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S.O. 28378

Report of Test 6810BB-6R-SS(0.90)-DA

for

TRES HERMANAS EDUCATIONAL MEDIA FOUNDATION

KOFG 91.1 MHz Cody, WY

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810BB-6R-SS(0.90)-DA to meet the needs of KOFG and to comply with the requirements of the FCC construction permit, file number BPED-20100401ADU.

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-20100410ADU indicates that the Horizontal radiation component shall not exceed 8.7 kW at any azimuth and is restricted to the following values at the azimuths specified:

230 Degrees T through 240 Degrees T: 1.05 kW

From Figure 1A, the maximum radiation of the Horizontal component occurs at 044 Degrees T to 100 Degrees T. At the restricted azimuth of 230 Degrees T through 240 Degrees T the Horizontal component is 10.17 dB down from the maximum of 8.7 kW, or 0.84 kW.

The R.M.S. of the Horizontal component is 0.724. The total Horizontal power gain is 6.327. The R.M.S. of the Vertical component is 0.718. The total Vertical power gain is 6.201. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.835. The R.M.S. of the measured composite pattern is 0.760. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.710. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810BB-6R-SS(0.90)-DA was mounted on a tower of precise scale to the Rohn 65G tower at the KOFG 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-20100401ADU, a single level of the 6810BB-6R-SS(0.90)-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 409.95 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 28378
August 23, 2010

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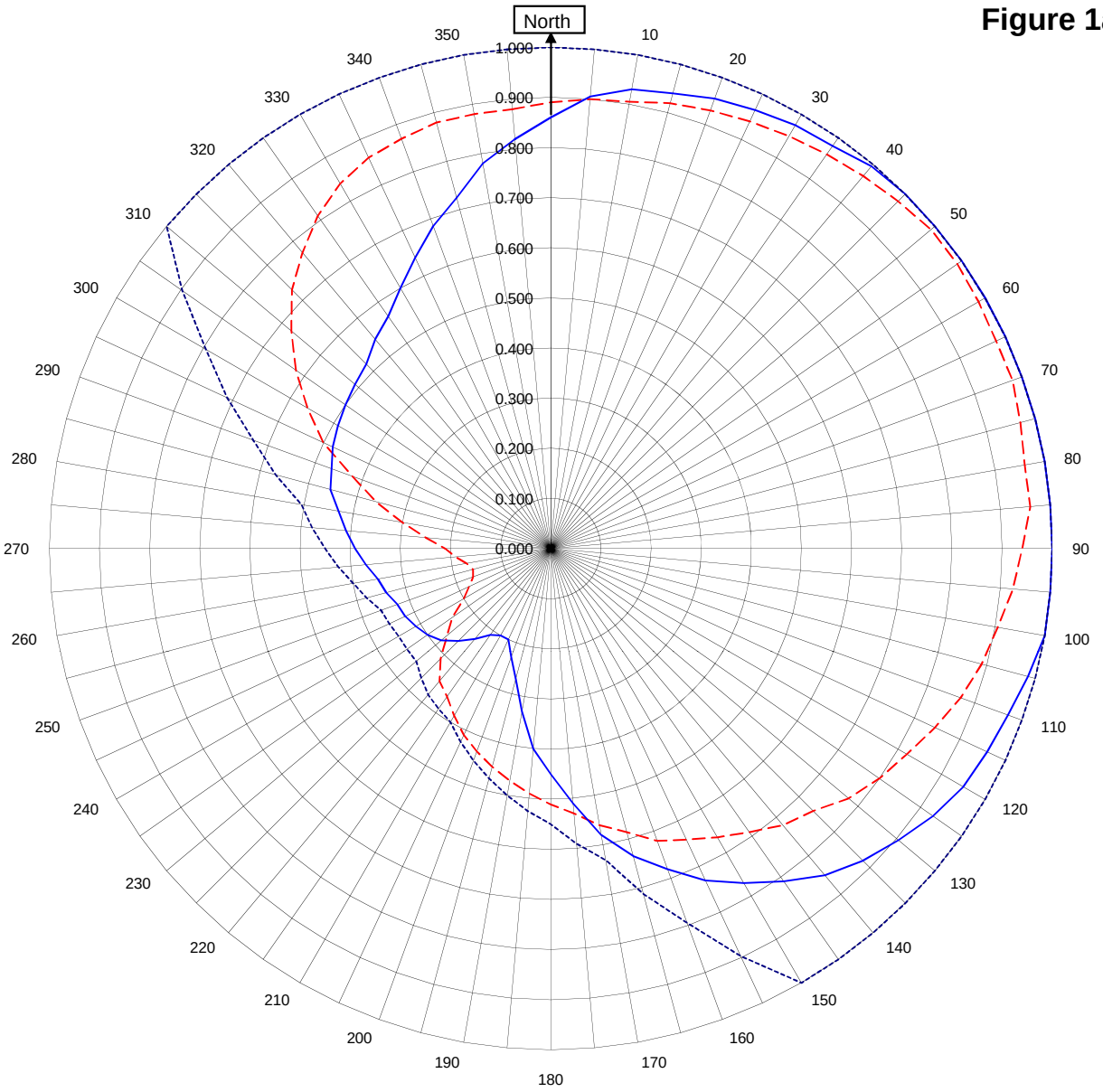
Figure 1a



KOFG Cody, WY

28378

August 23, 2010

_____Horizontal RMS	0.724
_ _ _ _ _ _ _ _ _ Vertical RMS	0.718
H/V Composite RMS	0.760
……FCC Composite RMS	0.835

Frequency	91.1 / 409.95 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810BB-6R-SS(0.90)-DA
Pattern Type	Directional Azimuth

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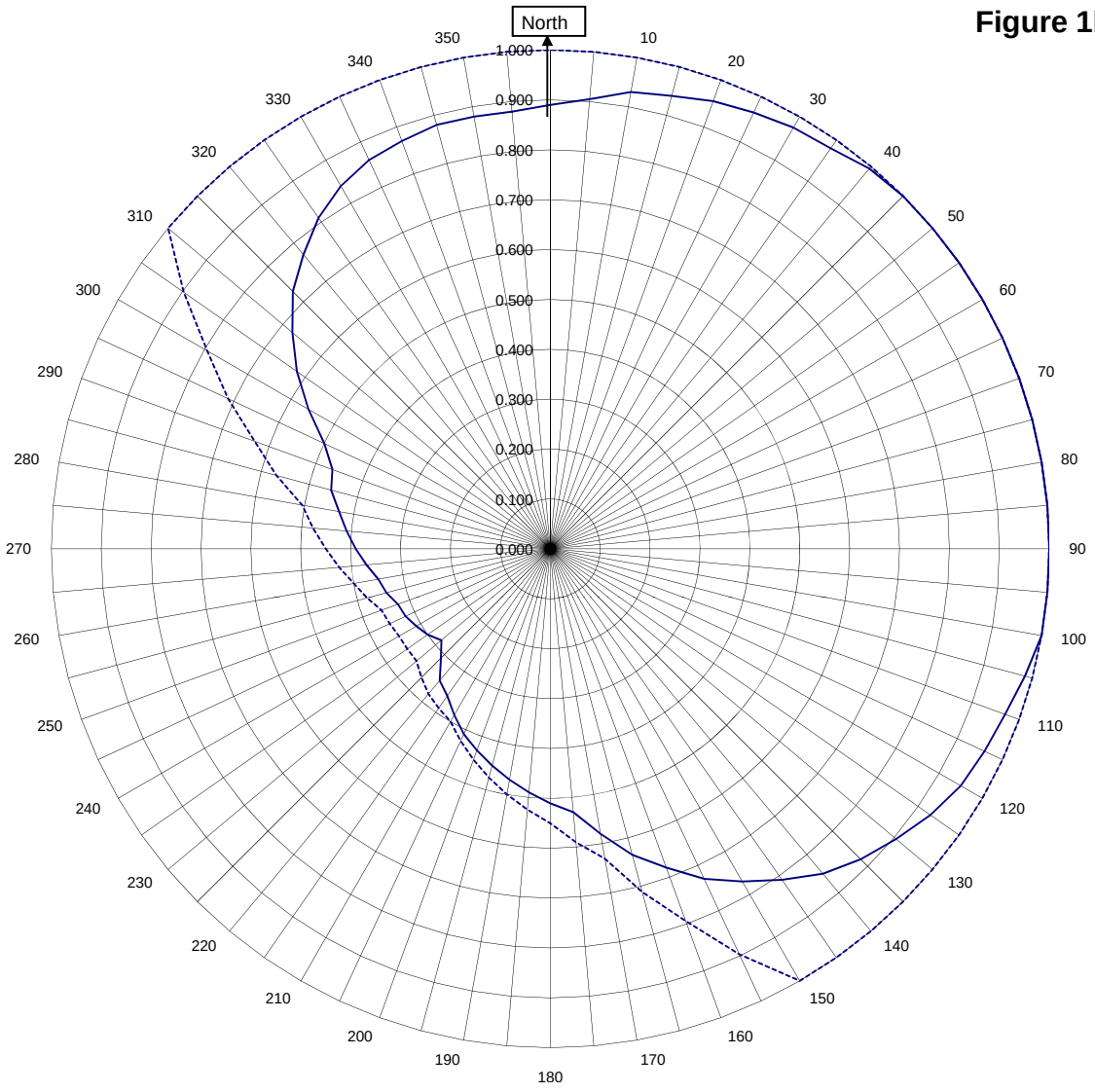
Figure 1b



KOFG Cody, WY

28378

August 23, 2010

_____H/VComposite RMS	0.760
……..FCC Composite RMS	0.835

Frequency	91.1 / 409.95 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810BB-6R-SS(0.90)-DA
Pattern Type	Directional H/V Composite

Figure 1c

Tabulation of Horizontal Azimuth Pattern
KOFG Cody, WY

Azimuth	Rel Field	Azimuth	Rel Field
0	0.860	180	0.450
10	0.930	190	0.330
20	0.955	200	0.230
30	0.975	210	0.200
40	0.995	220	0.235
45	1.000	225	0.260
50	1.000	230	0.285
60	1.000	240	0.310
70	1.000	250	0.325
80	1.000	260	0.350
90	1.000	270	0.390
100	1.000	280	0.430
110	0.970	290	0.465
120	0.950	300	0.490
130	0.905	310	0.510
135	0.880	315	0.520
140	0.850	320	0.545
150	0.770	330	0.600
160	0.680	340	0.685
170	0.580	350	0.780

Figure 1d

Tabulation of Vertical Azimuth Pattern
KOFG Cody, WY

Azimuth	Rel Field	Azimuth	Rel Field
0	0.890	180	0.510
10	0.905	190	0.470
20	0.930	200	0.430
30	0.950	210	0.385
40	0.970	220	0.345
45	0.980	225	0.310
50	0.990	230	0.270
60	0.985	240	0.200
70	0.980	250	0.165
80	0.960	260	0.170
90	0.940	270	0.210
100	0.905	280	0.300
110	0.870	290	0.420
120	0.820	300	0.560
130	0.775	310	0.675
135	0.740	315	0.730
140	0.720	320	0.770
150	0.665	330	0.840
160	0.620	340	0.870
170	0.560	350	0.880

Figure 1e

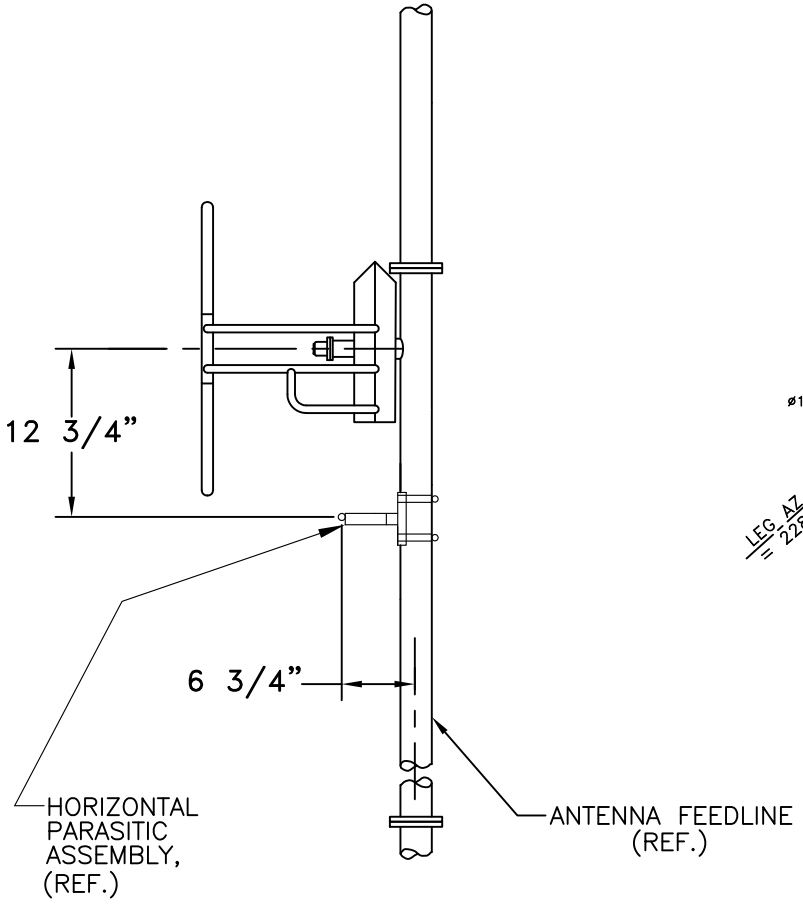
Tabulation of Composite Azimuth Pattern
KOFG Cody, WY

Azimuth	Rel Field	Azimuth	Rel Field
0	0.890	180	0.510
10	0.930	190	0.470
20	0.955	200	0.430
30	0.975	210	0.385
40	0.995	220	0.345
45	1.000	225	0.310
50	1.000	230	0.285
60	1.000	240	0.310
70	1.000	250	0.325
80	1.000	260	0.350
90	1.000	270	0.390
100	1.000	280	0.430
110	0.970	290	0.465
120	0.950	300	0.560
130	0.905	310	0.675
135	0.880	315	0.730
140	0.850	320	0.770
150	0.770	330	0.840
160	0.680	340	0.870
170	0.580	350	0.880

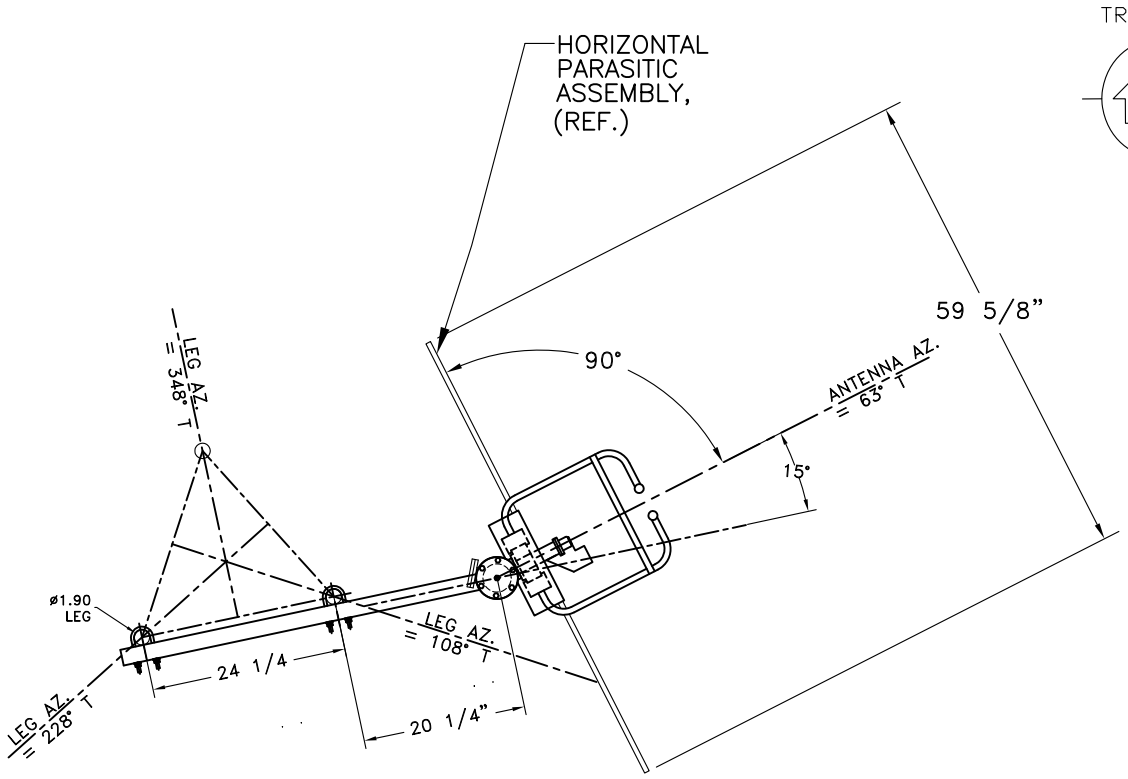
Figure 1f

Tabulation of FCC Directional Composite
KOFG Cody, WY

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.550
10	1.000	190	0.500
20	1.000	200	0.450
30	1.000	210	0.400
40	1.000	220	0.380
50	1.000	230	0.350
60	1.000	240	0.350
70	1.000	250	0.360
80	1.000	260	0.400
90	1.000	270	0.450
100	1.000	280	0.505
110	1.000	290	0.631
120	1.000	300	0.794
130	1.000	310	1.000
140	1.000	320	1.000
150	1.000	330	1.000
160	0.794	340	1.000
170	0.631	350	1.000



SIDE VIEW



TOP VIEW

TOWER MAKE: ROHN 65

ANTENNA HEADING 63° TRUE NORTH

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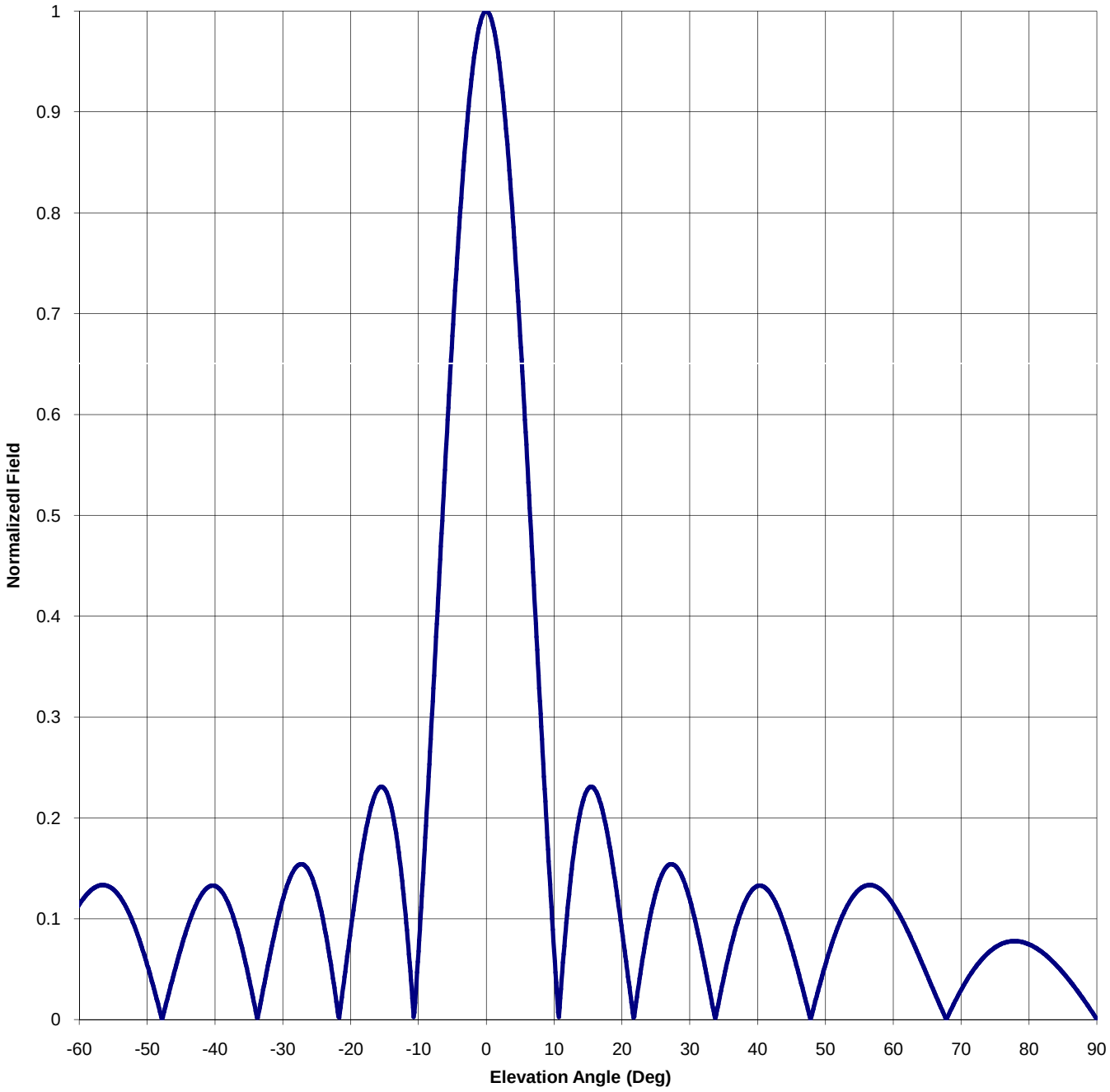
SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
28378	91.1	N.T.S.	ASP
			APPROVED BY: DAB

TITLE: MODEL-6810BB-6R-.90SS-DIRECTIONAL ANTENNA

DATE: 8/19/10

FIGURE 2

Antenna Mfg.:	**Shively Labs**			**Date:**	**8/23/2010**
Antenna Type:	**6810-6R-SS(0.90)-DA**				
Station:	**KOFG**	**Beam Tilt**	**0**		
Frequency:	**91.1**	**Gain (Max)**	**6.327**	**8.012**	**dB**
Channel #:	**216**	**Gain (Horizon)**	**6.327**	**8.012**	**dB**
Figure:	**Figure 3**				



Antenna Mfg.: Shively Labs **Date:** 8/23/2010

Antenna Type: 6810-6R-SS(0.90)-DA

Station: KOFG **Beam Tilt** 0

Frequency: 91.1 **Gain (Max)** 6.327 8.012 dB

Channel #: 216 **Gain (Horizon)** 6.327 8.012 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	0.093	0	1.000	46	0.047
-89	0.010	-43	0.111	1	0.986	47	0.021
-88	0.020	-42	0.124	2	0.944	48	0.005
-87	0.030	-41	0.131	3	0.876	49	0.031
-86	0.038	-40	0.133	4	0.786	50	0.055
-85	0.047	-39	0.127	5	0.678	51	0.076
-84	0.054	-38	0.115	6	0.558	52	0.095
-83	0.061	-37	0.096	7	0.431	53	0.110
-82	0.066	-36	0.071	8	0.303	54	0.122
-81	0.071	-35	0.041	9	0.180	55	0.129
-80	0.075	-34	0.009	10	0.068	56	0.133
-79	0.077	-33	0.026	11	0.030	57	0.133
-78	0.078	-32	0.060	12	0.111	58	0.130
-77	0.077	-31	0.092	13	0.171	59	0.123
-76	0.075	-30	0.119	14	0.210	60	0.114
-75	0.072	-29	0.139	15	0.229	61	0.103
-74	0.066	-28	0.151	16	0.228	62	0.089
-73	0.059	-27	0.154	17	0.210	63	0.075
-72	0.051	-26	0.145	18	0.179	64	0.059
-71	0.041	-25	0.126	19	0.137	65	0.044
-70	0.029	-24	0.097	20	0.088	66	0.028
-69	0.017	-23	0.058	21	0.037	67	0.012
-68	0.003	-22	0.013	22	0.013	68	0.003
-67	0.012	-21	0.037	23	0.058	69	0.017
-66	0.028	-20	0.088	24	0.097	70	0.029
-65	0.044	-19	0.137	25	0.126	71	0.041
-64	0.059	-18	0.179	26	0.145	72	0.051
-63	0.075	-17	0.210	27	0.154	73	0.059
-62	0.089	-16	0.228	28	0.151	74	0.066
-61	0.103	-15	0.229	29	0.139	75	0.072
-60	0.114	-14	0.210	30	0.119	76	0.075
-59	0.123	-13	0.171	31	0.092	77	0.077
-58	0.130	-12	0.111	32	0.060	78	0.078
-57	0.133	-11	0.030	33	0.026	79	0.077
-56	0.133	-10	0.068	34	0.009	80	0.075
-55	0.129	-9	0.180	35	0.041	81	0.071
-54	0.122	-8	0.303	36	0.071	82	0.066
-53	0.110	-7	0.431	37	0.096	83	0.061
-52	0.095	-6	0.558	38	0.115	84	0.054
-51	0.076	-5	0.678	39	0.127	85	0.047
-50	0.055	-4	0.786	40	0.133	86	0.038
-49	0.031	-3	0.876	41	0.131	87	0.030
-48	0.005	-2	0.944	42	0.124	88	0.020
-47	0.021	-1	0.986	43	0.111	89	0.010
-46	0.047	0	1.000	44	0.093	90	0.000
-45	0.071			45	0.071		

S.O. 28378 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

KOFG 91.1 MHz Cody, WY

Model 6810BB-6R-SS(0.90)-DA

Elevation Gain of Antenna 3.289

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

H RMS	0.724	V RMS	0.718	H/V Ratio	1.008

Elevation Gain of Horizontal Component 3.316

Elevation Gain of Vertical Component 3.262

Horizontal Azimuth Gain equals $1/(RMS)^2$. 1.908

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 1.901

Max. Vertical 0.99

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

Total Horizontal Power Gain = **6.327**

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

Total Vertical Power Gain = **6.201**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

8.7	kW ERP	Divided by H Gain	6.327	equals	1.38	kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

1.38	kW	Times V Gain	6.201	equals	8.53	kW V ERP

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

(0.99)^2	Times	8.70	Equals	8.53	kW Vertical ERP

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