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S.O. 37681

Report of Test 6810-3R-SS-EF

for

WIBG LIMITED LIABILITY COMPANY

WIBG 94.3 MHz AVALON, NJ

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-3R-SS-EF to meet the needs of WIBG and to comply with the requirements of the FCC construction permit, file number 0000129784. 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 0000129784 indicates that the Horizontal radiation component shall not exceed 6 kW at any azimuth and is restricted to the following values at the azimuths specified:

340 Degrees True: 0.529 kilowatts

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From Figure 1A, the maximum radiation of the Horizontal component occurs at 115 Degrees True to 120 Degrees True. At the restricted azimuth of 340 Degrees True the Horizontal component is 13.311 dB down from the maximum of 6 kW, or 0.280 kW.

The R.M.S. of the Horizontal component is 0.734. The total Horizontal power gain is 2.050. The R.M.S. of the Vertical component is 0.671. The total Vertical power gain is 2.026. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.867. The R.M.S. of the measured composite pattern is 0.764. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.736. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-3R-SS-EF was mounted on a tower of precise scale to the 24" X-braced tower at the WIBG 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 0000129784, a single level of the 6810-3R-SS-EF was set up on the Shively Labs scale model antenna pattern measuring range. A scale of 4.5:1 was used.

EQUIPMENT:

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 parabolic dish 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 Hypercell Superflex and Cellflex lCF cabling respectively.

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.

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 424.35 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:

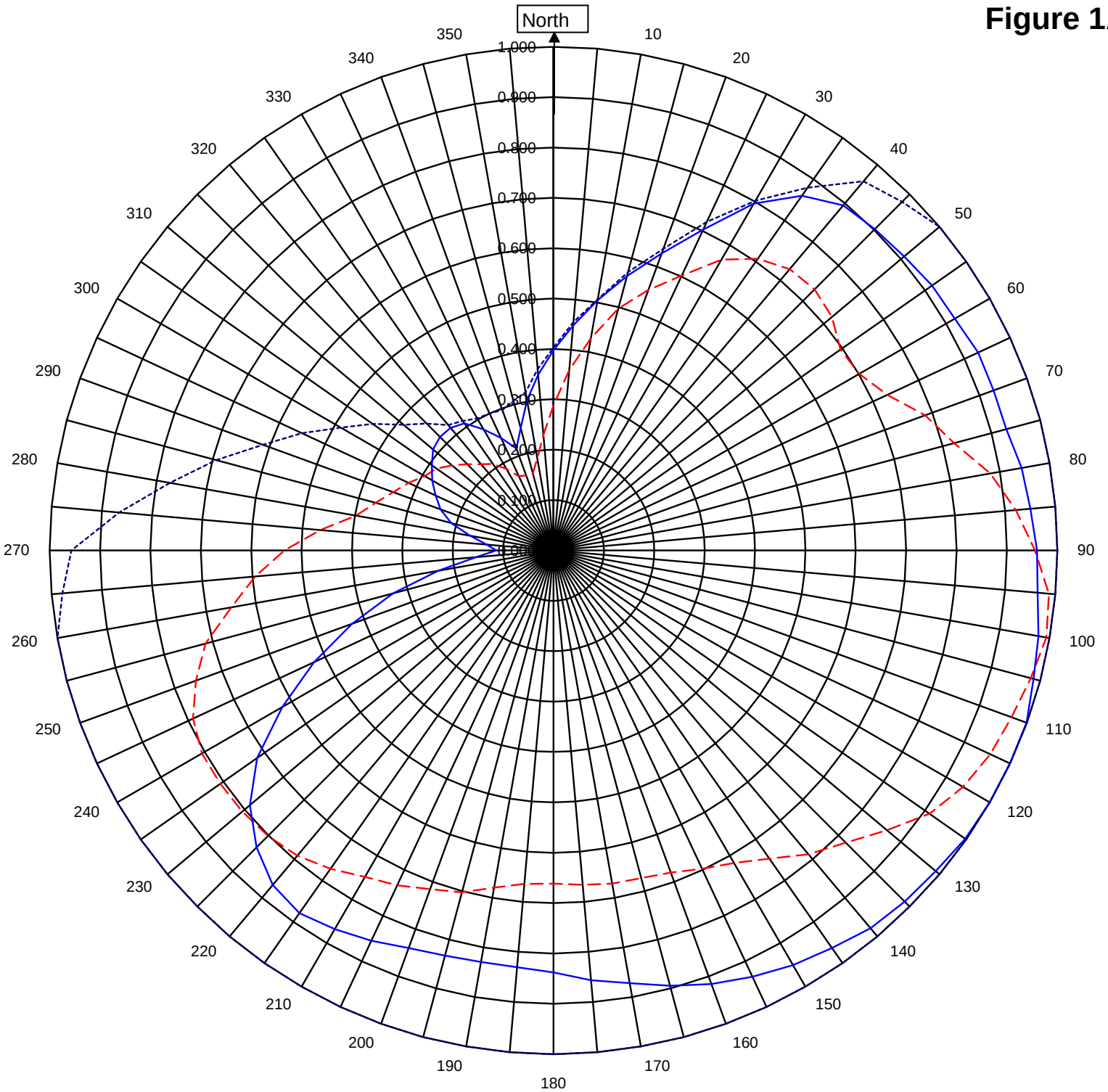
Sean C. Edwards
Director RF Engineering, Shively Labs

S/O: 37681
Date: 24 May 2021

Shively Labs

Shively Labs, a division of Howell Laboratories, Inc. Bridgton, ME (207)647-3327

Figure 1A



WIBG AVALON, NJ

37681

May 24, 2021

Horizontal RMS	0.734
Vertical RMS	0.671
H/V Composite RMS	0.764
FCC Composite RMS	0.867

Frequency	94.3 / 424.35 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-3R-SS-EF
Pattern Type	Directional Azimuth

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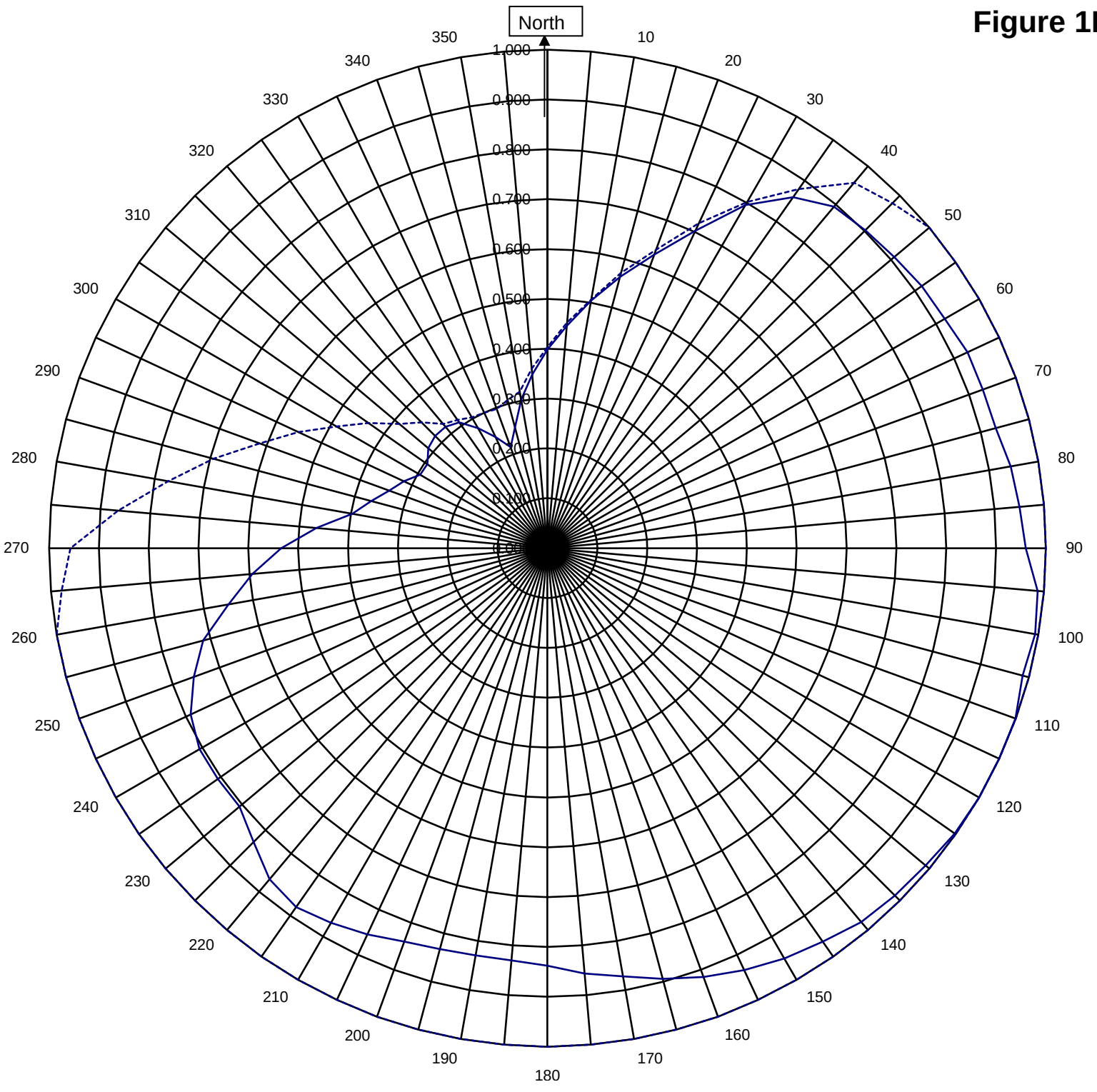
Figure 1B



WIBG AVALON, NJ

37681

May 24, 2021

_____H/VComposite RMS	0.764
……..FCC Composite RMS	0.867

Frequency	94.3 / 424.35 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-3R-SS-EF
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WIBG AVALON, NJ

Azimuth	Rel Field	Azimuth	Rel Field
0	0.398	180	0.838
10	0.504	190	0.829
20	0.627	200	0.840
30	0.795	210	0.868
40	0.894	220	0.867
45	0.902	225	0.834
50	0.908	230	0.786
60	0.920	240	0.621
70	0.930	250	0.425
80	0.944	260	0.232
90	0.960	270	0.113
100	0.978	280	0.168
110	0.999	290	0.238
120	1.000	300	0.278
130	0.990	310	0.312
135	0.986	315	0.319
140	0.979	320	0.318
150	0.951	330	0.278
160	0.916	340	0.216
170	0.872	350	0.303

Figure 1D

Tabulation of Vertical Azimuth Pattern
WIBG AVALON, NJ

Azimuth	Rel Field	Azimuth	Rel Field
0	0.288	180	0.661
10	0.428	190	0.680
20	0.550	200	0.715
30	0.667	210	0.748
40	0.729	220	0.791
45	0.733	225	0.801
50	0.721	230	0.806
60	0.701	240	0.806
70	0.785	250	0.755
80	0.880	260	0.650
90	0.956	270	0.534
100	0.994	280	0.398
110	0.968	290	0.338
120	0.939	300	0.295
130	0.864	310	0.262
135	0.820	315	0.242
140	0.787	320	0.224
150	0.716	330	0.187
160	0.680	340	0.158
170	0.672	350	0.186

Figure 1E

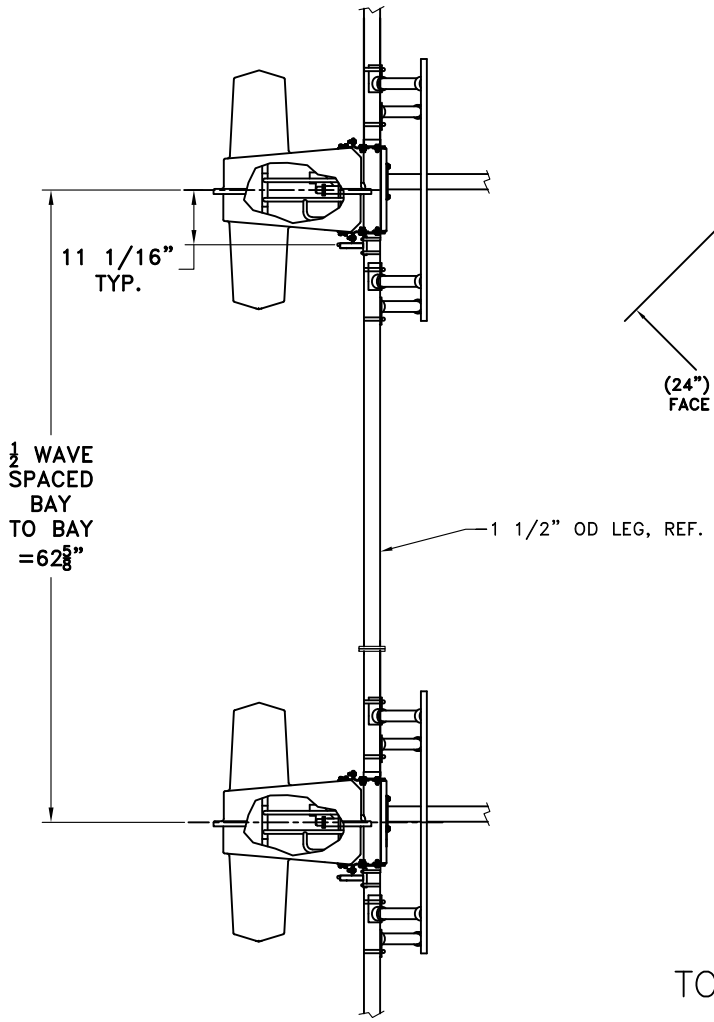
Tabulation of Composite Azimuth Pattern
WIBG AVALON, NJ

Azimuth	Rel Field	Azimuth	Rel Field
0	0.398	180	0.838
10	0.504	190	0.829
20	0.627	200	0.840
30	0.795	210	0.868
40	0.894	220	0.867
45	0.902	225	0.834
50	0.908	230	0.806
60	0.920	240	0.806
70	0.930	250	0.755
80	0.944	260	0.650
90	0.960	270	0.534
100	0.994	280	0.398
110	0.999	290	0.338
120	1.000	300	0.295
130	0.990	310	0.312
135	0.986	315	0.319
140	0.979	320	0.318
150	0.951	330	0.278
160	0.916	340	0.216
170	0.872	350	0.303

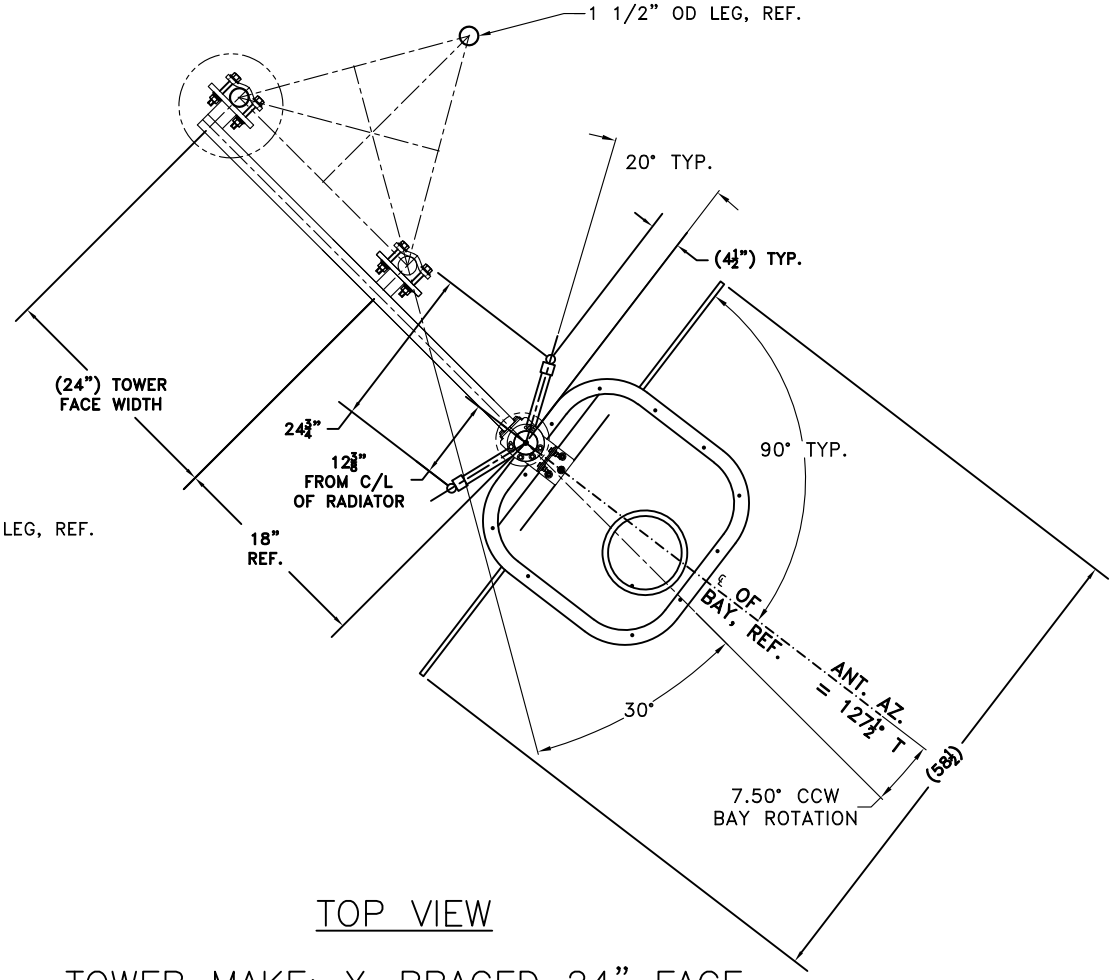
Figure 1F

Tabulation of FCC Directional Composite
WIBG AVALON, NJ

Azimuth	Rel Field	Azimuth	Rel Field
0	0.403	180	1.000
10	0.507	190	1.000
20	0.637	200	1.000
30	0.802	210	1.000
40	0.957	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	0.957
100	1.000	280	0.773
110	1.000	290	0.614
120	1.000	300	0.488
130	1.000	310	0.388
140	1.000	320	0.325
150	1.000	330	0.303
160	1.000	340	0.297
170	1.000	350	0.319



SIDE VIEW



TOP VIEW

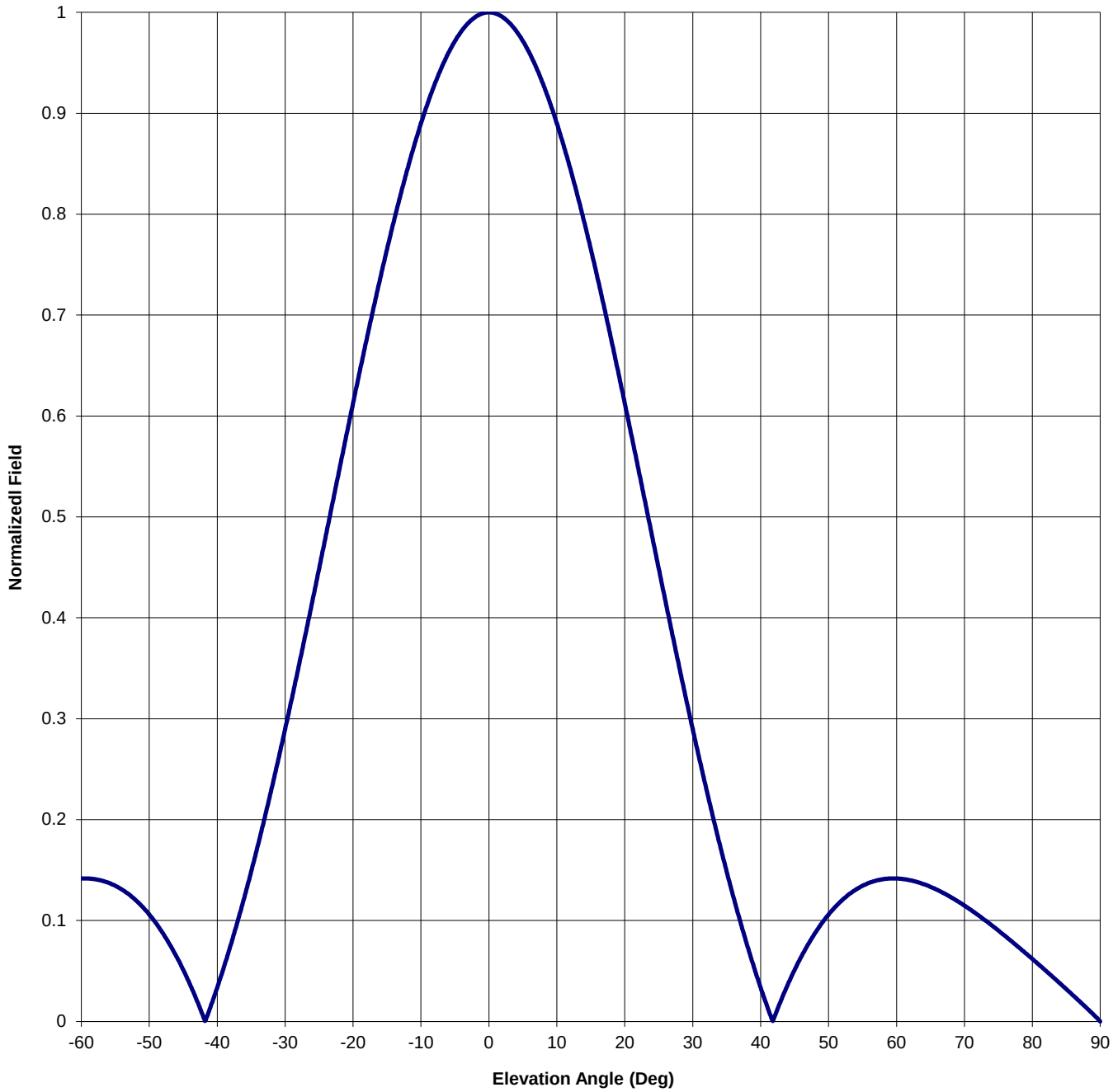
TOWER MAKE: X-BRACED 24" FACE

TRUE NORTH

ANTENNA HEADING 127½° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE			
SHOP ORDER: 37681	FREQUENCY: 94.3 MHz	SCALE: N.T.S.	DRAWN BY: JHFF APPROVED BY: ASP
TITLE: MODEL-6810-3R-SS-DIRECTIONAL ANTENNA			
DATE: 6-8-21	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date: 5/24/2021**
Antenna Type:	**6810-3R-SS-EF**			
Station:	**WIBG**	**Beam Tilt**	**0**	
Frequency:	**94.3**	**Gain (Max)**	**2.050**	**3.117 dB**
Channel #:	**232**	**Gain (Horizon)**	**2.050**	**3.117 dB**
Figure:	**Figure 3**			



Antenna Mfg.: Shively Labs **Date:** 5/24/2021

Antenna Type: 6810-3R-SS-EF

Station: WIBG **Beam Tilt** 0

Frequency: 94.3 **Gain (Max)** 2.050 3.117 dB

Channel #: 232 **Gain (Horizon)** 2.050 3.117 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	0.037	0	1.000	46	0.064
-89	0.007	-43	0.021	1	0.999	47	0.076
-88	0.013	-42	0.004	2	0.995	48	0.087
-87	0.020	-41	0.014	3	0.990	49	0.097
-86	0.026	-40	0.034	4	0.982	50	0.106
-85	0.032	-39	0.054	5	0.972	51	0.114
-84	0.038	-38	0.076	6	0.959	52	0.120
-83	0.044	-37	0.099	7	0.945	53	0.126
-82	0.050	-36	0.123	8	0.928	54	0.131
-81	0.056	-35	0.148	9	0.910	55	0.134
-80	0.062	-34	0.175	10	0.890	56	0.137
-79	0.068	-33	0.202	11	0.868	57	0.140
-78	0.073	-32	0.230	12	0.844	58	0.141
-77	0.079	-31	0.260	13	0.819	59	0.142
-76	0.085	-30	0.290	14	0.793	60	0.142
-75	0.090	-29	0.320	15	0.765	61	0.141
-74	0.095	-28	0.352	16	0.737	62	0.140
-73	0.101	-27	0.384	17	0.707	63	0.138
-72	0.105	-26	0.416	18	0.676	64	0.136
-71	0.110	-25	0.449	19	0.645	65	0.133
-70	0.115	-24	0.482	20	0.613	66	0.130
-69	0.119	-23	0.515	21	0.580	67	0.127
-68	0.123	-22	0.547	22	0.547	68	0.123
-67	0.127	-21	0.580	23	0.515	69	0.119
-66	0.130	-20	0.613	24	0.482	70	0.115
-65	0.133	-19	0.645	25	0.449	71	0.110
-64	0.136	-18	0.676	26	0.416	72	0.105
-63	0.138	-17	0.707	27	0.384	73	0.101
-62	0.140	-16	0.737	28	0.352	74	0.095
-61	0.141	-15	0.765	29	0.320	75	0.090
-60	0.142	-14	0.793	30	0.290	76	0.085
-59	0.142	-13	0.819	31	0.260	77	0.079
-58	0.141	-12	0.844	32	0.230	78	0.073
-57	0.140	-11	0.868	33	0.202	79	0.068
-56	0.137	-10	0.890	34	0.175	80	0.062
-55	0.134	-9	0.910	35	0.148	81	0.056
-54	0.131	-8	0.928	36	0.123	82	0.050
-53	0.126	-7	0.945	37	0.099	83	0.044
-52	0.120	-6	0.959	38	0.076	84	0.038
-51	0.114	-5	0.972	39	0.054	85	0.032
-50	0.106	-4	0.982	40	0.034	86	0.026
-49	0.097	-3	0.990	41	0.014	87	0.020
-48	0.087	-2	0.995	42	0.004	88	0.013
-47	0.076	-1	0.999	43	0.021	89	0.007
-46	0.064	0	1.000	44	0.037	90	0.000
-45	0.051			45	0.051		

S.O. 37681 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WIBG AVALON, NJ

MODEL 6810-3R-SS-EF

Elevation Gain of Antenna 1.01

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

H RMS 0.734237 V RMS 0.670943 H/V Ratio 1.094

Elevation Gain of Horizontal Component 1.105

Elevation Gain of Vertical Component 0.923

Horizontal Azimuth Gain equals $1/(RMS)^2$. 1.855

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 2.195

Max. Vertical 0.994

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

Total Horizontal Power Gain = **2.050**

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

Total Vertical Power Gain = **2.026**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

6 kW ERP Divided by H Gain 2.050 equals 2.927 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

2.927 kW Times V Gain 2.026 equals 5.928 kW V ERP

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

(0.994)^2 Times 6.00 Equals 5.928 kW Vertical ERP

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