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S.O. 30011

Report of Test 6810-4R-DA

for

Faith Communications Corp

KCIR   90.7 MHz   Twin Falls, ID

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-4R-DA to meet the needs of KCIR and to comply with the requirements of the FCC construction permit, file number BMPED-20120207AOL. 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-20120207AOL indicates that the Horizontal radiation component shall not exceed 45.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

50 - 180   Degrees T: 20.000 kW

200 - 220   Degrees T: 32.000 kW

From Figure 1A, the maximum radiation of the Horizontal component occurs at 264 Degrees T to 306 Degrees T. At the restricted azimuth of 50 - 180 Degrees T the Vertical component is 4.882 dB down from the maximum of 45.0 kW, or 14.621 kW and at the restricted azimuth of 200 – 220 Degrees T the horizontal component is 2.270 dB down from the maximum of 45.0 kW, or 26.681 kW.

The R.M.S. of the Horizontal component is 0.695. The total Horizontal power gain is 4.399. The R.M.S. of the Vertical component is 0.687. The total Vertical power gain is 4.268. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.859. The R.M.S. of the measured composite pattern is 0.731. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.730. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-4R-DA was mounted on a tower of precise scale to the 42" face tower at the KCIR 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 BMPED-20120207AOL, a single level of the 6810-4R-DA was set up on the Shively Labs 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:

<div align="center">

Hewlett Packard Model 8753 Network Analyzer

PC Based Controller

Hewlett Packard 7550A Graphics Plotter

</div>

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 408.15 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.
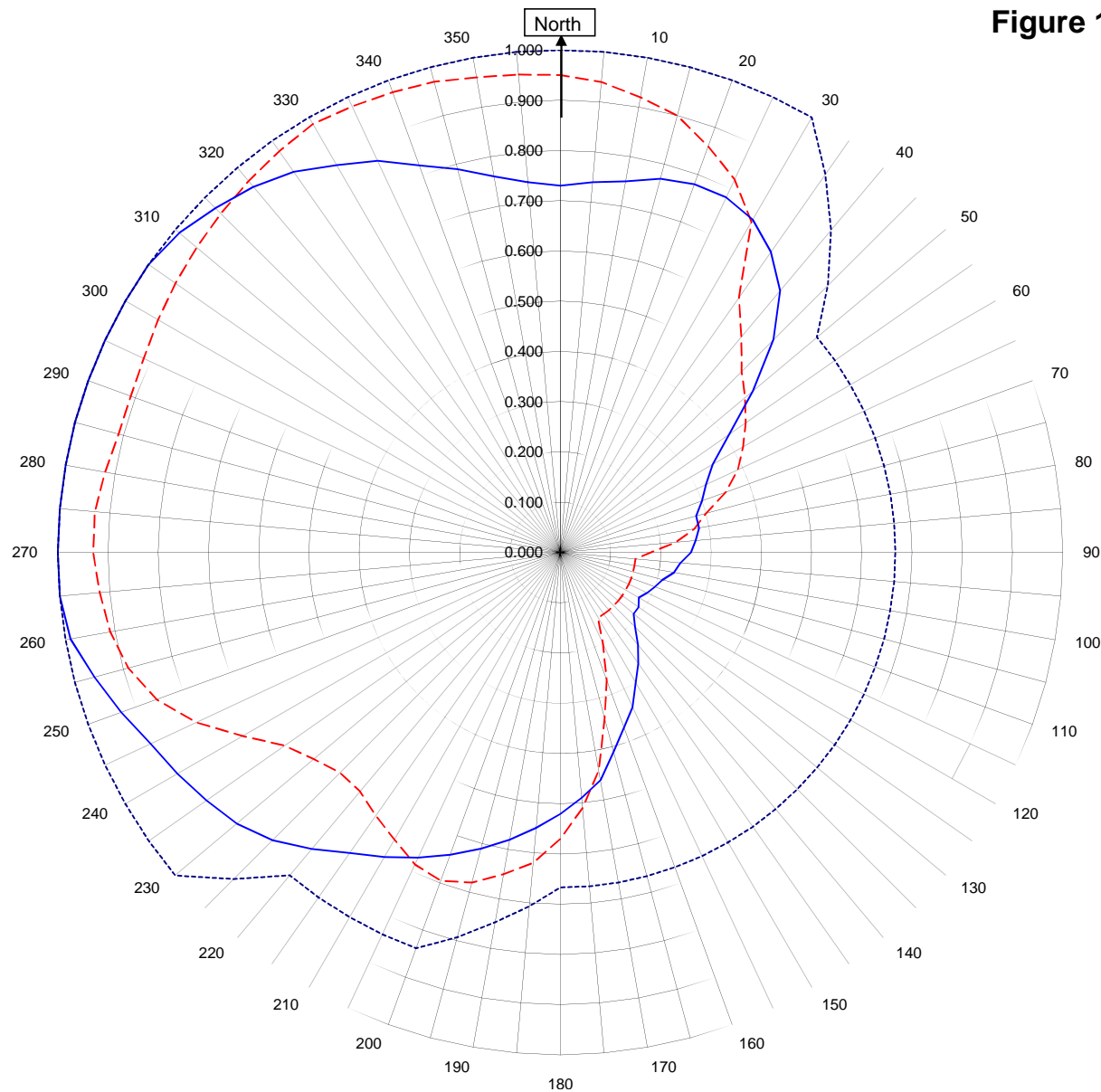
Respectfully submitted by:

Robert A. Surette
Director of Sales Engineering
S/O 30011
May 25, 2012

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Figure 1A

KCIR Twin Falls, ID

30011

May 25, 2012

Horizontal RMS	0.695	
Vertical RMS	0.687	
H/V Composite RMS	0.731	
..............FCC Composite RMS	0.859	

Frequency	90.7 / 408.15 mHz	
Plot	Relative Field	
Scale	4.5 : 1	
	See Figure 2 for Mechanical Details	

Antenna Model	6810-4R-DA
Pattern Type	Directional Azimuth

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Figure 1B

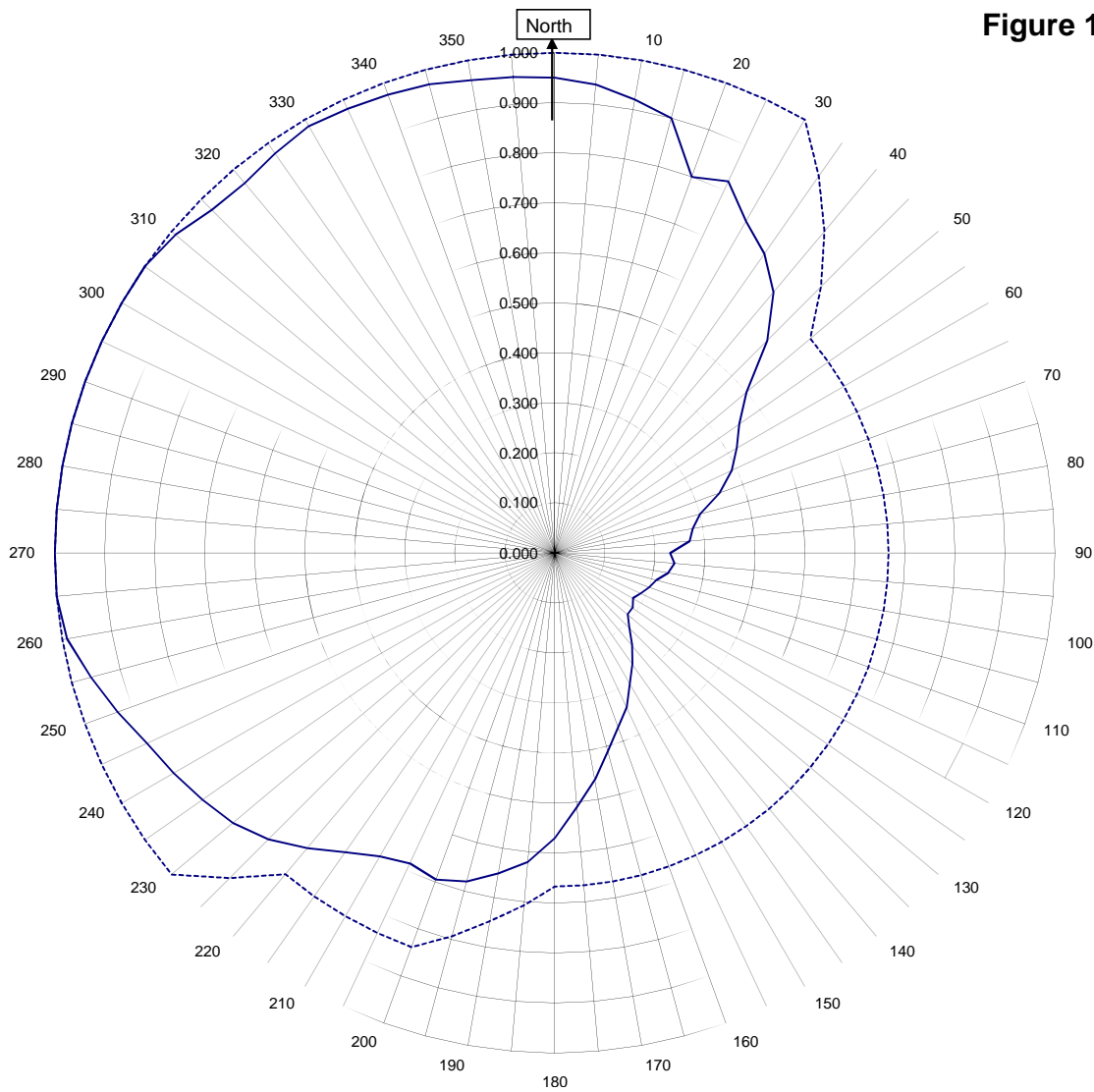## KCIR Twin Falls, ID
30011
May 25, 2012

_____ H/VComposite RMS	0.731	
……………FCC Composite RMS	0.859	

Frequency	90.7 / 408.15 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-4R-DA
Pattern Type	Directional H/V Composite

Tabulation of Horizontal Azimuth Pattern
KCIR Twin Falls, ID

Azimuth	Rel Field	Azimuth	Rel Field
0	0.730	180	0.520
10	0.750	190	0.580
20	0.780	200	0.640
30	0.765	210	0.700
40	0.680	220	0.770
45	0.600	225	0.810
50	0.500	230	0.840
60	0.350	240	0.880
70	0.300	250	0.930
80	0.280	260	0.990
90	0.260	270	1.000
100	0.230	280	1.000
110	0.200	290	1.000
120	0.180	300	1.000
130	0.190	310	0.990
135	0.210	315	0.970
140	0.240	320	0.950
150	0.300	330	0.890
160	0.370	340	0.820
170	0.460	350	0.760

Tabulation of Vertical Azimuth Pattern
KCIR Twin Falls, ID

Azimuth	Rel Field	Azimuth	Rel Field
0	0.950	180	0.570
10	0.920	190	0.650
20	0.860	200	0.695
30	0.760	210	0.660
40	0.560	220	0.620
45	0.510	225	0.620
50	0.480	230	0.640
60	0.420	240	0.730
70	0.350	250	0.855
80	0.270	260	0.910
90	0.180	270	0.930
100	0.150	280	0.920
110	0.150	290	0.910
120	0.150	300	0.925
130	0.150	310	0.945
135	0.150	315	0.955
140	0.150	320	0.965
150	0.150	330	0.985
160	0.270	340	0.975
170	0.440	350	0.960

Figure 1E

Tabulation of Composite Azimuth Pattern
KCIR Twin Falls, ID

Azimuth	Rel Field	Azimuth	Rel Field
0	0.950	180	0.570
10	0.920	190	0.650
20	0.800	200	0.695
30	0.765	210	0.700
40	0.680	220	0.770
45	0.600	225	0.810
50	0.500	230	0.840
60	0.420	240	0.880
70	0.350	250	0.930
80	0.280	260	0.990
90	0.230	270	1.000
100	0.230	280	1.000
110	0.200	290	1.000
120	0.180	300	1.000
130	0.190	310	0.990
135	0.210	315	0.970
140	0.240	320	0.965
150	0.300	330	0.985
160	0.370	340	0.975
170	0.460	350	0.960

Tabulation of FCC Directional Composite
KCIR Twin Falls, ID

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.667
10	1.000	190	0.747
20	1.000	200	0.838
30	1.000	210	0.838
40	0.838	220	0.838
50	0.667	230	1.000
60	0.667	240	1.000
70	0.667	250	1.000
80	0.667	260	1.000
90	0.667	270	1.000
100	0.667	280	1.000
110	0.667	290	1.000
120	0.667	300	1.000
130	0.667	310	1.000
140	0.667	320	1.000
150	0.667	330	1.000
160	0.667	340	1.000
170	0.667	350	1.000

TRUE NORTH

FULL
WAVE
SPACED
BAY
TO BAY
= 129 1/2"

13 7/8"
TYP.

SIDE VIEW

90° TYP.

ANTENNA AZ.
= 306° TN

23 5/8"
REF.

50°
CW

LEG AZ.
= 16° TN

42" TOWER
FACE WIDTH,
REF.
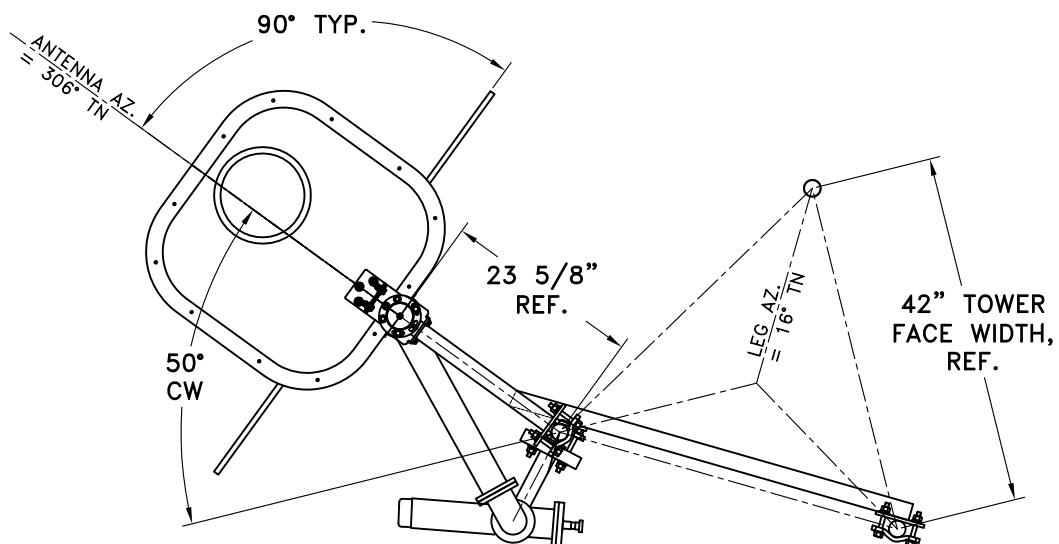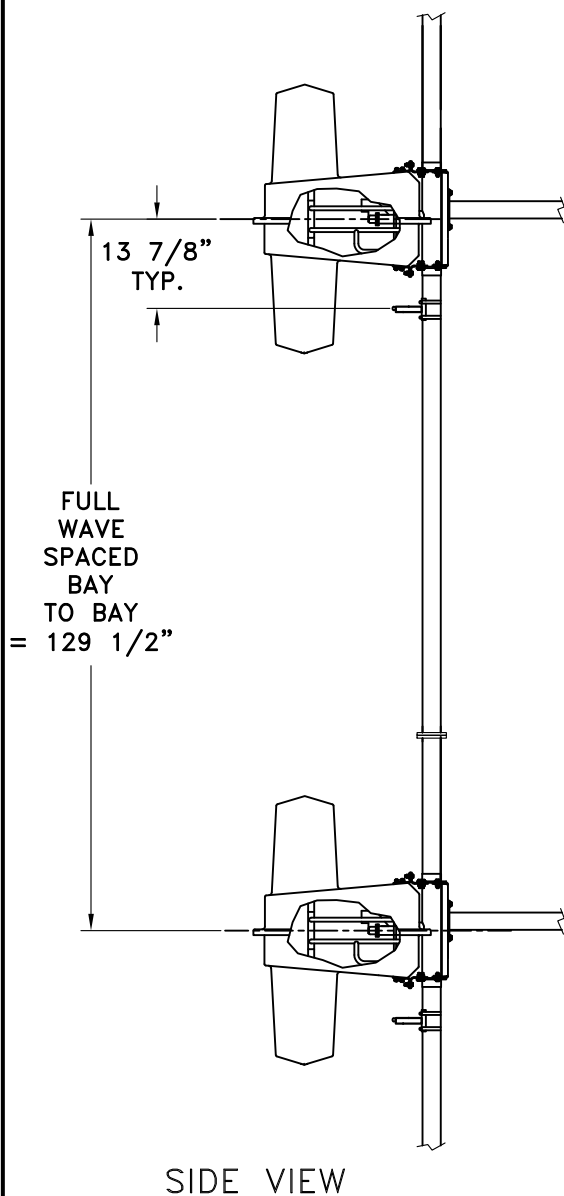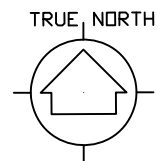
TOP VIEW

TOWER MAKE: 42" FACE

ANTENNA HEADING 306° TRUE NORTH

Antenna Mfg.: Shively Labs　　　　　　　　　　**Date: 5/25/2012**
Antenna Type: 6810-4R-DA
　　　　　Station: KCIR　　　　**Beam Tilt**　　1.5
　　　Frequency: 90.7　　　**Gain (Max)**　　4.399　　**6.434 dB**
　　　Channel #: 214　　**Gain (Horizon)**　　4.245　　**6.279 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	0.058	0	0.982	46	0.179
-89	0.020	-43	0.087	1	0.998	47	0.151
-88	0.039	-42	0.113	2	0.998	48	0.121
-87	0.058	-41	0.134	3	0.983	49	0.090
-86	0.077	-40	0.151	4	0.954	50	0.057
-85	0.095	-39	0.162	5	0.911	51	0.023
-84	0.113	-38	0.168	6	0.855	52	0.011
-83	0.131	-37	0.167	7	0.788	53	0.044
-82	0.150	-36	0.161	8	0.712	54	0.076
-81	0.168	-35	0.148	9	0.629	55	0.107
-80	0.186	-34	0.129	10	0.541	56	0.136
-79	0.204	-33	0.103	11	0.451	57	0.163
-78	0.221	-32	0.073	12	0.360	58	0.188
-77	0.239	-31	0.038	13	0.271	59	0.210
-76	0.256	-30	0.001	14	0.185	60	0.230
-75	0.273	-29	0.043	15	0.106	61	0.248
-74	0.289	-28	0.087	16	0.033	62	0.262
-73	0.305	-27	0.130	17	0.030	63	0.274
-72	0.320	-26	0.173	18	0.084	64	0.284
-71	0.334	-25	0.213	19	0.128	65	0.291
-70	0.347	-24	0.249	20	0.161	66	0.295
-69	0.359	-23	0.279	21	0.182	67	0.297
-68	0.369	-22	0.301	22	0.194	68	0.297
-67	0.378	-21	0.316	23	0.194	69	0.295
-66	0.385	-20	0.320	24	0.186	70	0.291
-65	0.390	-19	0.314	25	0.169	71	0.285
-64	0.393	-18	0.297	26	0.145	72	0.278
-63	0.393	-17	0.269	27	0.115	73	0.269
-62	0.391	-16	0.228	28	0.080	74	0.259
-61	0.387	-15	0.176	29	0.041	75	0.248
-60	0.379	-14	0.113	30	0.001	76	0.235
-59	0.369	-13	0.040	31	0.039	77	0.222
-58	0.355	-12	0.042	32	0.079	78	0.208
-57	0.339	-11	0.130	33	0.117	79	0.193
-56	0.319	-10	0.225	34	0.152	80	0.178
-55	0.297	-9	0.322	35	0.183	81	0.162
-54	0.272	-8	0.420	36	0.209	82	0.145
-53	0.244	-7	0.518	37	0.231	83	0.129
-52	0.214	-6	0.611	38	0.247	84	0.111
-51	0.182	-5	0.699	39	0.257	85	0.094
-50	0.148	-4	0.779	40	0.261	86	0.076
-49	0.113	-3	0.849	41	0.260	87	0.058
-48	0.077	-2	0.907	42	0.253	88	0.039
-47	0.042	-1	0.952	43	0.241	89	0.020
-46	0.007	0	0.982	44	0.224	90	0.000
-45	0.027			45	0.203		

VALIDATION OF TOTAL POWER GAIN CALCULATION

KCIR   Twin Falls, ID

MODEL   6810-4R-DA

Elevation Gain of Antenna   2.1

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

H RMS   0.694585   V RMS   0.687246   H/V Ratio   1.011

Elevation Gain of Horizontal Component   2.122

Elevation Gain of Vertical Component   2.078

Horizontal Azimuth Gain equals $1/(RMS)^2$.   2.073

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$.   2.054
Max. Vertical   0.985

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

Total Horizontal Power Gain =   **4.399**

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

Total Vertical Power Gain =   **4.268**

==

ERP divided by Horizontal Power Gain equals Antenna Input Power

45   kW ERP   Divided by H Gain   4.399   equals   10.229   kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

10.229   kW   Times V Gain   4.268   equals   43.660   kW V ERP

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

$(0.985)^2$ Times   45.00   Equals   43.660   kW Vertical ERP

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