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S.O. 32226

Report of Test 6810-4-(H52/V48)-DA

for

Family Life Broadcasting, INC

WJBP 91.5 MHz Red Bank, TN

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-4-(H52/V48)-DA to meet the needs of WJBP and to comply with the requirements of the FCC construction permit, file number BLED-19990917AAR. 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 BLED-19990917AAR indicates that the Horizontal radiation component shall not exceed 11.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

160-170 Degrees True: 0.58 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 345 Degrees True to 353 Degrees True. At the restricted azimuth of 160-170 Degrees True the Horizontal component is 13.893 dB down from the maximum of 11.0 kW, or 0.449 kW.

The R.M.S. of the Horizontal component is 0.706. The total Horizontal power gain is 4.502. The R.M.S. of the Vertical component is 0.667. The total Vertical power gain is 4.063. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.772. The R.M.S. of the measured composite pattern is 0.709. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.656. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-4-(H52/V48)-DA was mounted on a pole of precise scale to the 8 5/8" pole at the WJBP 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 BLED-19990917AAR, a single level of the 6810-4-(H52/V48)-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.

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 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.

TEST PROCEDURES:

The receiving antenna system is mounted so that the horizontal and vertical azimuth patterns are measured independently. The network analyzer was set to 411.75 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 32226
November 26, 2014

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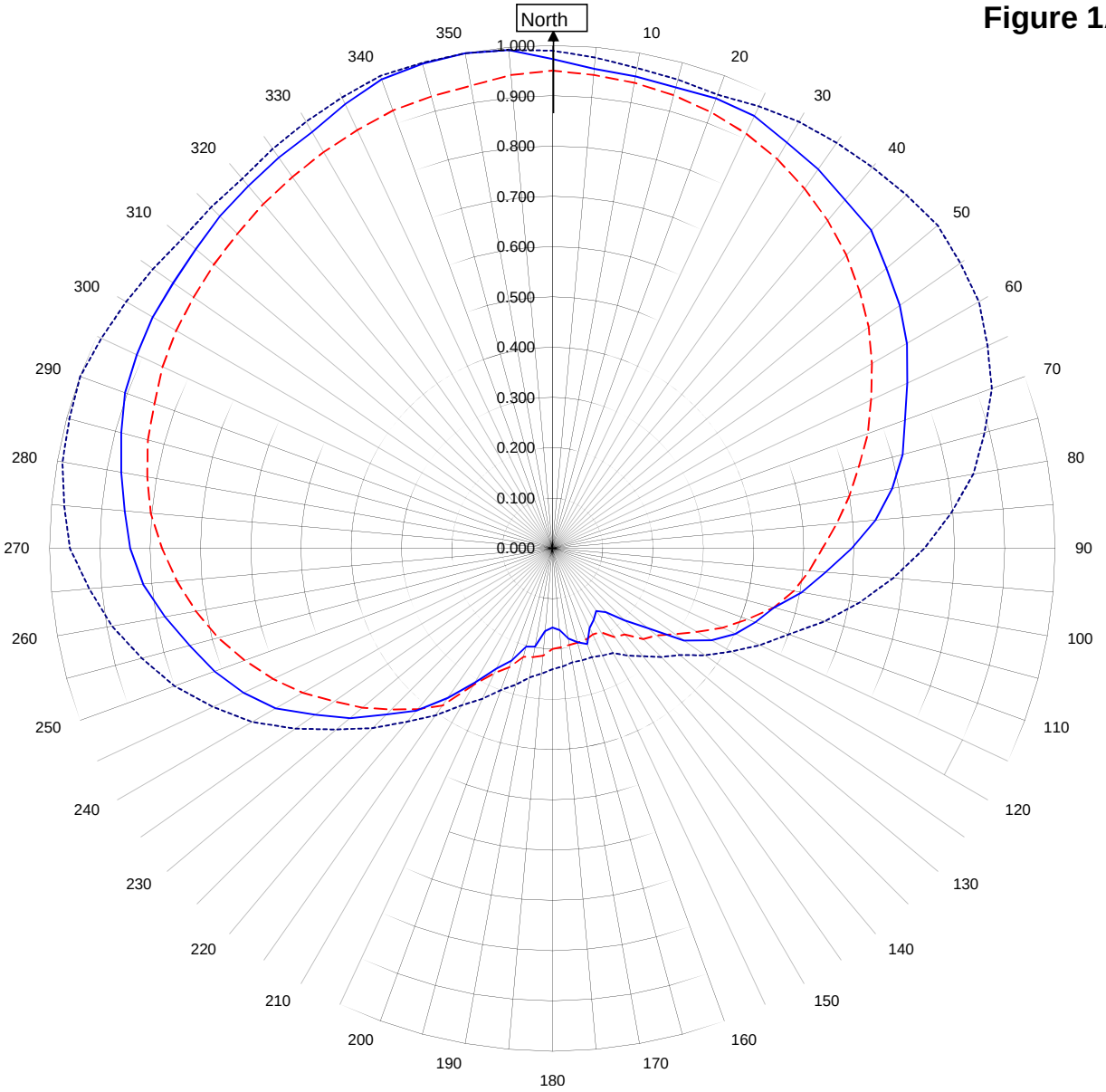
Figure 1A



WJBP RED BANK, TN

32226

November 25, 2014

Horizontal RMS	0.706
Vertical RMS	0.667
H/V Composite RMS	0.709
FCC Composite RMS	0.772

Frequency	91.5 / 411.75 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-4-(H-52/V-48)-DA
Pattern Type	Directional Azimuth

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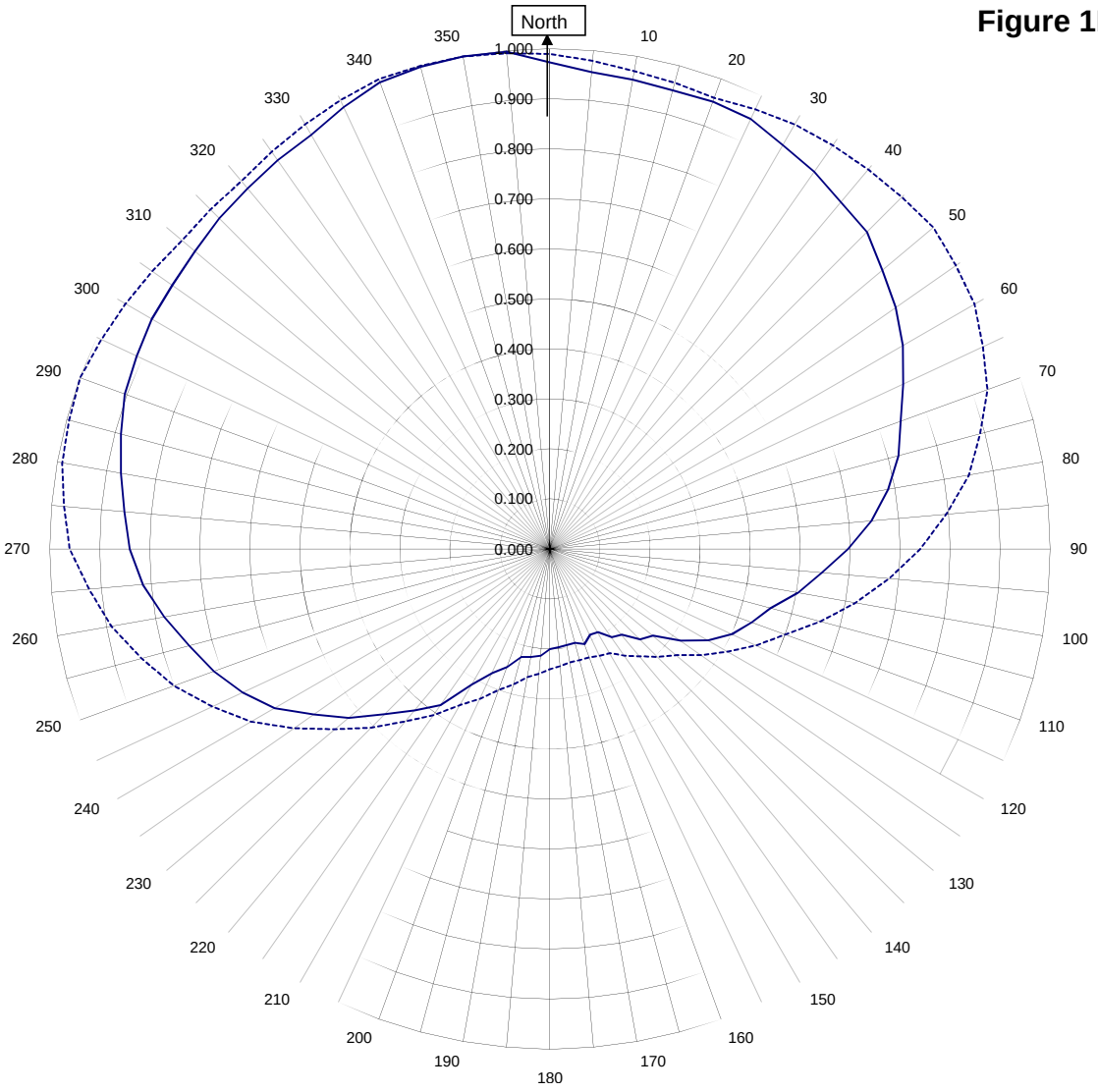
Figure 1B



WJBP RED BANK, TN

32226

November 25, 2014

_____H/VComposite RMS	0.709
……FCC Composite RMS	0.772

Frequency	91.5 / 411.75 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-4-(H-52/V-48)-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WJBP RED BANK, TN

Azimuth	Rel Field	Azimuth	Rel Field
0	0.973	180	0.157
10	0.953	190	0.198
20	0.952	200	0.237
30	0.932	210	0.308
40	0.905	220	0.421
45	0.896	225	0.467
50	0.867	230	0.525
60	0.814	240	0.636
70	0.746	250	0.715
80	0.686	260	0.783
90	0.595	270	0.840
100	0.503	280	0.871
110	0.429	290	0.905
120	0.365	300	0.919
130	0.245	310	0.926
135	0.202	315	0.935
140	0.165	320	0.941
150	0.164	330	0.956
160	0.202	340	0.993
170	0.182	350	1.000

Figure 1D

Tabulation of Vertical Azimuth Pattern
WJBP RED BANK, TN

Azimuth	Rel Field	Azimuth	Rel Field
0	0.950	180	0.200
10	0.940	190	0.219
20	0.923	200	0.251
30	0.894	210	0.313
40	0.851	220	0.417
45	0.827	225	0.453
50	0.797	230	0.492
60	0.734	240	0.574
70	0.667	250	0.651
80	0.600	260	0.720
90	0.537	270	0.777
100	0.487	280	0.818
110	0.412	290	0.843
120	0.332	300	0.865
130	0.269	310	0.879
135	0.255	315	0.886
140	0.223	320	0.894
150	0.192	330	0.910
160	0.193	340	0.927
170	0.195	350	0.934

Figure 1E

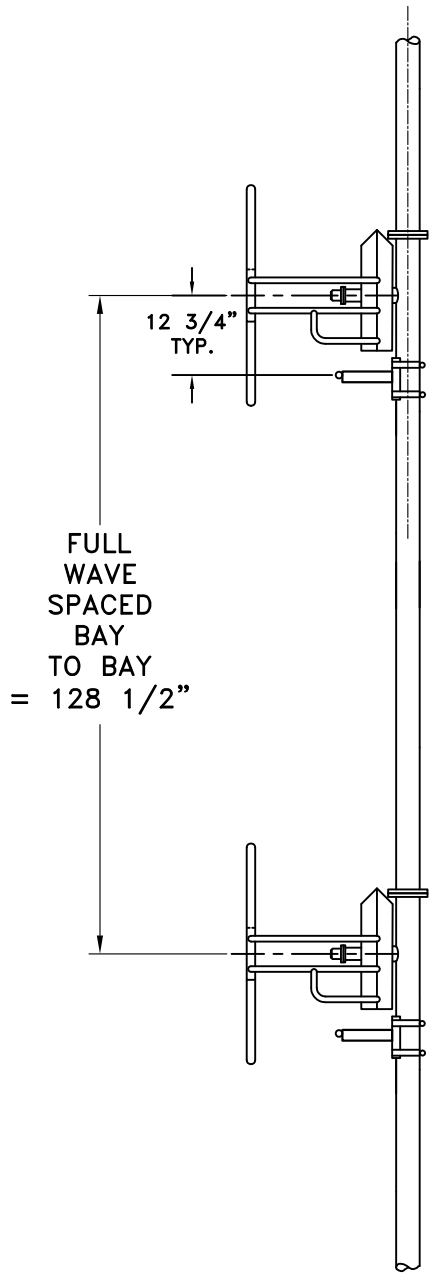
Tabulation of Composite Azimuth Pattern
WJBP RED BANK, TN

Azimuth	Rel Field	Azimuth	Rel Field
0	0.973	180	0.200
10	0.953	190	0.219
20	0.952	200	0.251
30	0.932	210	0.313
40	0.905	220	0.421
45	0.896	225	0.467
50	0.867	230	0.525
60	0.814	240	0.636
70	0.746	250	0.715
80	0.686	260	0.783
90	0.595	270	0.840
100	0.503	280	0.871
110	0.429	290	0.905
120	0.365	300	0.919
130	0.269	310	0.926
135	0.255	315	0.935
140	0.223	320	0.941
150	0.192	330	0.956
160	0.202	340	0.993
170	0.195	350	1.000

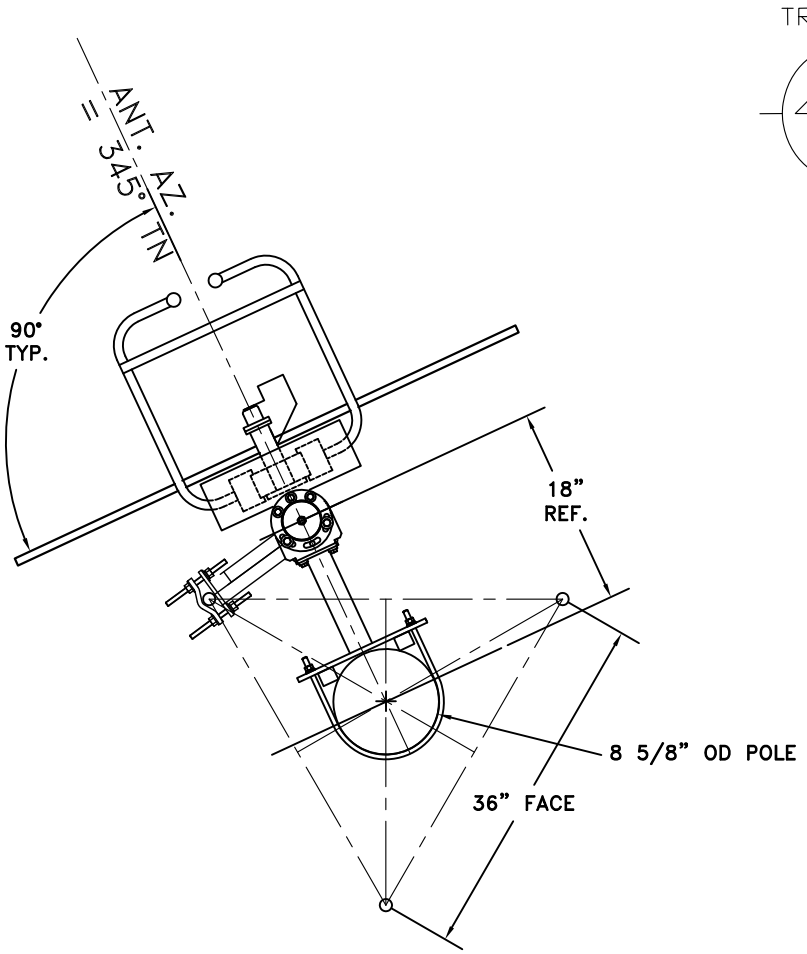
Figure 1F

Tabulation of FCC Directional Composite
WJBP RED BANK, TN

Azimuth	Rel Field	Azimuth	Rel Field
0	0.990	180	0.240
10	0.970	190	0.260
20	0.960	200	0.300
30	0.980	210	0.360
40	0.990	220	0.450
50	1.000	230	0.560
60	0.980	240	0.690
70	0.930	250	0.800
80	0.850	260	0.890
90	0.740	270	0.960
100	0.620	280	0.990
110	0.500	290	1.000
120	0.410	300	0.980
130	0.330	310	0.960
140	0.280	320	0.960
150	0.240	330	0.980
160	0.230	340	1.000
170	0.230	350	1.000



SIDE VIEW



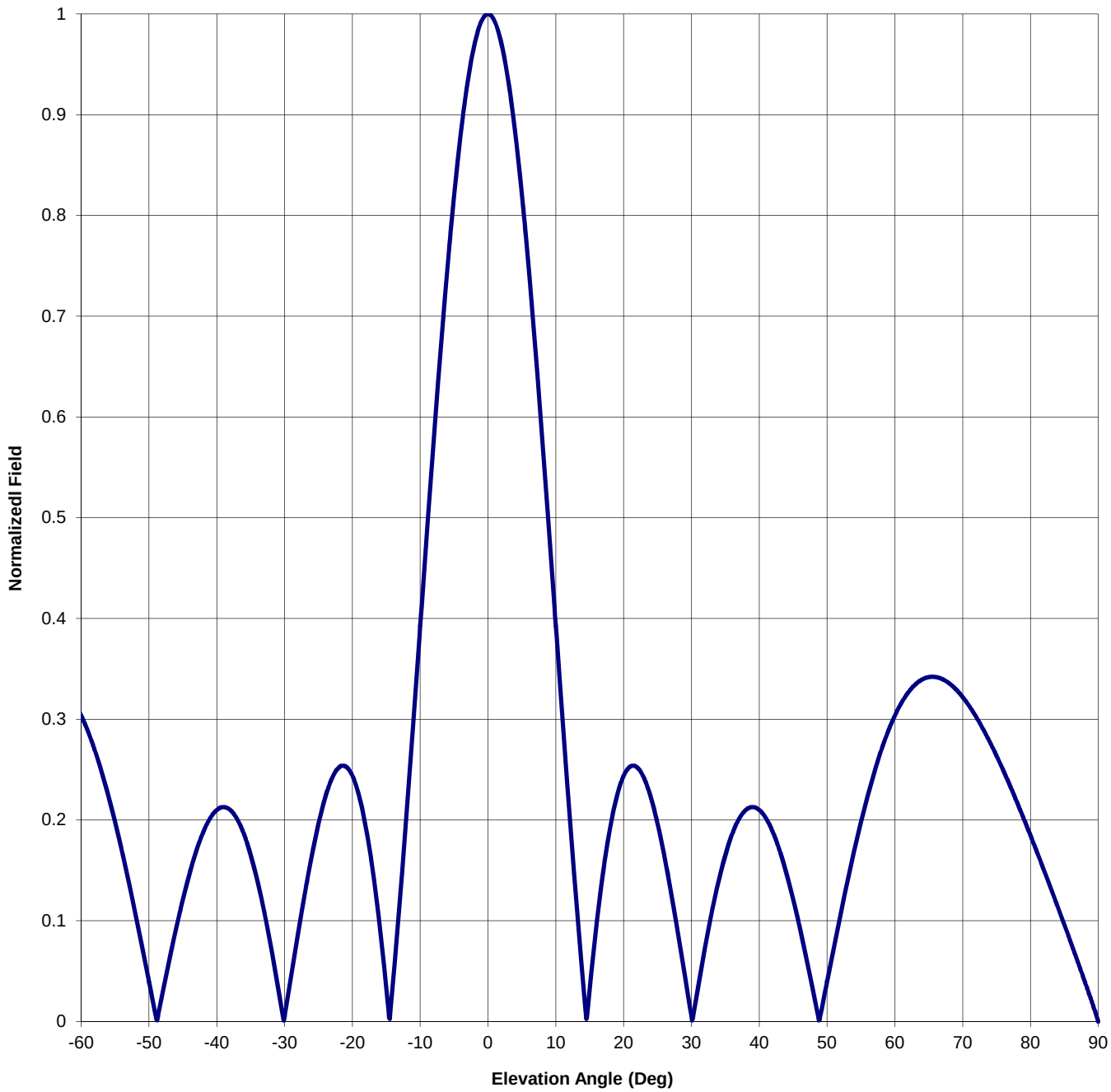
TOP VIEW

TOWER MAKE: TOP MOUNTED
POLE

ANTENNA HEADING 345° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER: 32226	FREQUENCY: 91.5	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY: DAB
TITLE: MODEL-6810-4-H/V-DIRECTIONAL ANTENNA			
DATE: 11-25-14	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date:**	**11/26/2014**
Antenna Type:	**6810-4-(H52/V48)-DA**				
Station:	**WJBP**	**Beam Tilt**	**0**		
Frequency:	**91.5**	**Gain (Max)**	**4.502**	**6.534**	**dB**
Channel #:	**218**	**Gain (Horizon)**	**4.502**	**6.534**	**dB**
Figure:	**Figure 3**				



Antenna Mfg.: Shively Labs **Date:** 11/26/2014

Antenna Type: 6810-4-(H52/V48)-DA

Station: WJBP **Beam Tilt** 0

Frequency: 91.5 **Gain (Max)** 4.502 6.534 dB

Channel #: 218 **Gain (Horizon)** 4.502 6.534 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	0.147	0	1.000	46	0.092
-89	0.021	-43	0.170	1	0.992	47	0.061
-88	0.040	-42	0.188	2	0.970	48	0.028
-87	0.059	-41	0.202	3	0.933	49	0.005
-86	0.078	-40	0.210	4	0.883	50	0.040
-85	0.096	-39	0.213	5	0.820	51	0.074
-84	0.114	-38	0.210	6	0.747	52	0.107
-83	0.132	-37	0.201	7	0.666	53	0.139
-82	0.150	-36	0.186	8	0.578	54	0.169
-81	0.167	-35	0.165	9	0.486	55	0.198
-80	0.185	-34	0.139	10	0.392	56	0.224
-79	0.201	-33	0.109	11	0.299	57	0.248
-78	0.218	-32	0.074	12	0.207	58	0.269
-77	0.234	-31	0.035	13	0.120	59	0.288
-76	0.249	-30	0.005	14	0.040	60	0.304
-75	0.264	-29	0.047	15	0.033	61	0.317
-74	0.277	-28	0.088	16	0.096	62	0.327
-73	0.290	-27	0.128	17	0.150	63	0.334
-72	0.302	-26	0.164	18	0.192	64	0.339
-71	0.313	-25	0.197	19	0.224	65	0.342
-70	0.322	-24	0.223	20	0.244	66	0.342
-69	0.330	-23	0.242	21	0.253	67	0.340
-68	0.336	-22	0.252	22	0.252	68	0.336
-67	0.340	-21	0.253	23	0.242	69	0.330
-66	0.342	-20	0.244	24	0.223	70	0.322
-65	0.342	-19	0.224	25	0.197	71	0.313
-64	0.339	-18	0.192	26	0.164	72	0.302
-63	0.334	-17	0.150	27	0.128	73	0.290
-62	0.327	-16	0.096	28	0.088	74	0.277
-61	0.317	-15	0.033	29	0.047	75	0.264
-60	0.304	-14	0.040	30	0.005	76	0.249
-59	0.288	-13	0.120	31	0.035	77	0.234
-58	0.269	-12	0.207	32	0.074	78	0.218
-57	0.248	-11	0.299	33	0.109	79	0.201
-56	0.224	-10	0.392	34	0.139	80	0.185
-55	0.198	-9	0.486	35	0.165	81	0.167
-54	0.169	-8	0.578	36	0.186	82	0.150
-53	0.139	-7	0.666	37	0.201	83	0.132
-52	0.107	-6	0.747	38	0.210	84	0.114
-51	0.074	-5	0.820	39	0.213	85	0.096
-50	0.040	-4	0.883	40	0.210	86	0.078
-49	0.005	-3	0.933	41	0.202	87	0.059
-48	0.028	-2	0.970	42	0.188	88	0.040
-47	0.061	-1	0.992	43	0.170	89	0.021
-46	0.092	0	1.000	44	0.147	90	0.000
-45	0.121			45	0.121		

S.O. 32226 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WJBP RED BANK, TN

MODEL 6810-4-(H-52/V-48)-DA

Elevation Gain of Antenna 2.12

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

H RMS 0.706493 V RMS 0.666556 H/V Ratio 1.060

Elevation Gain of Horizontal Component 2.247

Elevation Gain of Vertical Component 2.000

Horizontal Azimuth Gain equals $1/(RMS)^2$. 2.003

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 2.031

Max. Vertical 0.95

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

Total Horizontal Power Gain = **4.502**

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

Total Vertical Power Gain = **4.063**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

11 kW ERP Divided by H Gain 4.502 equals 2.443 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

2.443 kW Times V Gain 4.063 equals 9.928 kW V ERP

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

(0.95)^2 Times 11.00 Equals 9.928 kW Vertical ERP

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