

S.O. 35446
Report of Test 6810-2R-DA
for
EDUCATIONAL MEDIA FOUNDATION
KLCF 91.1 MHz TRUTH OR CONSEQUENCE, NM.

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-2R-DA to meet the needs of KLCF and to comply with the requirements of the FCC construction permit, file number BMPED-20170829AAQ. 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 BMPED-20170829AAQ indicates that the Horizontal radiation component shall not exceed 1.00 kW at any azimuth and is restricted to the following values at the azimuths specified:

220 - 260 Degrees True: 0.230 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 343 Degrees True to 348 Degrees True. At the restricted azimuth of 220 - 260 Degrees True the Vertical component is 10.72 dB down from the maximum of 1.0 kW, or 0.085 kW.

The R.M.S. of the Horizontal component is 0.728. The total Horizontal power gain is 2.198. The R.M.S. of the Vertical component is 0.618. The total Vertical power gain is 2.176. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.862. The R.M.S. of the measured composite pattern is 0.763. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.733. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-2R-DA was mounted on a tower of precise scale to the Caballo tower at the KLCF site. The antenna is mounted to an offset 3-inch pipe, from the 60-degree face. The spacing of the pole to the tower is 36-inches. The 6810-2R-DA antenna is mounted to the 3-inch pipe. Both horizontal and vertical parasitics were used to achieve the pattern. 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 BMPED-20170829AAQ, a single level of the 6810-2R-DA 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 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 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:



Angela Gillespie
Vice President, Shively Labs

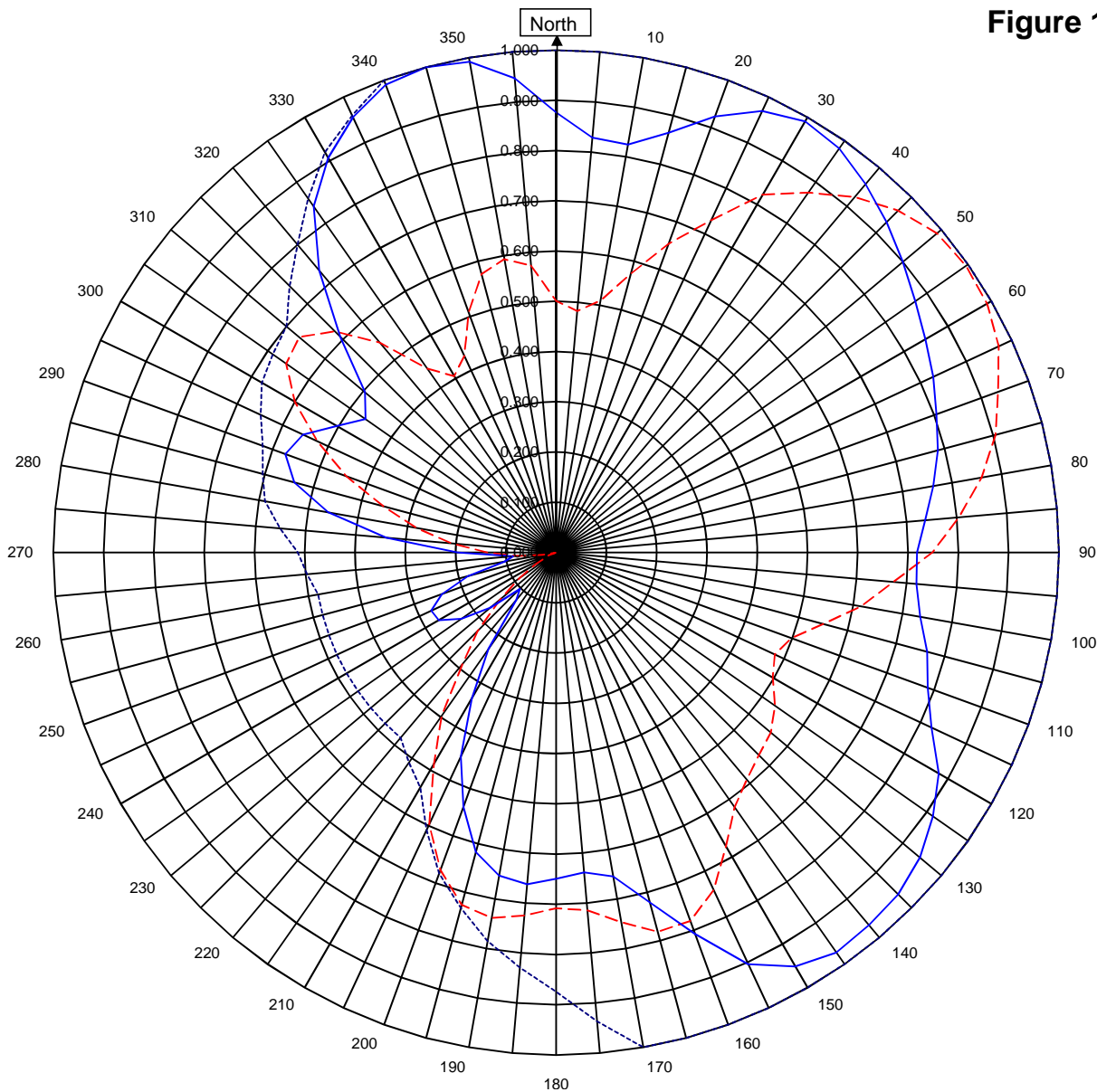
S/O 35446

Date APRIL 6, 2018

Shively Labs

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

Figure 1A



KLCF **TRUTH OR CONSEQUENCE, NM.**
35446
April 6, 2018

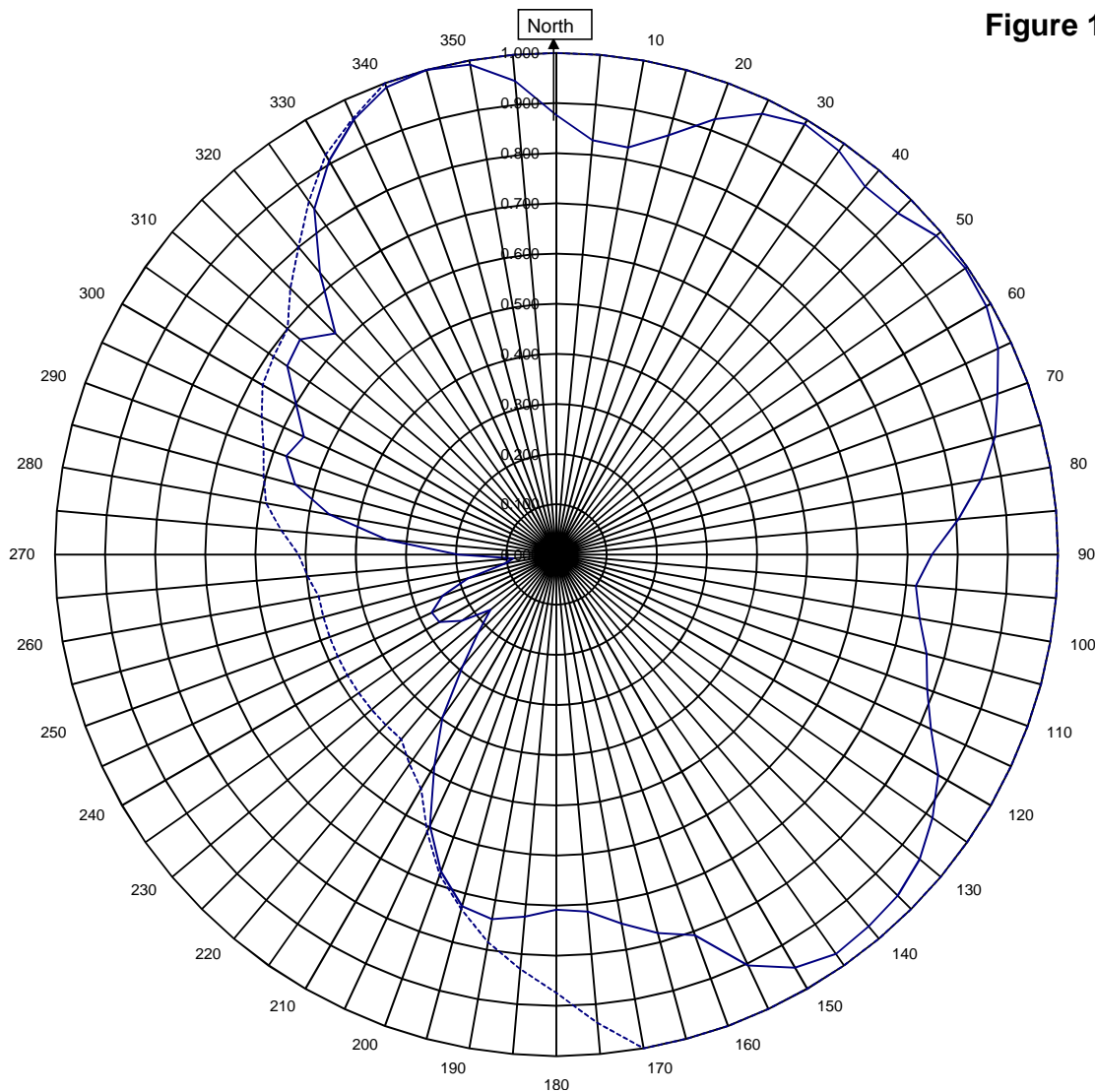
Horizontal RMS	0.728	Frequency	91.1 / 409.95 MHz
Vertical RMS	0.618	Plot	Relative Field
H/V Composite RMS	0.763	Scale	4.5 : 1
FCC Composite RMS	0.862	See Figure 2 for Mechanical Details	

Antenna Model	6810-2R-DA
Pattern Type	Directional Azimuth

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Figure 1B



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—————H/V Composite RMS	0.763
.....FCC Composite RMS	0.862

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

Antenna Model	6810-2R-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern

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Azimuth	Rel Field	Azimuth	Rel Field
0	0.876	180	0.649
10	0.824	190	0.653
20	0.924	200	0.539
30	0.991	210	0.335
40	0.958	220	0.124
45	0.930	225	0.102
50	0.900	230	0.171
60	0.848	240	0.269
70	0.805	250	0.242
80	0.762	260	0.105
90	0.718	270	0.196
100	0.735	280	0.460
110	0.787	290	0.573
120	0.879	300	0.504
130	0.945	310	0.497
135	0.962	315	0.607
140	0.968	320	0.733
150	0.951	330	0.907
160	0.808	340	0.991
170	0.655	350	0.992

Figure 1D

Tabulation of Vertical Azimuth Pattern
 KLCF TRUTH OR CONSEQUENCE, NM.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.500	180	0.708
10	0.509	190	0.738
20	0.654	200	0.673
30	0.822	210	0.486
40	0.923	220	0.291
45	0.962	225	0.221
50	0.988	230	0.144
60	0.990	240	0.046
70	0.936	250	0.015
80	0.860	260	0.027
90	0.749	270	0.137
100	0.616	280	0.283
110	0.498	290	0.444
120	0.498	300	0.600
130	0.557	310	0.667
135	0.571	315	0.623
140	0.590	320	0.546
150	0.676	330	0.405
160	0.781	340	0.508
170	0.747	350	0.593

Figure 1E

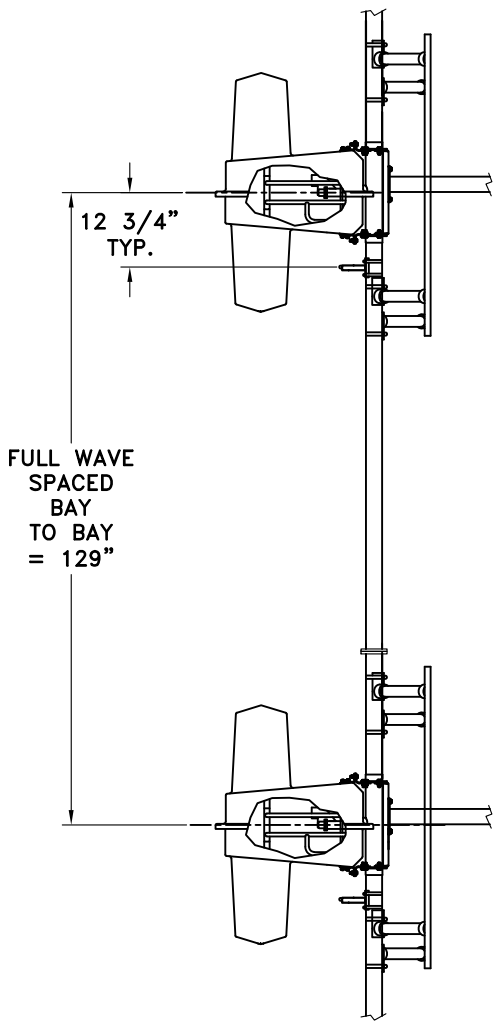
Tabulation of Composite Azimuth Pattern
KLCF TRUTH OR CONSEQUENCE, NM.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.876	180	0.708
10	0.824	190	0.738
20	0.924	200	0.673
30	0.991	210	0.486
40	0.958	220	0.291
45	0.962	225	0.221
50	0.988	230	0.171
60	0.990	240	0.269
70	0.936	250	0.242
80	0.860	260	0.105
90	0.749	270	0.196
100	0.735	280	0.460
110	0.787	290	0.573
120	0.879	300	0.600
130	0.945	310	0.667
135	0.962	315	0.623
140	0.968	320	0.733
150	0.951	330	0.907
160	0.808	340	0.991
170	0.747	350	0.992

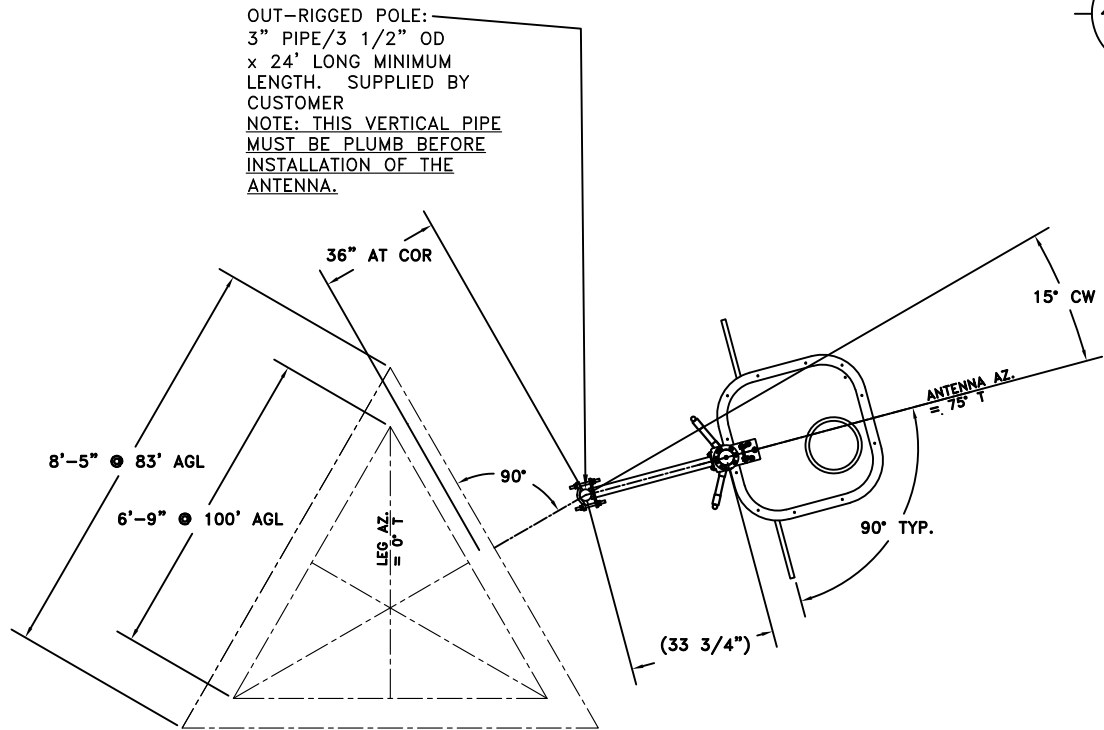
Figure 1F

Tabulation of FCC Directional Composite
KLCF TRUTH OR CONSEQUENCE, NM.

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.874
10	1.000	190	0.785
20	1.000	200	0.680
30	1.000	210	0.540
40	1.000	220	0.481
50	1.000	230	0.481
60	1.000	240	0.481
70	1.000	250	0.481
80	1.000	260	0.481
90	1.000	270	0.514
100	1.000	280	0.588
110	1.000	290	0.621
120	1.000	300	0.676
130	1.000	310	0.700
140	1.000	320	0.800
150	1.000	330	0.920
160	1.000	340	1.000
170	1.000	350	1.000

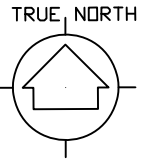


SIDE VIEW



TOP VIEW

TOWER MAKE: SELF
SUPPORTING



ANTENNA HEADING 75° TRUE NORTH

SHIVELY LABS			
A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE			
SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
35446	91.1	N.T.S.	ASP
TITLE:		APPROVED BY:	
		DAB	
MODEL-6810-2R-DIRECTIONAL ANTENNA			
DATE:			
4-6-18	FIGURE 2		

Antenna Mfg.: Shively Labs
Antenna Type: 6810-2R-DA

Date: 4/6/2018

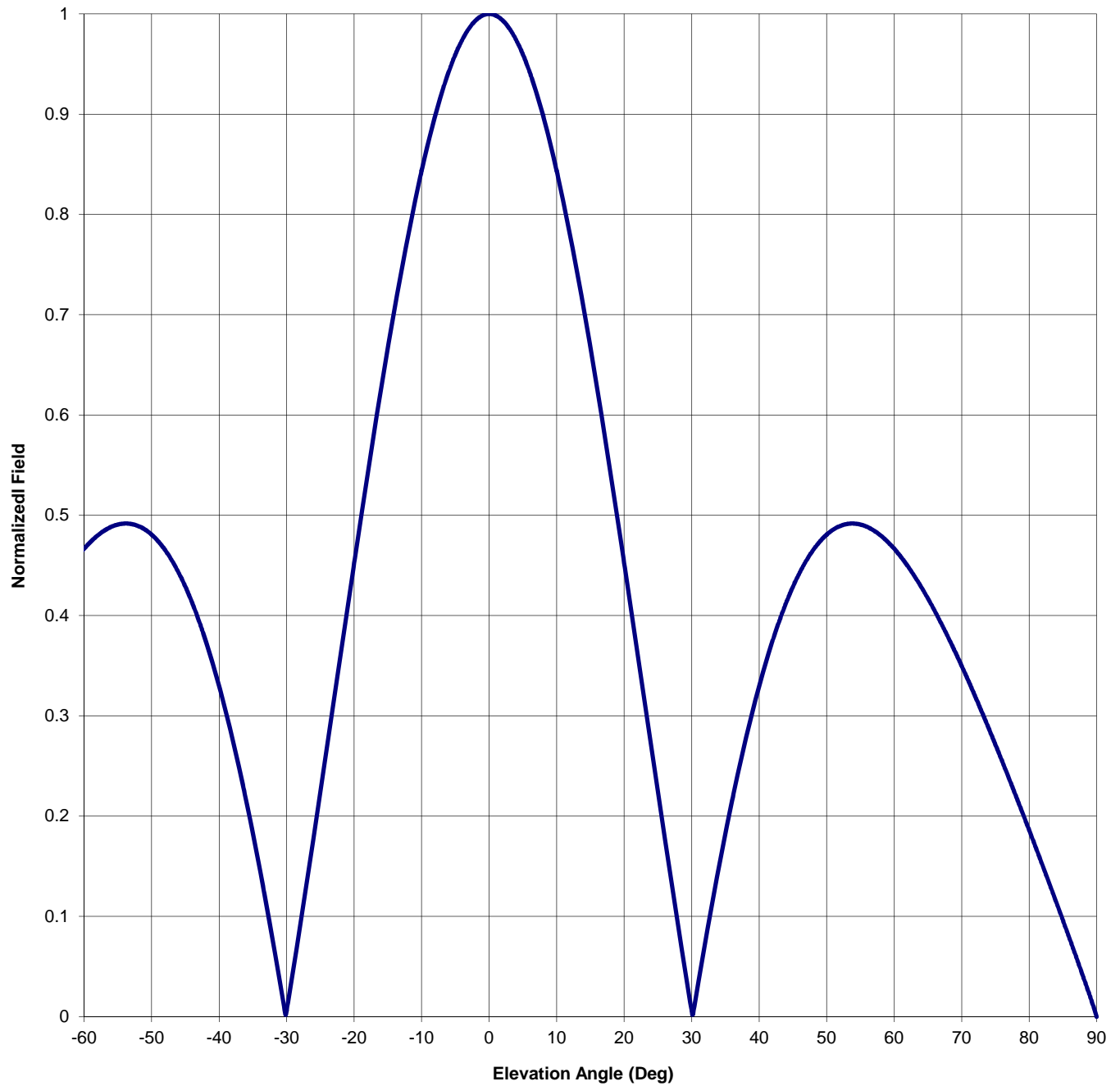
Station: KLCF

Frequency: 91.1

Channel #: 216

Figure: Figure 3

Beam Tilt	0	
Gain (Max)	2.198	3.420 dB
Gain (Horizon)	2.198	3.420 dB



Antenna Mfg.: Shively Labs

Date: 4/6/2018

Antenna Type: 6810-2R-DA

Station: KLCF

Beam Tilt 0

Frequency: 91.1

Gain (Max) 2.198

3.420 dB

Channel #: 216

Gain (Horizon) 2.198

3.420 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	0.413	0	1.000	46	0.443
-89	0.021	-43	0.395	1	0.998	47	0.455
-88	0.040	-42	0.375	2	0.993	48	0.465
-87	0.059	-41	0.353	3	0.985	49	0.474
-86	0.078	-40	0.330	4	0.974	50	0.481
-85	0.096	-39	0.304	5	0.960	51	0.486
-84	0.114	-38	0.277	6	0.942	52	0.489
-83	0.132	-37	0.247	7	0.922	53	0.491
-82	0.150	-36	0.216	8	0.898	54	0.492
-81	0.168	-35	0.183	9	0.872	55	0.491
-80	0.186	-34	0.148	10	0.844	56	0.488
-79	0.203	-33	0.112	11	0.813	57	0.485
-78	0.221	-32	0.074	12	0.779	58	0.480
-77	0.238	-31	0.035	13	0.744	59	0.474
-76	0.255	-30	0.006	14	0.706	60	0.467
-75	0.271	-29	0.048	15	0.667	61	0.459
-74	0.288	-28	0.091	16	0.627	62	0.449
-73	0.304	-27	0.134	17	0.585	63	0.439
-72	0.319	-26	0.179	18	0.541	64	0.429
-71	0.335	-25	0.224	19	0.497	65	0.417
-70	0.350	-24	0.270	20	0.452	66	0.405
-69	0.364	-23	0.315	21	0.407	67	0.392
-68	0.378	-22	0.361	22	0.361	68	0.378
-67	0.392	-21	0.407	23	0.315	69	0.364
-66	0.405	-20	0.452	24	0.270	70	0.350
-65	0.417	-19	0.497	25	0.224	71	0.335
-64	0.429	-18	0.541	26	0.179	72	0.319
-63	0.439	-17	0.585	27	0.134	73	0.304
-62	0.449	-16	0.627	28	0.091	74	0.288
-61	0.459	-15	0.667	29	0.048	75	0.271
-60	0.467	-14	0.706	30	0.006	76	0.255
-59	0.474	-13	0.744	31	0.035	77	0.238
-58	0.480	-12	0.779	32	0.074	78	0.221
-57	0.485	-11	0.813	33	0.112	79	0.203
-56	0.488	-10	0.844	34	0.148	80	0.186
-55	0.491	-9	0.872	35	0.183	81	0.168
-54	0.492	-8	0.898	36	0.216	82	0.150
-53	0.491	-7	0.922	37	0.247	83	0.132
-52	0.489	-6	0.942	38	0.277	84	0.114
-51	0.486	-5	0.960	39	0.304	85	0.096
-50	0.481	-4	0.974	40	0.330	86	0.078
-49	0.474	-3	0.985	41	0.353	87	0.059
-48	0.465	-2	0.993	42	0.375	88	0.040
-47	0.455	-1	0.998	43	0.395	89	0.021
-46	0.443	0	1.000	44	0.413	90	0.000
-45	0.429			45	0.429		

VALIDATION OF TOTAL POWER GAIN CALCULATION

KLCF TRUTH OR CONSEQUENCE, NM.

MODEL 6810-2R-DA

Elevation Gain of Antenna

0.99

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

H RMS 0.72818

V RMS 0.618493

H/V Ratio 1.177

Elevation Gain of Horizontal Component 1.166

Elevation Gain of Vertical Component 0.841

Horizontal Azimuth Gain equals $1/(\text{RMS})^2$. 1.886Vertical Azimuth Gain equals $1/(\text{RMS}/\text{Max Vert})^2$. 2.588

Max. Vertical 0.995

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

Total Horizontal Power Gain =

2.198

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

Total Vertical Power Gain =

2.176

=====

ERP divided by Horizontal Power Gain equals Antenna Input Power

1

kW ERP Divided by H Gain 2.198 equals 0.455 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.455 kW Times V Gain 2.176 equals 0.990 kW V ERP

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

(0.995)² Times 1.00 Equals 0.990 kW Vertical ERP

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