210	0.985
40	0.069	220	0.985
45	0.081	225	0.980
50	0.095	230	0.980
60	0.130	240	0.975
70	0.176	250	0.960
80	0.217	260	0.930
90	0.253	270	0.870
100	0.304	280	0.843
110	0.411	290	0.847
120	0.542	300	0.868
130	0.636	310	0.864
135	0.665	315	0.850
140	0.682	320	0.828
150	0.697	330	0.785
160	0.736	340	0.720
170	0.832	350	0.594

Figure 1E

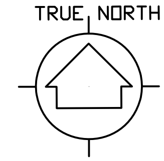
Tabulation of Composite Azimuth Pattern
WLTE PENDLETON, SC.

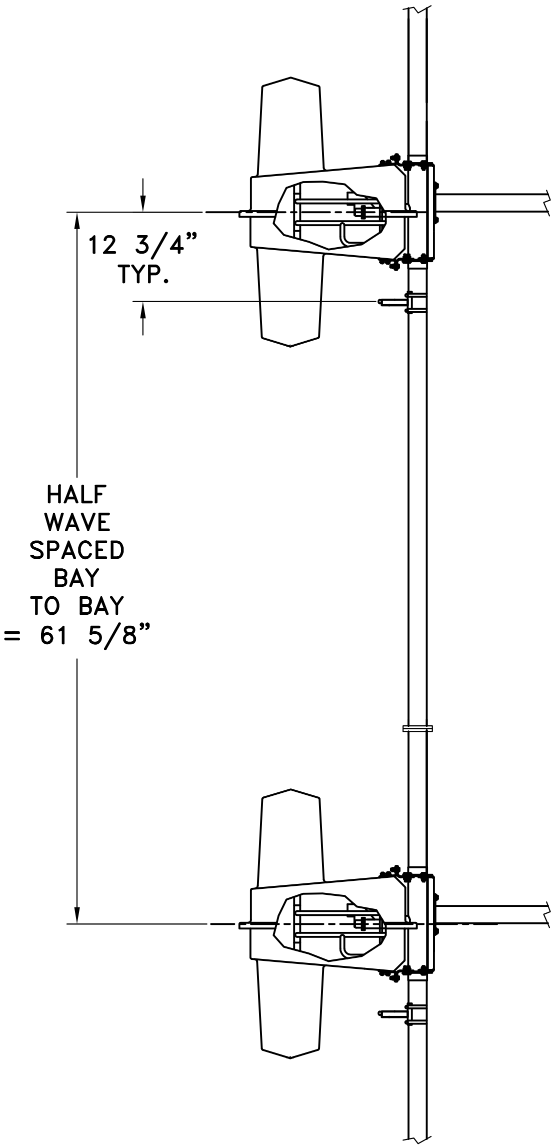
Azimuth	Rel Field	Azimuth	Rel Field
0	0.562	180	0.990
10	0.435	190	1.000
20	0.367	200	0.980
30	0.293	210	0.985
40	0.203	220	0.985
45	0.195	225	0.980
50	0.162	230	0.980
60	0.183	240	0.975
70	0.192	250	0.960
80	0.222	260	0.944
90	0.253	270	0.980
100	0.304	280	1.000
110	0.411	290	0.985
120	0.542	300	0.913
130	0.664	310	0.864
135	0.718	315	0.850
140	0.754	320	0.828
150	0.797	330	0.807
160	0.850	340	0.795
170	0.933	350	0.687

Figure 1F

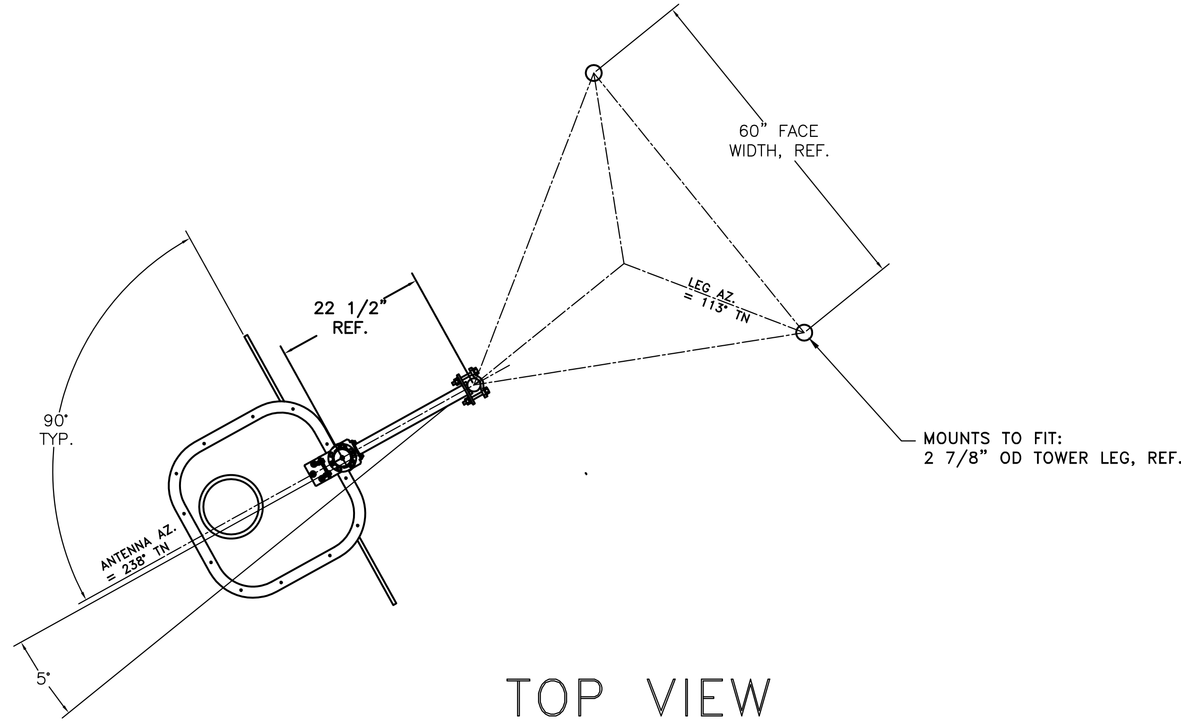
Tabulation of FCC Directional Composite
WLTE PENDLETON, SC.

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	1.000
10	0.875	190	1.000
20	0.700	200	1.000
30	0.560	210	1.000
40	0.450	220	1.000
50	0.370	230	1.000
60	0.370	240	1.000
70	0.370	250	1.000
80	0.370	260	1.000
90	0.450	270	1.000
100	0.560	280	1.000
110	0.700	290	1.000
120	0.875	300	1.000
130	1.000	310	1.000
140	1.000	320	1.000
150	1.000	330	1.000
160	1.000	340	1.000
170	1.000	350	1.000





SIDE VIEW



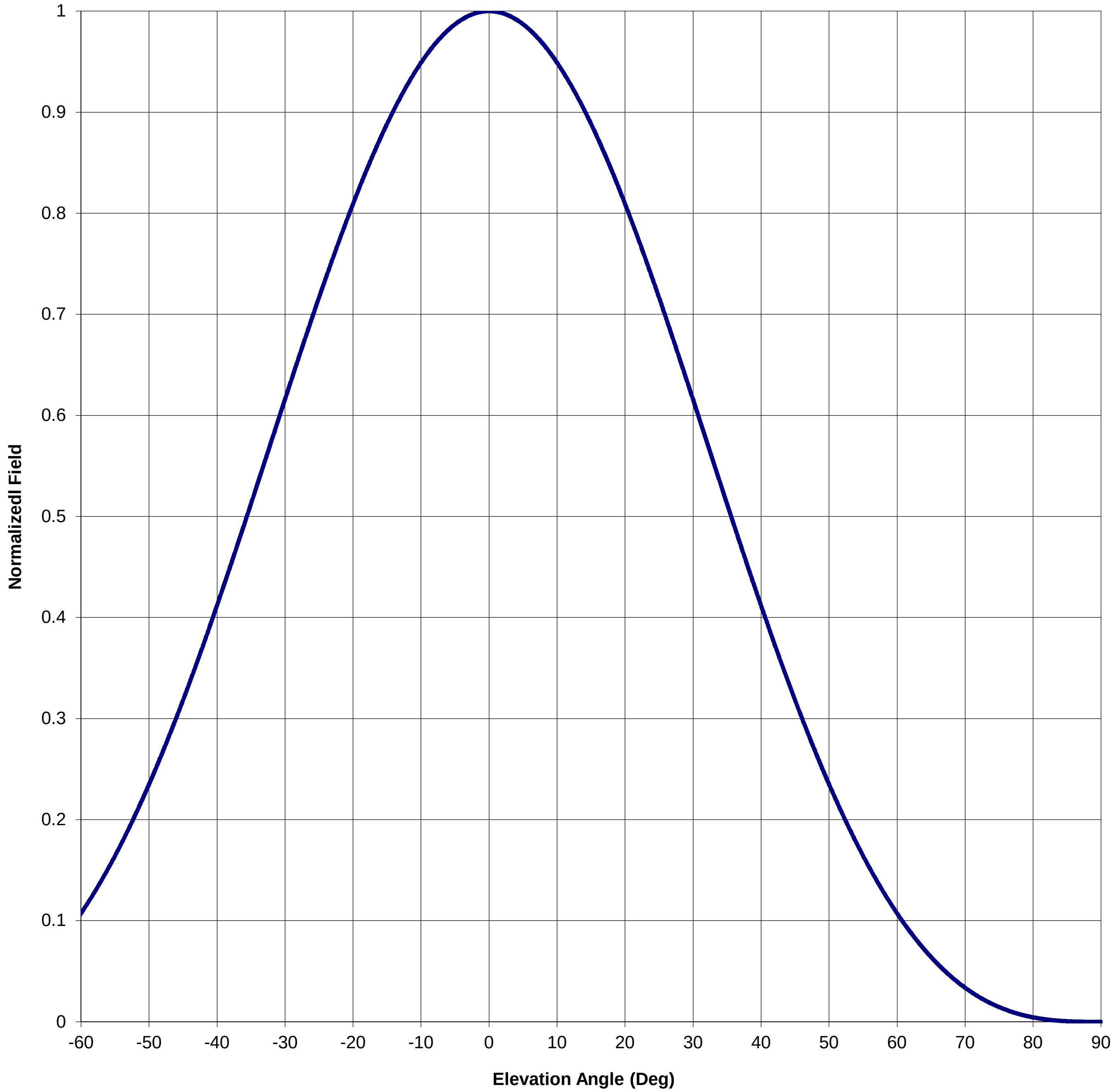
TOP VIEW

TOWER MAKE: SABRE 60"
FACE

ANTENNA HEADING 238° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER: 32361	FREQUENCY: 95.9	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY: DAB
TITLE: MODEL–6810–2R–SS–DIRECTIONAL ANTENNA			
DATE: 1–23–15	FIGURE 2		

Antenna Mfg.:	**Shively Labs**				**Date: 1/22/2015**
Antenna Type:	**6810-2R-SS(0.5)-DA**				
Station:	**WLTE**	**Beam Tilt**	**0**		
Frequency:	**95.9**	**Gain (Max)**	**1.362**	**1.343 dB**	
Channel #:	**240**	**Gain (Horizon)**	**1.362**	**1.343 dB**	
Figure:	**Figure 3**				



Antenna Mfg.: Shively Labs **Date:** 1/22/2015

Antenna Type: 6810-2R-SS(0.5)-DA

Station: WLTE **Beam Tilt** 0

Frequency: 95.9 **Gain (Max)** 1.362 1.343 dB

Channel #: 240 **Gain (Horizon)** 1.362 1.343 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	0.283
-88	0.000	-42	0.373	2	0.998	48	0.267
-87	0.000	-41	0.392	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	0.574	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	0.050
-68	0.044	-22	0.774	22	0.774	68	0.044
-67	0.050	-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	0.574	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	0.392	87	0.000
-48	0.267	-2	0.998	42	0.373	88	0.000
-47	0.283	-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. 32361 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WLTE PENDLETON, SC.

MODEL 6810-2R-SS(0.5)-DA

Elevation Gain of Antenna 0.7

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

H RMS 0.730669 V RMS 0.703605 H/V Ratio 1.038

Elevation Gain of Horizontal Component 0.727

Elevation Gain of Vertical Component 0.674

Horizontal Azimuth Gain equals $1/(RMS)^2$. 1.873

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 1.960
Max. Vertical 0.985

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

Total Horizontal Power Gain = **1.362**

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

Total Vertical Power Gain = **1.321**

==

ERP divided by Horizontal Power Gain equals Antenna Input Power

6.0 kW ERP Divided by H Gain 1.362 equals 4.407 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

4.407 kW Times V Gain 1.321 equals 5.821 kW V ERP

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

(0.985)^2 Times 6.00 Equals 5.821 kW Vertical ERP

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