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S.O. 33041

Report of Test 6815-1R-DA

for

HOLY FAMILY COMMUNICATIONS, INC.

WLGU   90.7 MHz   LANCASTER, NY.

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6815-1R-DA to meet the needs of WLGU and to comply with the requirements of the FCC construction permit, file number BMPED-20160317AAT. 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-20160317AAT 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:

270   Degrees True: 0.1 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 133 Degrees True to 157 Degrees True. At the restricted azimuth of 270 Degrees True the Vertical component is 10.49 dB down from the maximum of 1.0 kW, or 0.089 kW

The R.M.S. of the Horizontal component is 0.663. The total Horizontal power gain is 1.047. The R.M.S. of the Vertical component is 0.662. The total Vertical power gain is 1.031. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.724. The R.M.S. of the measured composite pattern is 0.674. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.615. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6815-1R-DA was mounted on a pole of precise scale to the P6X.432 (6.625 dia.) pole at the WLGU site. The spacing of the antenna to the tpole was varied to achieve the vertical pattern shown in Figure 1A. Horizontal parasitic elements were placed ¼ wave length above and below the bay. The lengths of these horizontal parasitic elements were 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-20160317AAT, a single level of the 6815-1R-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 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:
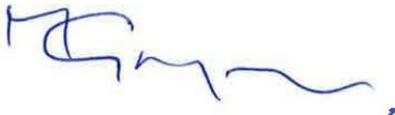
Martyn Gregory

Vice President, Shively Labs
S/O 33041
Date April 13, 2016

Shively Labs

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

Figure 1A
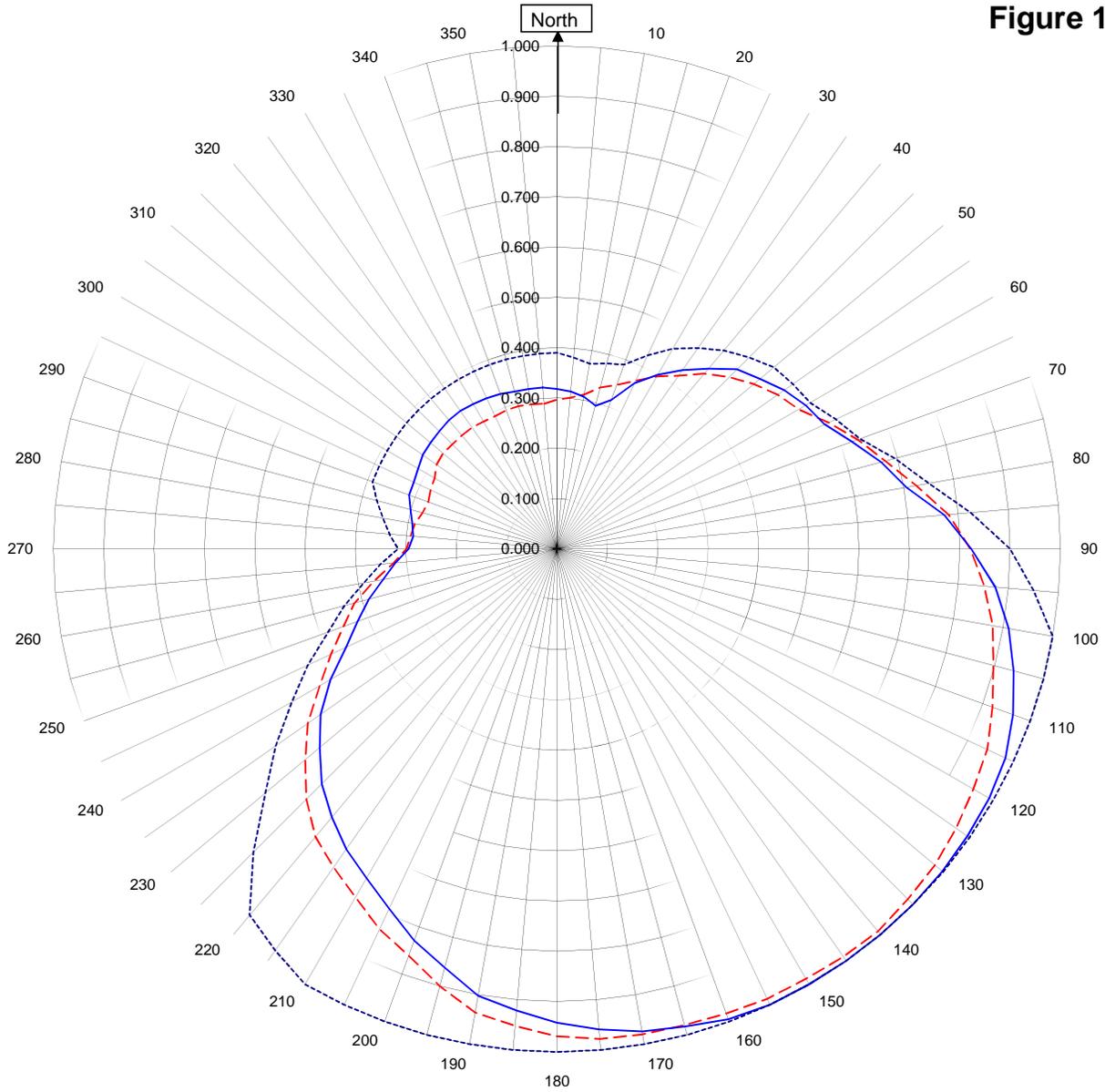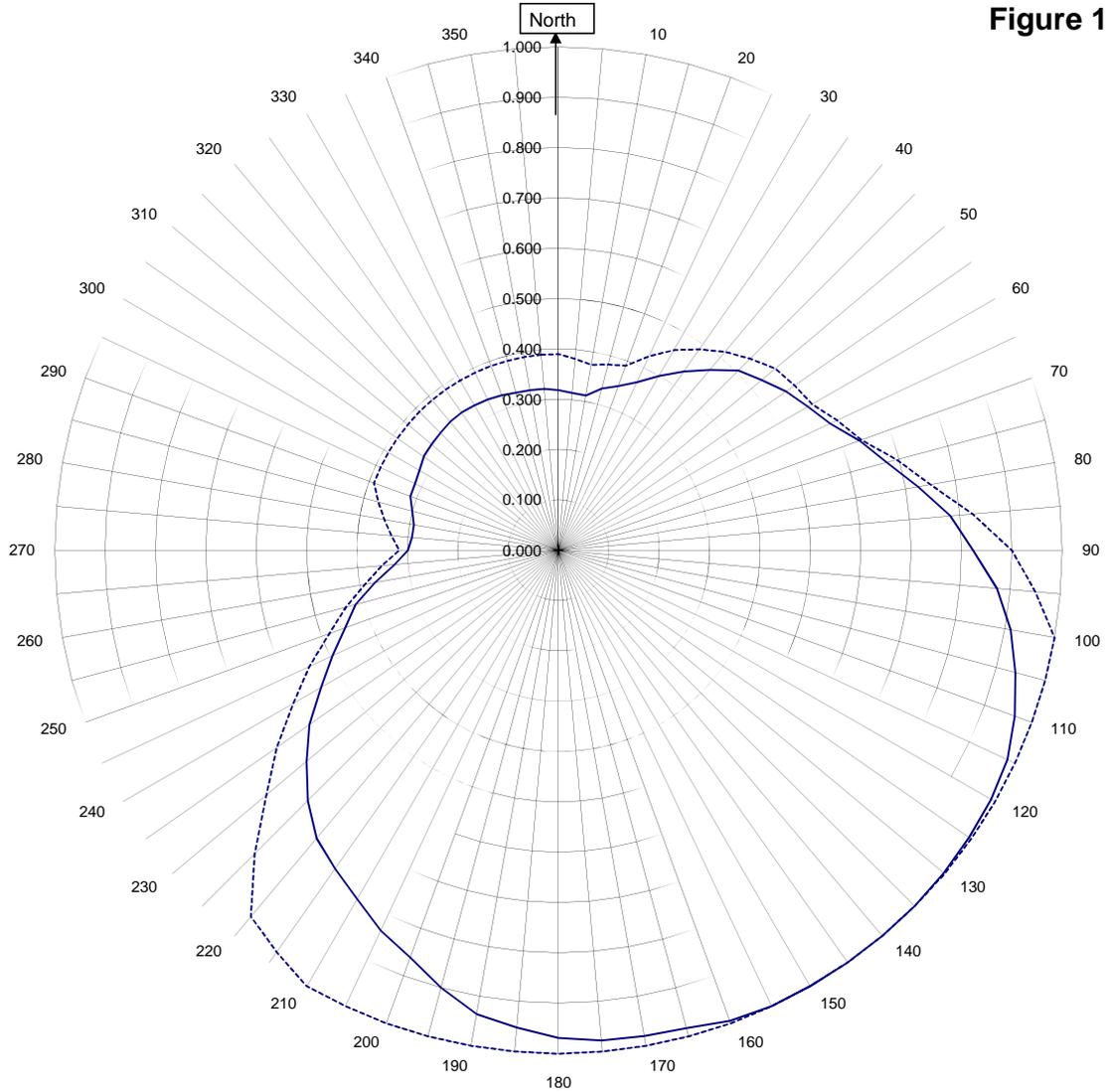
WLGU   LANCASTER, NY.

33041
April 13, 2016

Horizontal RMS	0.663		Frequency	90.7 / 408.15 mHz	
Vertical RMS	0.662		Plot	Relative Field	
H/V Composite RMS	0.674		Scale	4.5 : 1	
..............FCC Composite RMS	0.724			See Figure 2 for Mechanical Details	

Antenna Model	6815-1R-DA
Pattern Type	Directional Azimuth

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Figure 1B

WLGU   LANCASTER, NY.

33041

April 13, 2016

			Frequency	90.7 / 408.15 mHz
_____H/VComposite RMS	0.674		Plot	Relative Field
……….......FCC Composite RMS	0.724		Scale	4.5 : 1
				See Figure 2 for Mechanical Details

Antenna Model	6815-1R-DA
Pattern Type	Directional H/V Composite

Tabulation of Horizontal Azimuth Pattern
WLGU LANCASTER, NY.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.318	180	0.942
10	0.307	190	0.902
20	0.315	200	0.829
30	0.400	210	0.756
40	0.468	220	0.696
45	0.505	225	0.661
50	0.526	230	0.615
60	0.571	240	0.519
70	0.623	250	0.422
80	0.705	260	0.351
90	0.823	270	0.295
100	0.911	280	0.292
110	0.964	290	0.313
120	0.991	300	0.319
130	0.998	310	0.328
135	1.000	315	0.331
140	1.000	320	0.334
150	1.000	330	0.333
160	0.995	340	0.328
170	0.974	350	0.323

Tabulation of Vertical Azimuth Pattern
WLGU LANCASTER, NY.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.297	180	0.969
10	0.312	190	0.936
20	0.347	200	0.861
30	0.396	210	0.800
40	0.455	220	0.747
45	0.483	225	0.704
50	0.510	230	0.653
60	0.555	240	0.544
70	0.636	250	0.451
80	0.725	260	0.370
90	0.821	270	0.299
100	0.879	280	0.287
110	0.920	290	0.272
120	0.955	300	0.281
130	0.979	310	0.296
135	0.985	315	0.294
140	0.992	320	0.294
150	0.987	330	0.292
160	0.983	340	0.294
170	0.980	350	0.292

Tabulation of Composite Azimuth Pattern
WLGU LANCASTER, NY.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.318	180	0.969
10	0.312	190	0.936
20	0.347	200	0.861
30	0.400	210	0.800
40	0.468	220	0.747
45	0.505	225	0.704
50	0.526	230	0.653
60	0.571	240	0.544
70	0.636	250	0.451
80	0.725	260	0.370
90	0.823	270	0.299
100	0.911	280	0.292
110	0.964	290	0.313
120	0.991	300	0.319
130	0.998	310	0.328
135	1.000	315	0.331
140	1.000	320	0.334
150	1.000	330	0.333
160	0.995	340	0.328
170	0.980	350	0.323

Tabulation of FCC Directional Composite
WLGU LANCASTER, NY.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.390	180	1.000
10	0.374	190	1.000
20	0.390	200	1.000
30	0.460	210	1.000
40	0.515	220	0.950
50	0.562	230	0.757
60	0.581	240	0.608
70	0.640	250	0.484
80	0.750	260	0.390
90	0.900	270	0.316
100	1.000	280	0.351
110	1.000	290	0.390
120	1.000	300	0.390
130	1.000	310	0.390
140	1.000	320	0.390
150	1.000	330	0.390
160	1.000	340	0.390
170	1.000	350	0.390

TRUE NORTH

MOUNTS TO FIT:
6" PIPE (6 5/8" OD) TOP
MOUNTED OUT–RIGGED POLE
SUPPLIED BY CUSTOMER.
LOCATION AND QUANTITY OF
MOUNTS FROM TOWER TO
OUT–RIGGED POLE TO BE
DETERMINED AND SUPPLIED BY
CUSTOMER.

32 1/2" TYP.

32 1/2" TYP.

14 5/8" REF.

90° TYP.

ANTENNA AZIMUTH = 150° TN
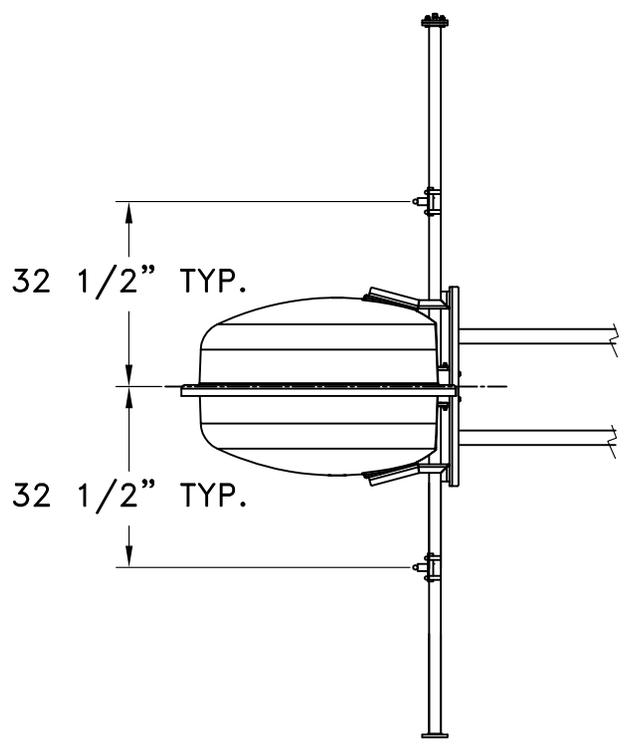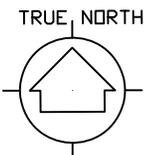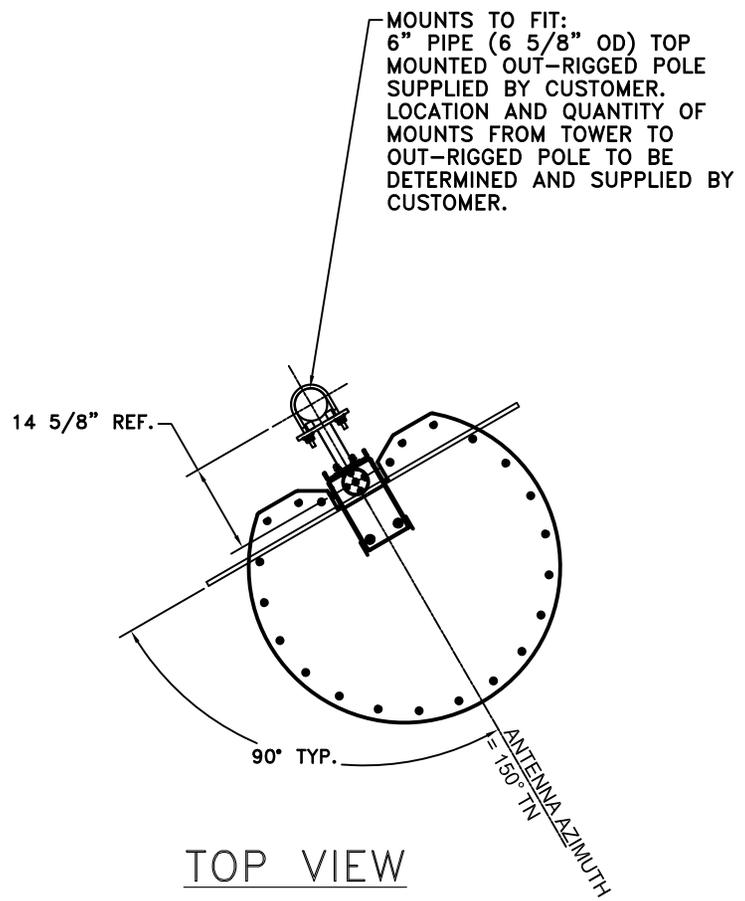
TOP VIEW

TOWER MAKE: 6" PIPE

(6 $\frac{5}{8}$" OD)

SIDE VIEW

ANTENNA HEADING 150° TRUE NORTH

Antenna Mfg.: **Shively Labs** **Date: 4/13/2016**
Antenna Type: **6815-1R-DA**
Station: **WLGU** **Beam Tilt** **0**
Frequency: **90.7** **Gain (Max)** **1.047** **0.199 dB**
Channel #: **214** **Gain (Horizon)** **1.047** **0.199 dB**
Figure: **Figure 3**

Antenna Mfg.: Shively Labs　　　　　　　　　　　　　**Date: 4/13/2016**
Antenna Type: 6815-1R-DA
Station: WLGU　　　　　　**Beam Tilt**　　　　**0**
Frequency: 90.7　　　　**Gain (Max)**　　**1.047**　　**0.199 dB**
Channel #: 214　　　**Gain (Horizon)**　**1.047**　　**0.199 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	0.729	0	1.000	46	0.705
-89	0.021	-43	0.741	1	1.000	47	0.693
-88	0.040	-42	0.752	2	0.999	48	0.680
-87	0.059	-41	0.763	3	0.999	49	0.667
-86	0.078	-40	0.774	4	0.998	50	0.654
-85	0.096	-39	0.785	5	0.996	51	0.641
-84	0.114	-38	0.796	6	0.995	52	0.628
-83	0.133	-37	0.806	7	0.993	53	0.614
-82	0.151	-36	0.816	8	0.991	54	0.600
-81	0.168	-35	0.826	9	0.988	55	0.586
-80	0.186	-34	0.835	10	0.985	56	0.572
-79	0.204	-33	0.845	11	0.982	57	0.558
-78	0.221	-32	0.854	12	0.979	58	0.544
-77	0.239	-31	0.862	13	0.975	59	0.529
-76	0.256	-30	0.871	14	0.971	60	0.514
-75	0.273	-29	0.879	15	0.967	61	0.499
-74	0.290	-28	0.887	16	0.963	62	0.484
-73	0.307	-27	0.895	17	0.958	63	0.469
-72	0.324	-26	0.903	18	0.953	64	0.453
-71	0.341	-25	0.910	19	0.948	65	0.437
-70	0.357	-24	0.917	20	0.942	66	0.422
-69	0.373	-23	0.924	21	0.936	67	0.406
-68	0.390	-22	0.930	22	0.930	68	0.390
-67	0.406	-21	0.936	23	0.924	69	0.373
-66	0.422	-20	0.942	24	0.917	70	0.357
-65	0.437	-19	0.948	25	0.910	71	0.341
-64	0.453	-18	0.953	26	0.903	72	0.324
-63	0.469	-17	0.958	27	0.895	73	0.307
-62	0.484	-16	0.963	28	0.887	74	0.290
-61	0.499	-15	0.967	29	0.879	75	0.273
-60	0.514	-14	0.971	30	0.871	76	0.256
-59	0.529	-13	0.975	31	0.862	77	0.239
-58	0.544	-12	0.979	32	0.854	78	0.221
-57	0.558	-11	0.982	33	0.845	79	0.204
-56	0.572	-10	0.985	34	0.835	80	0.186
-55	0.586	-9	0.988	35	0.826	81	0.168
-54	0.600	-8	0.991	36	0.816	82	0.151
-53	0.614	-7	0.993	37	0.806	83	0.133
-52	0.628	-6	0.995	38	0.796	84	0.114
-51	0.641	-5	0.996	39	0.785	85	0.096
-50	0.654	-4	0.998	40	0.774	86	0.078
-49	0.667	-3	0.999	41	0.763	87	0.059
-48	0.680	-2	0.999	42	0.752	88	0.040
-47	0.693	-1	1.000	43	0.741	89	0.021
-46	0.705	0	1.000	44	0.729	90	0.000
-45	0.717			45	0.717		

VALIDATION OF TOTAL POWER GAIN CALCULATION

WLGU   LANCASTER, NY.

MODEL   6815-1R-DA

Elevation Gain of Antenna   0.46

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

H RMS   0.663064   V RMS   0.662369   H/V Ratio   1.001

Elevation Gain of Horizontal Component   0.460

Elevation Gain of Vertical Component   0.460

Horizontal Azimuth Gain equals $1/(RMS)^2$.   2.275

Vertical Azimuth Gain equals $1/(RMS/Max Vert)^2$.   2.243
Max. Vertical   0.992

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

Total Horizontal Power Gain =   1.047

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

Total Vertical Power Gain =   1.031

===

ERP divided by Horizontal Power Gain equals Antenna Input Power

1   kW ERP   Divided by H Gain   1.047   equals   0.955   kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.955   kW   Times V Gain   1.031   equals   0.984   kW V ERP

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

$(0.992)^2$ Times   1.00   Equals   0.984   kW Vertical ERP

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