Shively Labs
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S.O. 27626

Report of Test 6810-2R-(0.9)SS-DA

for

MLB-DAYTON IV, LLC

WKSW 101.5 MHz Enon, OH

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-2R-(0.9)SS-DA to meet the needs of WKSW and to comply with the requirements of the FCC construction permit, file number BMPH-20090513ADN.

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-20090513ADN 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:

270 Degrees T: 1.591 kW

330 Degrees T: 2.535 kW

From Figure 1A, the maximum radiation of the Horizontal component occurs at 159 Degrees T to 165 Degrees T. At the restricted azimuth of 270 Degrees T the Horizontal component is 9.4 dB down from the maximum of 6.0 kW, or 0.690 kW. At the restricted azimuth of 330 Degrees T the Horizontal component is 8.8 dB down from the maximum of 6.0 kW, or 0.786 kW.

The R.M.S. of the Horizontal component is 0.723. The total Horizontal power gain is 2.149. The R.M.S. of the Vertical component is 0.650. The total Vertical power gain is 2.149. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.874. The R.M.S. of the measured composite pattern is 0.761. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.743. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-2R-(0.9)SS-DA was mounted on a pole of precise scale to the 4 ½" O.D. pole at the WKSW 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 BMPH-20090513ADN, a single level of the 6810-2R-(0.9)SS-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 456.75 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 27626
July 22, 2009

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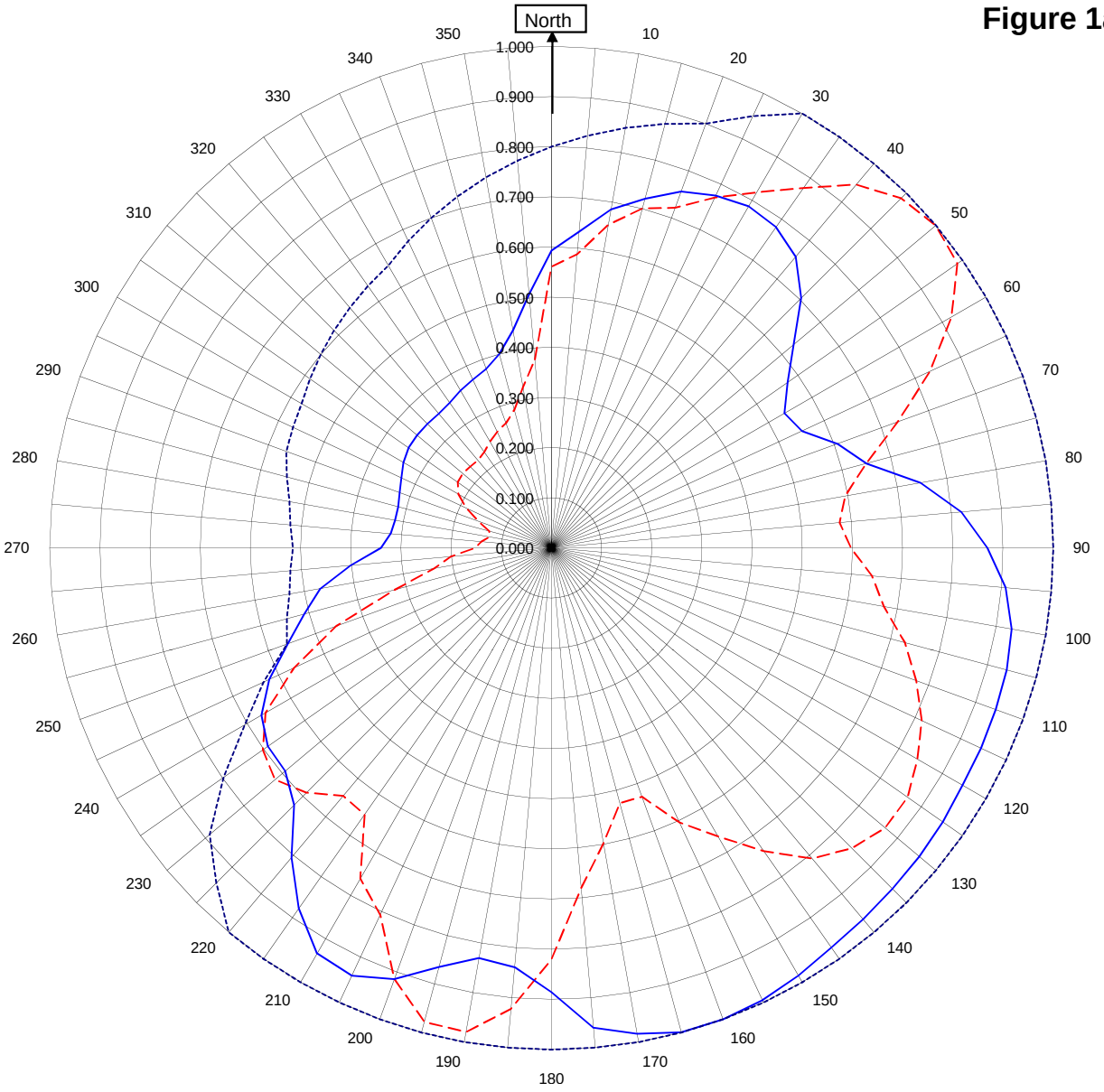
Figure 1a



WKSW Enon, OH

27626

July 22, 2009

Horizontal RMS	0.723
Vertical RMS	0.650
H/V Composite RMS	0.761
FCC Composite RMS	0.874

Frequency	101.5 / 456.75 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-2R-(0.9)SS-DA Patt 07
Pattern Type	Directional Azimuth

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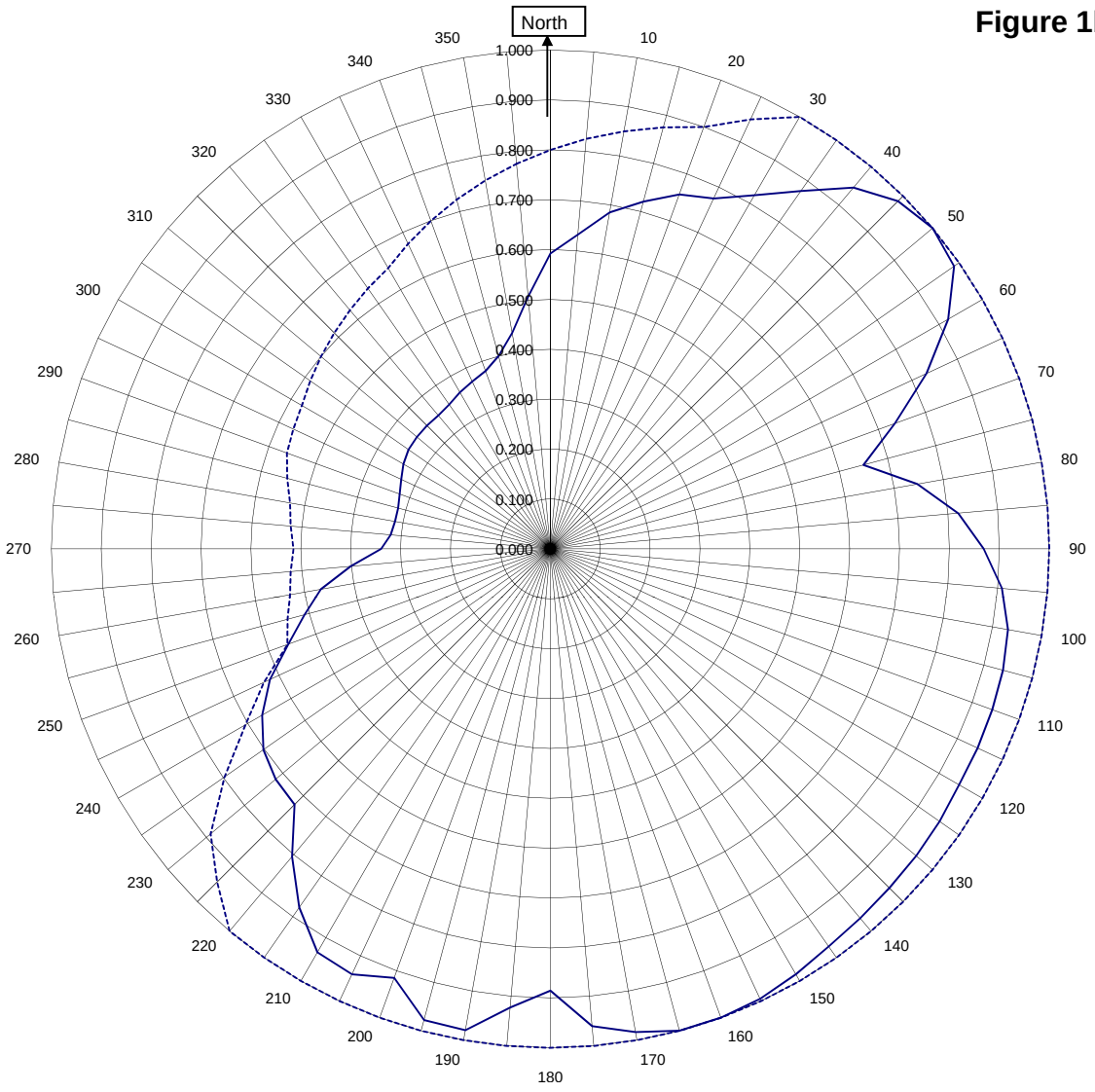
Figure 1b



WKSW Enon, OH

27626

July 22, 2009

_____H/VComposite RMS	0.761
……..FCC Composite RMS	0.874

Frequency	101.5 / 456.75 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-2R-(0.9)SS-DA Patt 07
Pattern Type	Directional H/V Composite

Figure 1c

Tabulation of Horizontal Azimuth Pattern 07
WKSW Enon, OH

Azimuth	Rel Field	Azimuth	Rel Field
0	0.592	180	0.886
10	0.685	190	0.830
20	0.756	200	0.915
30	0.786	210	0.934
40	0.758	220	0.805
45	0.704	225	0.725
50	0.631	230	0.692
60	0.536	240	0.667
70	0.607	250	0.559
80	0.747	260	0.467
90	0.869	270	0.339
100	0.931	280	0.316
110	0.943	290	0.322
120	0.946	300	0.340
130	0.957	310	0.349
135	0.961	315	0.349
140	0.966	320	0.349
150	0.985	330	0.362
160	1.000	340	0.380
170	0.984	350	0.440

Figure 1d

Tabulation of Vertical Azimuth Pattern 07
WKSW Enon, OH

Azimuth	Rel Field	Azimuth	Rel Field
0	0.560	180	0.821
10	0.654	190	0.980
20	0.721	200	0.915
30	0.818	210	0.761
40	0.945	220	0.645
45	0.986	225	0.690
50	1.000	230	0.719
60	0.921	240	0.658
70	0.735	250	0.457
80	0.595	260	0.238
90	0.597	270	0.152
100	0.673	280	0.125
110	0.774	290	0.155
120	0.843	300	0.214
130	0.868	310	0.231
135	0.847	315	0.229
140	0.809	320	0.228
150	0.664	330	0.245
160	0.528	340	0.265
170	0.598	350	0.326

Figure 1e

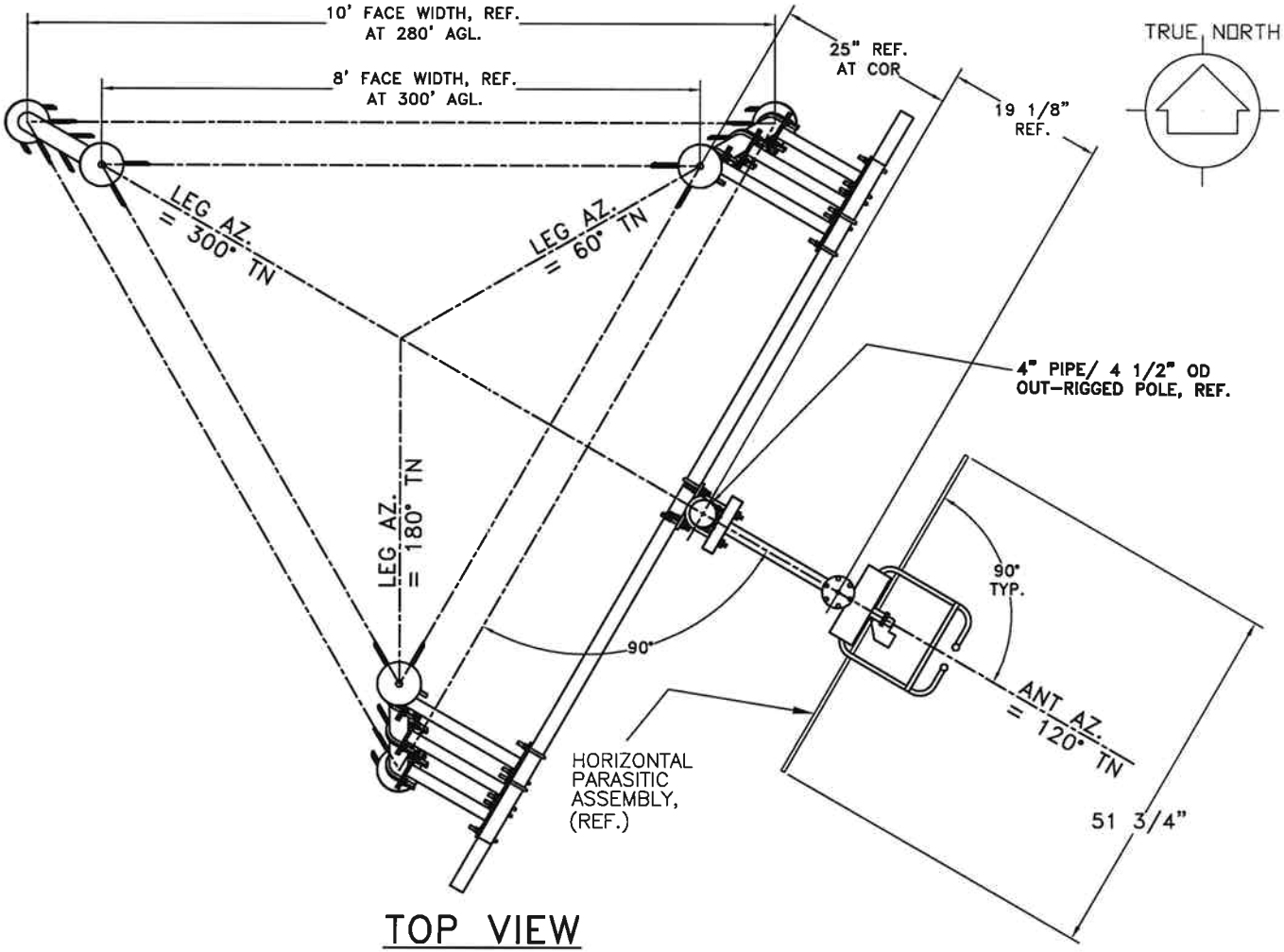
Tabulation of Composite Azimuth Pattern 07
WKSW Enon, OH

Azimuth	Rel Field	Azimuth	Rel Field
0	0.592	180	0.886
10	0.685	190	0.980
20	0.756	200	0.915
30	0.818	210	0.934
40	0.945	220	0.805
45	0.986	225	0.725
50	1.000	230	0.719
60	0.921	240	0.667
70	0.735	250	0.559
80	0.747	260	0.467
90	0.869	270	0.339
100	0.931	280	0.316
110	0.943	290	0.322
120	0.946	300	0.340
130	0.957	310	0.349
135	0.961	315	0.349
140	0.966	320	0.349
150	0.985	330	0.362
160	1.000	340	0.380
170	0.984	350	0.440

Figure 1f

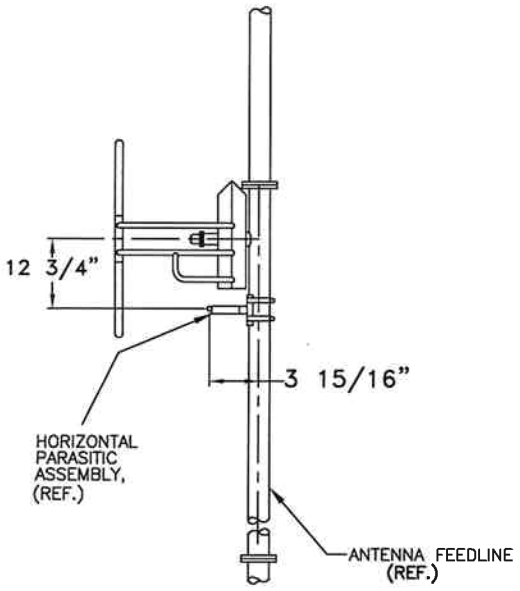
Tabulation of FCC Directional Composite
WKSW Enon, OH

Azimuth	Rel Field	Azimuth	Rel Field
0	0.800	180	1.000
10	0.850	190	1.000
20	0.900	200	1.000
30	1.000	210	1.000
40	1.000	220	1.000
50	1.000	230	0.889
60	1.000	240	0.706
70	1.000	250	0.561
80	1.000	260	0.530
90	1.000	270	0.515
100	1.000	280	0.530
110	1.000	290	0.562
120	1.000	300	0.575
130	1.000	310	0.600
140	1.000	320	0.625
150	1.000	330	0.650
160	1.000	340	0.700
170	1.000	350	0.750



TOP VIEW

TOWER: SELF-SUPPORTING



SIDE VIEW

ANTENNA HEADING 120° TRUE NORTH

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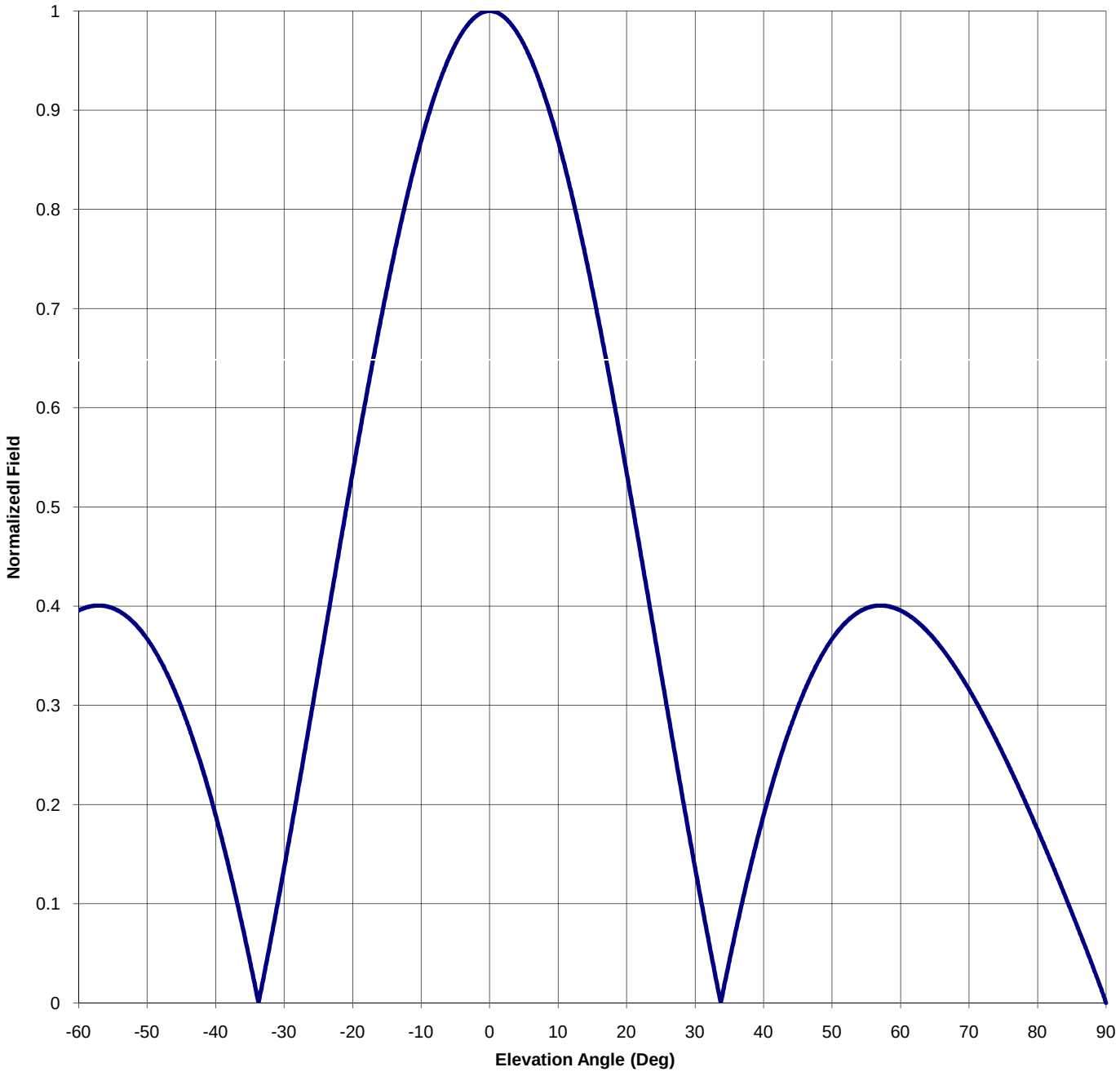
SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
27626	101.5 MHz.	N.T.S.	ASP
			APPROVED BY: DAB

TITLE: MODEL-6810-2-SS-DIRECTIONAL ANTENNA

DATE: 8/7/09

FIGURE 2

Antenna Mfg.:	**Shively Labs**			**Date: 8/10/2009**
Antenna Type:	**6810-2R-(0.9)SS-DA**			
Station:	**WKSW**	**Beam Tilt**	**0**	
Frequency:	**101.5**	**Gain (Max)**	**2.149**	**3.322 dB**
Channel #:	**268**	**Gain (Horizon)**	**2.149**	**3.322 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs **Date:** 8/10/2009

Antenna Type: 6810-2R-(0.9)SS-DA

Station: WKSW **Beam Tilt** 0

Frequency: 101.5 **Gain (Max)** 2.149 3.322 dB

Channel #: 268 **Gain (Horizon)** 2.149 3.322 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	0.280	0	1.000	46	0.315
-89	0.020	-43	0.259	1	0.999	47	0.330
-88	0.038	-42	0.238	2	0.995	48	0.344
-87	0.056	-41	0.214	3	0.988	49	0.356
-86	0.074	-40	0.189	4	0.978	50	0.367
-85	0.091	-39	0.163	5	0.966	51	0.376
-84	0.108	-38	0.135	6	0.952	52	0.384
-83	0.125	-37	0.105	7	0.934	53	0.390
-82	0.142	-36	0.074	8	0.915	54	0.395
-81	0.158	-35	0.042	9	0.893	55	0.398
-80	0.175	-34	0.009	10	0.869	56	0.400
-79	0.190	-33	0.026	11	0.843	57	0.401
-78	0.206	-32	0.062	12	0.815	58	0.400
-77	0.221	-31	0.098	13	0.785	59	0.398
-76	0.236	-30	0.136	14	0.753	60	0.396
-75	0.251	-29	0.175	15	0.720	61	0.392
-74	0.265	-28	0.214	16	0.685	62	0.387
-73	0.278	-27	0.253	17	0.649	63	0.381
-72	0.291	-26	0.293	18	0.612	64	0.374
-71	0.304	-25	0.334	19	0.574	65	0.366
-70	0.316	-24	0.374	20	0.535	66	0.358
-69	0.327	-23	0.415	21	0.495	67	0.348
-68	0.338	-22	0.455	22	0.455	68	0.338
-67	0.348	-21	0.495	23	0.415	69	0.327
-66	0.358	-20	0.535	24	0.374	70	0.316
-65	0.366	-19	0.574	25	0.334	71	0.304
-64	0.374	-18	0.612	26	0.293	72	0.291
-63	0.381	-17	0.649	27	0.253	73	0.278
-62	0.387	-16	0.685	28	0.214	74	0.265
-61	0.392	-15	0.720	29	0.175	75	0.251
-60	0.396	-14	0.753	30	0.136	76	0.236
-59	0.398	-13	0.785	31	0.098	77	0.221
-58	0.400	-12	0.815	32	0.062	78	0.206
-57	0.401	-11	0.843	33	0.026	79	0.190
-56	0.400	-10	0.869	34	0.009	80	0.175
-55	0.398	-9	0.893	35	0.042	81	0.158
-54	0.395	-8	0.915	36	0.074	82	0.142
-53	0.390	-7	0.934	37	0.105	83	0.125
-52	0.384	-6	0.952	38	0.135	84	0.108
-51	0.376	-5	0.966	39	0.163	85	0.091
-50	0.367	-4	0.978	40	0.189	86	0.074
-49	0.356	-3	0.988	41	0.214	87	0.056
-48	0.344	-2	0.995	42	0.238	88	0.038
-47	0.330	-1	0.999	43	0.259	89	0.020
-46	0.315	0	1.000	44	0.280	90	0.000
-45	0.298			45	0.298		

S.O. 27626 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WKSW 101.5 MHz Enon, OH

Model 6810-2R-(0.9)SS-DA

Elevation Gain of Antenna 1.010

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

H RMS 0.723 V RMS 0.65 H/V Ratio 1.112

Elevation Gain of Horizontal Component 1.123

Elevation Gain of Vertical Component 0.908

Horizontal Azimuth Gain equals $1/(RMS)^2$. 1.913

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 2.367

Max. Vertical 1

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

Total Horizontal Power Gain = **2.149**

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

Total Vertical Power Gain = **2.149**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

6 kW ERP Divided by H Gain 2.149 equals 2.79 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

2.79 kW Times V Gain 2.149 equals 6.00 kW V ERP

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

(1)^2 Times 6.00 Equals 6.00 kW Vertical ERP

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