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S.O. 27550

Report of Test 6810-2-DA

for

ASSOCIATED STUDENTS OF THE UNIVERSITY OF OREGON

KWVA 88.1 MHz Eugene, OR

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-2-DA to meet the needs of KWVA and to comply with the requirements of the FCC construction permit, file number BPED-20070906AAN.

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 BPED-20070906AAN indicates that the Horizontal radiation component shall not exceed 1.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

20 – 50 Degrees T: 0.032 kW

From Figure 1A, the maximum radiation of the Horizontal component occurs at 219 Degrees T to 241 Degrees T. At the restricted azimuth of 20 -50 Degrees T the Horizontal component is 16.48 dB down from the maximum of 1.0 kW, or 0.023 kW.

The R.M.S. of the Horizontal component is 0.741. The total Horizontal power gain is 1.854. The R.M.S. of the Vertical component is 0.722. The total Vertical power gain is 1.709. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.786. The R.M.S. of the measured composite pattern is 0.750. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.668. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-2-DA was mounted on a tower of precise scale to the Rohn 65 tower at the KWVA 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 BPED-20070906AAN, a single level of the 6810-2-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 396.45 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 27550
October 2, 2009

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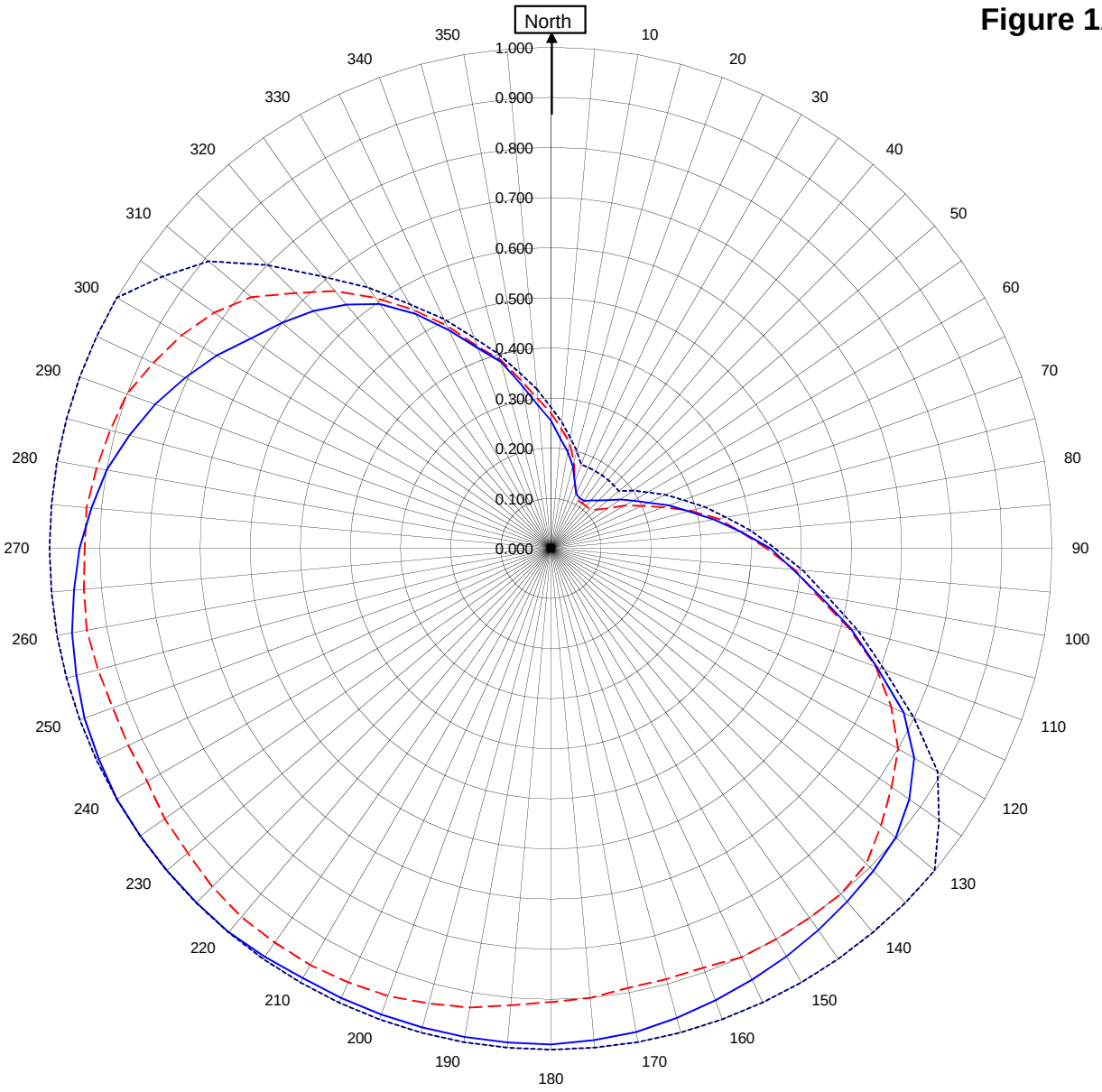
Figure 1A



KWVA Eugene, OR

27550

October 2, 2009

Horizontal RMS	0.741
Vertical RMS	0.722
H/V Composite RMS	0.750
FCC Composite RMS	0.786

Frequency	88.1 / 396.45 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-2-DA Patt 05-A
Pattern Type	Directional Azimuth

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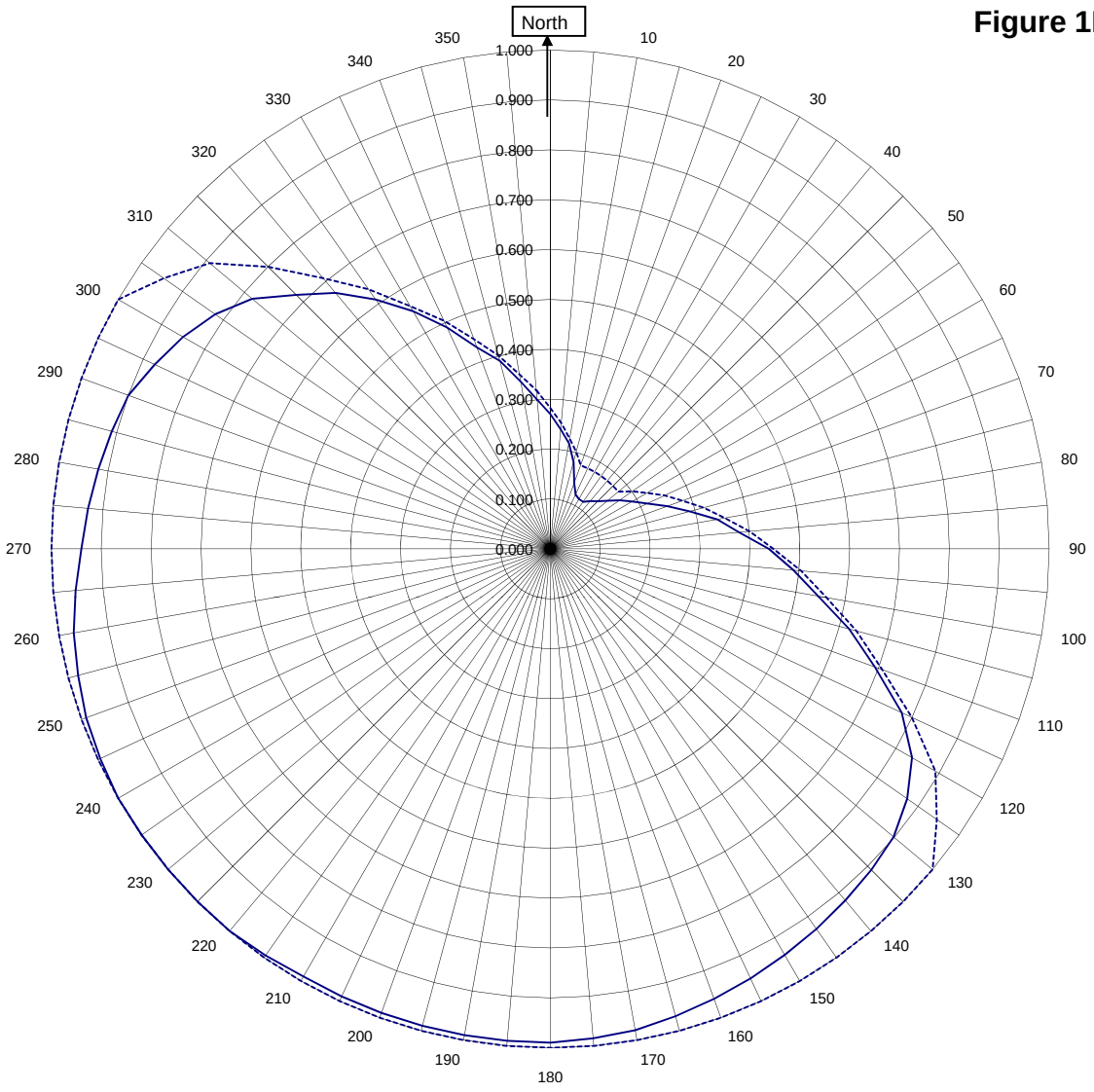
Figure 1B



KWVA Eugene, OR

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October 2, 2009

_____H/VComposite RMS	0.750
……..FCC Composite RMS	0.786

Frequency	88.1 / 396.45 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-2-DA Patt 05-A
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
KWVA Eugene, OR

Azimuth	Rel Field	Azimuth	Rel Field
0	0.255	180	0.990
10	0.195	190	0.990
20	0.140	200	0.990
30	0.115	210	0.990
40	0.125	220	1.000
45	0.135	225	1.000
50	0.150	230	1.000
60	0.190	240	1.000
70	0.250	250	0.990
80	0.330	260	0.970
90	0.438	270	0.940
100	0.545	280	0.900
110	0.692	290	0.840
120	0.837	300	0.770
130	0.898	310	0.700
135	0.910	315	0.670
140	0.920	320	0.635
150	0.940	330	0.540
160	0.960	340	0.425
170	0.980	350	0.330

Figure 1D

Tabulation of Vertical Azimuth Pattern
KWVA Eugene, OR

Azimuth	Rel Field	Azimuth	Rel Field
0	0.270	180	0.905
10	0.215	190	0.930
20	0.140	200	0.950
30	0.110	210	0.960
40	0.110	220	0.960
45	0.110	225	0.955
50	0.120	230	0.945
60	0.170	240	0.930
70	0.240	250	0.930
80	0.340	260	0.940
90	0.430	270	0.930
100	0.540	280	0.920
110	0.690	290	0.900
120	0.800	300	0.850
130	0.860	310	0.780
135	0.890	315	0.720
140	0.900	320	0.670
150	0.900	330	0.550
160	0.890	340	0.430
170	0.890	350	0.340

Figure 1E

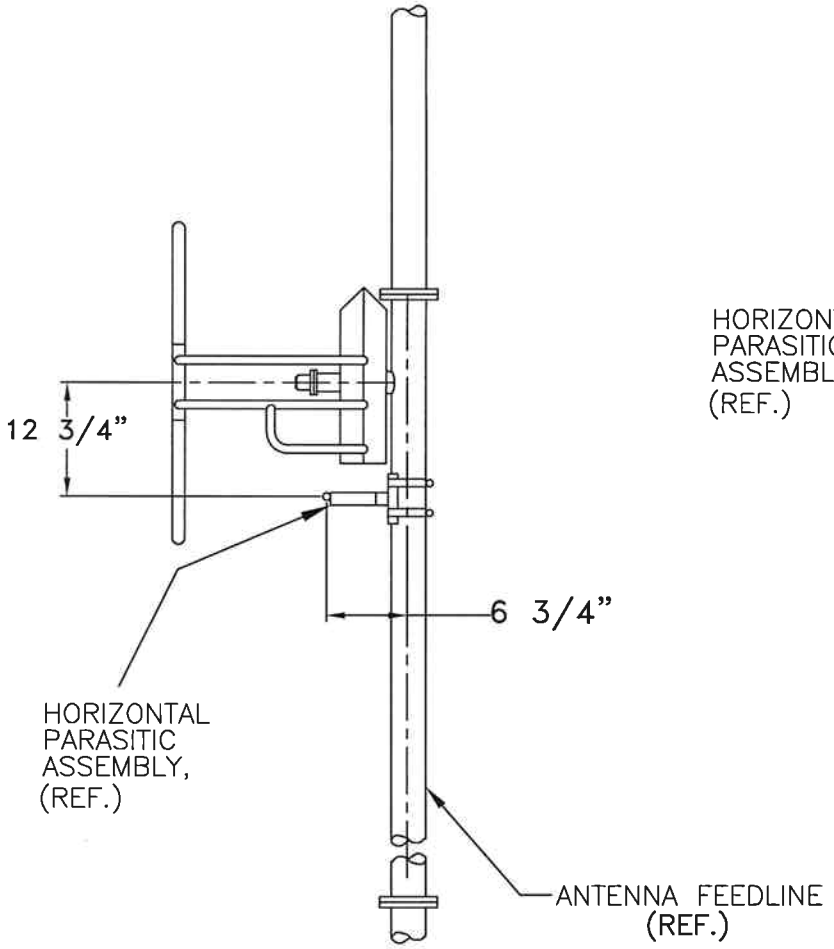
Tabulation of Composite Azimuth Pattern
KWVA Eugene, OR

Azimuth	Rel Field	Azimuth	Rel Field
0	0.270	180	0.990
10	0.215	190	0.990
20	0.140	200	0.990
30	0.115	210	0.990
40	0.125	220	1.000
45	0.135	225	1.000
50	0.150	230	1.000
60	0.190	240	1.000
70	0.250	250	0.990
80	0.340	260	0.970
90	0.438	270	0.940
100	0.545	280	0.920
110	0.692	290	0.900
120	0.837	300	0.850
130	0.898	310	0.780
135	0.910	315	0.720
140	0.920	320	0.670
150	0.940	330	0.550
160	0.960	340	0.430
170	0.980	350	0.340

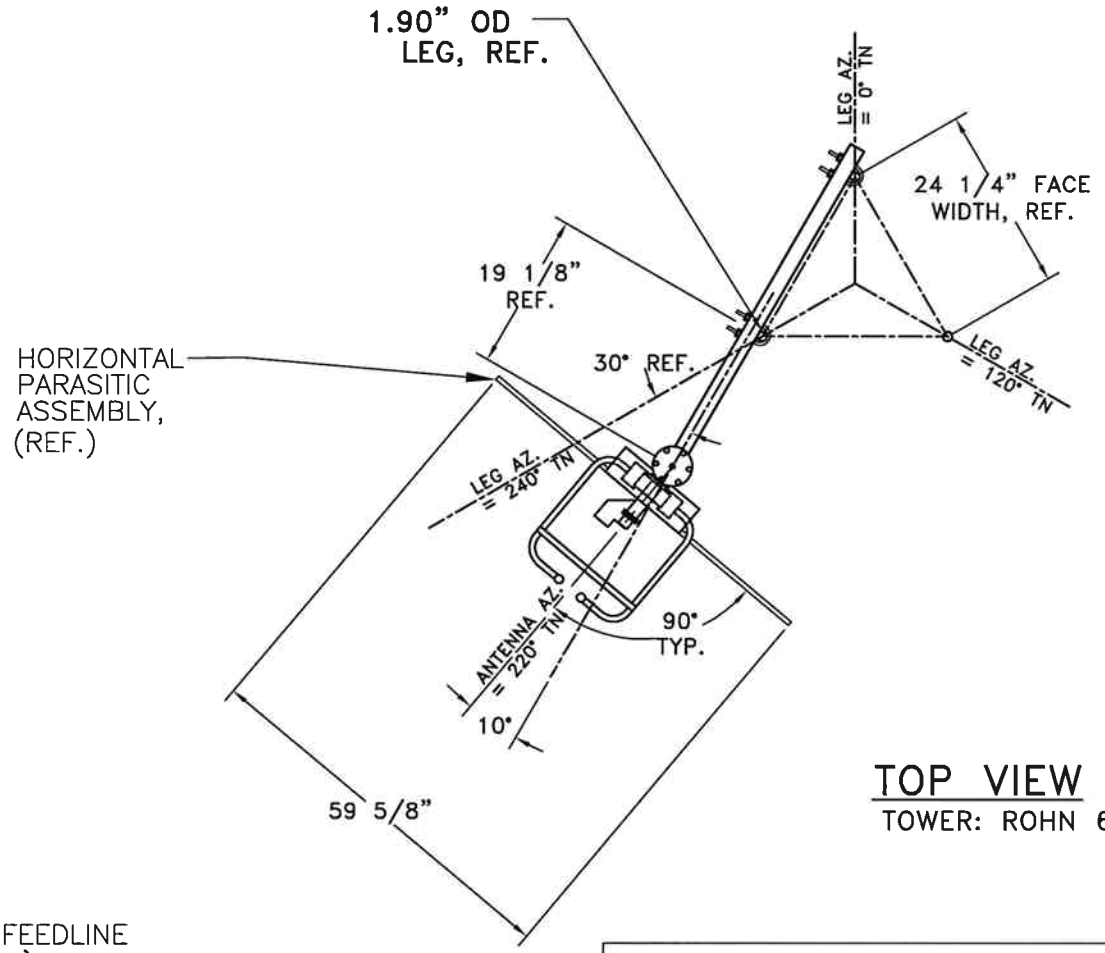
Figure 1F

Tabulation of FCC Directional Composite
KWVA Eugene, OR

Azimuth	Rel Field	Azimuth	Rel Field
0	0.282	180	1.000
10	0.224	190	1.000
20	0.178	200	1.000
30	0.178	210	1.000
40	0.178	220	1.000
50	0.178	230	1.000
60	0.224	240	1.000
70	0.282	250	1.000
80	0.355	260	1.000
90	0.447	270	1.000
100	0.562	280	1.000
110	0.708	290	1.000
120	0.891	300	1.000
130	1.000	310	0.891
140	1.000	320	0.708
150	1.000	330	0.562
160	1.000	340	0.447
170	1.000	350	0.355



SIDE VIEW

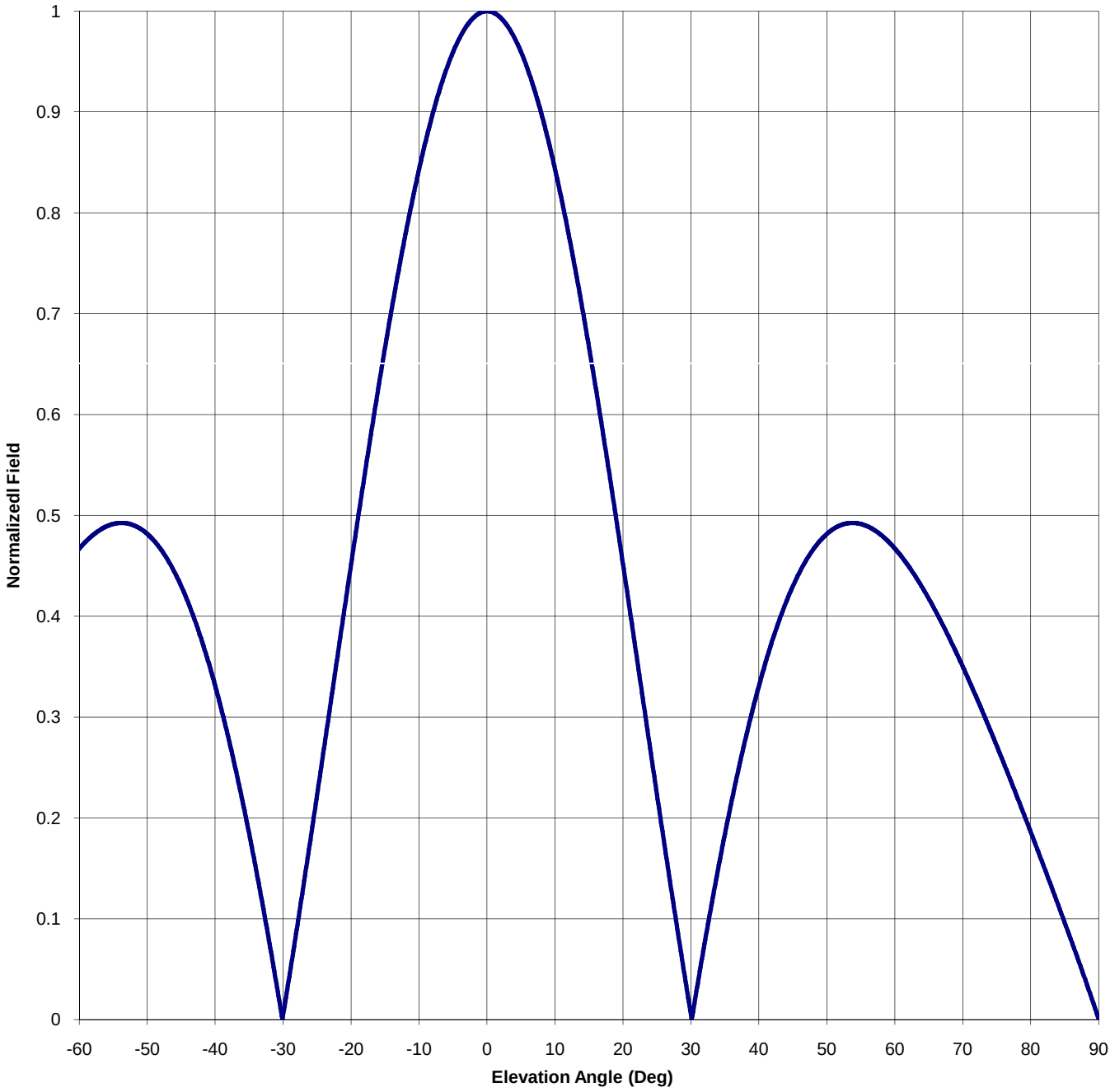


TOP VIEW
TOWER: ROHN 65

ANTENNA HEADING 220° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER: 27550	FREQUENCY: 88.1 MHz.	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY: DAB
TITLE: MODEL-6810-2-DIRECTIONAL ANTENNA			
DATE: 9/28/09	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date: 10/13/2009**
Antenna Type:	**6810-2-DA**			
Station:	**KWVA**	**Beam Tilt**	**0**	
Frequency:	**88.1**	**Gain (Max)**	**1.854**	**2.681 dB**
Channel #:	**201**	**Gain (Horizon)**	**1.854**	**2.681 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs
Antenna Type: 6810-2-DA
Station: KWVA
Frequency: 88.1
Channel #: 201
Figure: 3

Beam Tilt 0
Gain (Max) 1.854 **2.681 dB**
Gain (Horizon) 1.854 **2.681 dB**

Date: 10/13/2009

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	0.414	0	1.000	46	0.444
-89	0.021	-43	0.396	1	0.998	47	0.456
-88	0.040	-42	0.376	2	0.993	48	0.466
-87	0.059	-41	0.355	3	0.985	49	0.475
-86	0.078	-40	0.331	4	0.974	50	0.482
-85	0.096	-39	0.305	5	0.959	51	0.487
-84	0.114	-38	0.278	6	0.942	52	0.490
-83	0.132	-37	0.248	7	0.921	53	0.492
-82	0.150	-36	0.217	8	0.898	54	0.492
-81	0.168	-35	0.184	9	0.872	55	0.491
-80	0.186	-34	0.149	10	0.843	56	0.489
-79	0.203	-33	0.113	11	0.812	57	0.485
-78	0.221	-32	0.075	12	0.779	58	0.480
-77	0.238	-31	0.036	13	0.743	59	0.474
-76	0.255	-30	0.005	14	0.706	60	0.467
-75	0.271	-29	0.047	15	0.667	61	0.459
-74	0.288	-28	0.090	16	0.626	62	0.450
-73	0.304	-27	0.133	17	0.584	63	0.440
-72	0.320	-26	0.178	18	0.541	64	0.429
-71	0.335	-25	0.223	19	0.497	65	0.417
-70	0.350	-24	0.269	20	0.452	66	0.405
-69	0.364	-23	0.315	21	0.406	67	0.392
-68	0.379	-22	0.361	22	0.361	68	0.379
-67	0.392	-21	0.406	23	0.315	69	0.364
-66	0.405	-20	0.452	24	0.269	70	0.350
-65	0.417	-19	0.497	25	0.223	71	0.335
-64	0.429	-18	0.541	26	0.178	72	0.320
-63	0.440	-17	0.584	27	0.133	73	0.304
-62	0.450	-16	0.626	28	0.090	74	0.288
-61	0.459	-15	0.667	29	0.047	75	0.271
-60	0.467	-14	0.706	30	0.005	76	0.255
-59	0.474	-13	0.743	31	0.036	77	0.238
-58	0.480	-12	0.779	32	0.075	78	0.221
-57	0.485	-11	0.812	33	0.113	79	0.203
-56	0.489	-10	0.843	34	0.149	80	0.186
-55	0.491	-9	0.872	35	0.184	81	0.168
-54	0.492	-8	0.898	36	0.217	82	0.150
-53	0.492	-7	0.921	37	0.248	83	0.132
-52	0.490	-6	0.942	38	0.278	84	0.114
-51	0.487	-5	0.959	39	0.305	85	0.096
-50	0.482	-4	0.974	40	0.331	86	0.078
-49	0.475	-3	0.985	41	0.355	87	0.059
-48	0.466	-2	0.993	42	0.376	88	0.040
-47	0.456	-1	0.998	43	0.396	89	0.021
-46	0.444	0	1.000	44	0.414	90	0.000
-45	0.430			45	0.430		

S.O. 27550 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

KWVA 88.1 MHz Eugene, OR

Model 6810-2-DA

Elevation Gain of Antenna 0.992

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

H RMS	0.741	V RMS	0.722	H/V Ratio	1.026

Elevation Gain of Horizontal Component 1.018

Elevation Gain of Vertical Component 0.967

Horizontal Azimuth Gain equals $1/(RMS)^2$. 1.821

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 1.768

Max. Vertical 0.96

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

Total Horizontal Power Gain = **1.854**

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

Total Vertical Power Gain = **1.709**

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ERP divided by Horizontal Power Gain equals Antenna Input Power

1	kW ERP	Divided by H Gain	1.854	equals	0.54	kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.54	kW	Times V Gain	1.709	equals	0.92	kW V ERP

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

(0.96)^2	Times	1.00	Equals	0.92	kW Vertical ERP

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