Shively Labs
a division of Howell Laboratories,Inc.

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P. O. Box 389 Harrison Rd.,
Bridgton, Maine 04009 USA

(207) 647-3327
888-SHIVELY
Fax: (207) 647-8273
E-mail: sales@shively.com
Web site: www.shively.com

S.O. 26442

Report of Test 6810-1R-DA

for

GREAT EASTERN RADIO, LLC

WVRR 101.9 MHz Westminster, VT

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-1R-DA to meet the needs of WVRR and to comply with the requirements of the FCC construction permit, file number BPH-20070119AFN.

RESULTS:

The measured azimuth pattern for the 6810-1R-DA is shown in Figure 1. Figure 1A shows the Tabulation of the Horizontal Polarization. Figure 1B shows the Tabulation of the Vertical Polarization. Figure 1C shows the Tabulation of the FCC Composite Pattern. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BPH-20070119AFN indicates that the Horizontal radiation component shall not exceed 1.05 kW at any azimuth and is restricted to the following values at the azimuths specified:

200 - 210 Degrees T: 0.25 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 016 Degrees T to 026 Degrees T and at 075 Degrees T to 094 Degrees T. At the restricted azimuth of 200 - 210 Degrees T the Horizontal component is 6.69 dB down from the maximum of 1.05 kW, or 0.23 kW.

The R.M.S. of the Horizontal component is 0.740. The total Horizontal power gain is 0.909. The R.M.S. of the Vertical component is 0.684. The total Vertical power gain is 0.891. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.926. The R.M.S. of the measured composite pattern is 0.789. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.787. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

The 6810-1R-DA was mounted on a tower of precise scale to the Fred A. Nudd 78" face tower at the WVRR site. The spacing of the antenna to the tower was varied to achieve the vertical pattern shown in Figure 1. 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 1 was achieved. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BPH-20070119AFN, a single level of the 6810-1R-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 458.55 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 1.

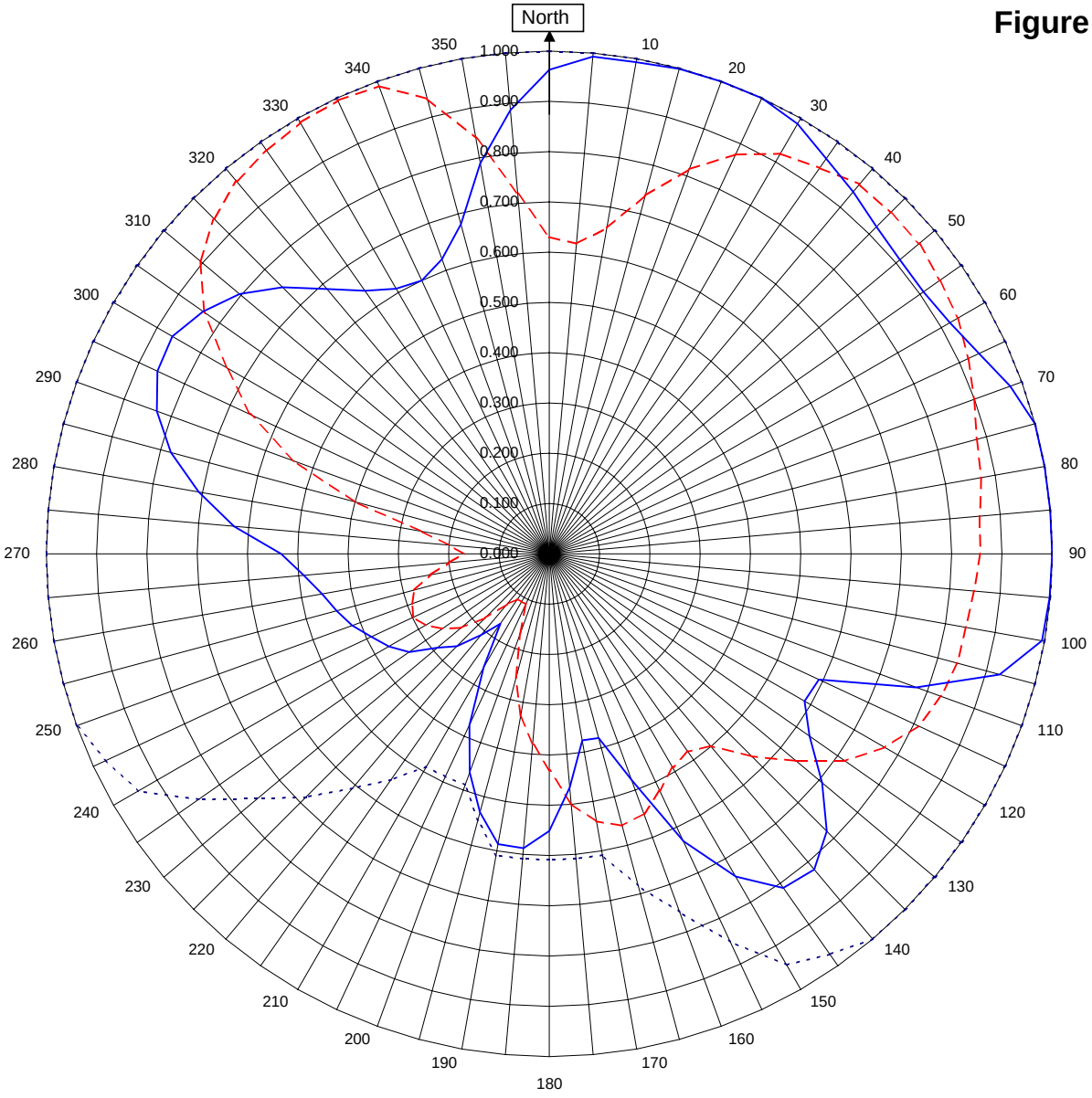
Respectfully submitted by:

Robert A. Surette
Director of Sales Engineering
S/O 26442
April 1, 2008

Shively Labs

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

Figure 1



WVRR Westminster, VT

26442

April 3, 2008

Horizontal RMS	0.740
Vertical RMS	0.684
H/V Composite RMS	0.789
FCC Composite RMS	0.926

Frequency	101.9 / 458.55 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6810-1R-DA Pattern 08
Pattern Type	Directional Azimuth

Figure 1a

Tabulation of Horizontal Azimuth Pattern
WVRR Westminster, VT

Azimuth	Rel Field	Azimuth	Rel Field
0	0.963	180	0.551
10	0.993	190	0.586
20	1.000	200	0.463
30	0.987	210	0.260
40	0.940	220	0.210
45	0.920	225	0.260
50	0.910	230	0.290
60	0.920	240	0.368
70	0.975	250	0.417
80	1.000	260	0.459
90	1.000	270	0.533
100	0.995	280	0.708
110	0.776	290	0.830
120	0.586	300	0.865
130	0.708	310	0.804
135	0.780	315	0.750
140	0.820	320	0.688
150	0.741	330	0.609
160	0.479	340	0.624
170	0.377	350	0.789

Figure 1b

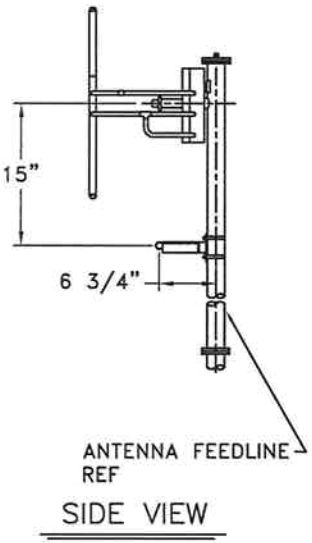
Tabulation of Vertical Azimuth Pattern
WVRR Westminster, VT

Azimuth	Rel Field	Azimuth	Rel Field
0	0.630	180	0.430
10	0.658	190	0.328
20	0.814	200	0.170
30	0.919	210	0.110
40	0.960	220	0.130
45	0.960	225	0.180
50	0.960	230	0.229
60	0.938	240	0.284
70	0.899	250	0.290
80	0.872	260	0.240
90	0.857	270	0.170
100	0.841	280	0.260
110	0.829	290	0.540
120	0.770	300	0.740
130	0.640	310	0.905
135	0.570	315	0.943
140	0.498	320	0.968
150	0.490	330	0.990
160	0.550	340	0.990
170	0.540	350	0.840

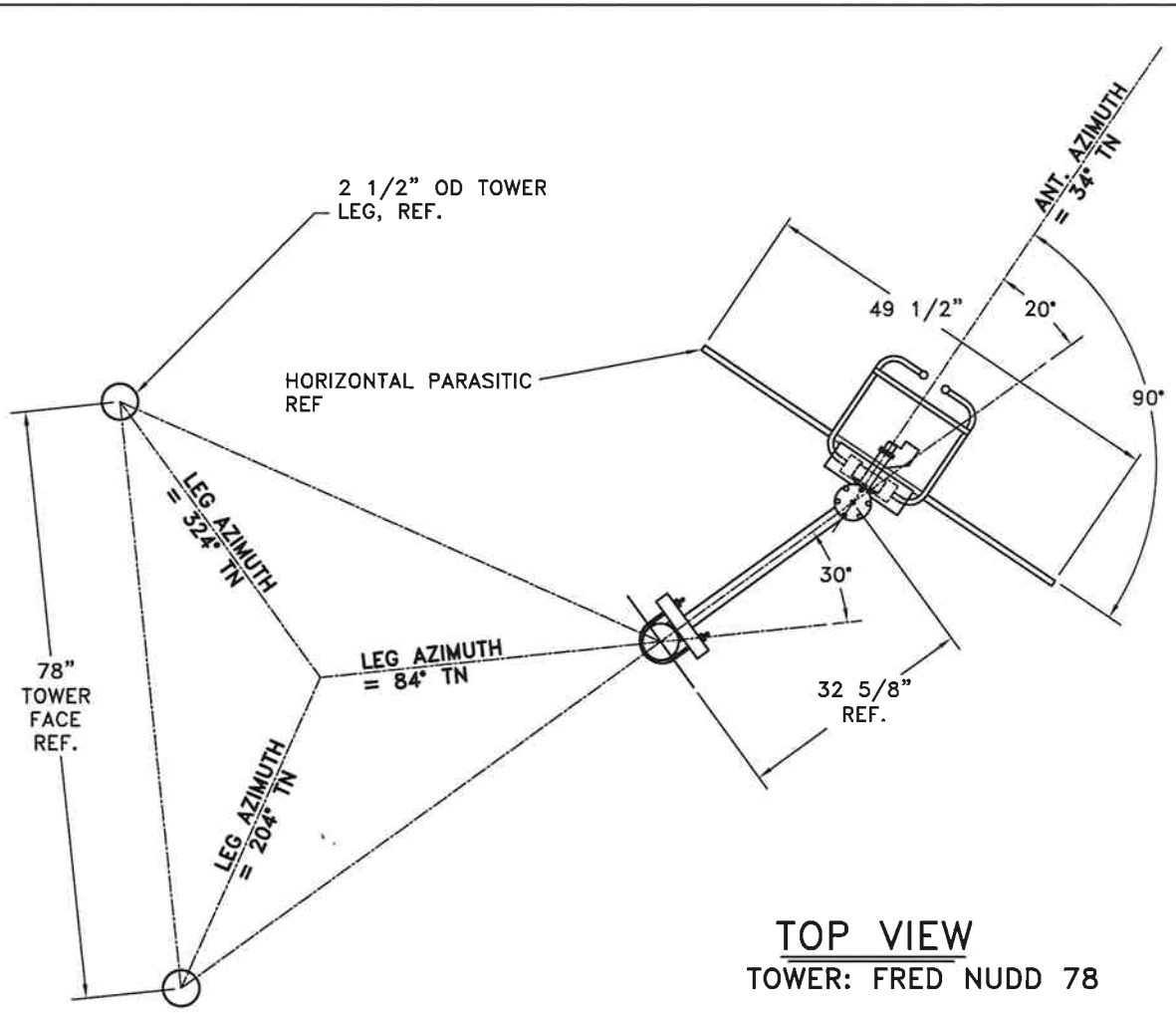
Figure 1c

Tabulation of FCC Directional Composite
WVRR Westminster, VT

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.609
10	1.000	190	0.609
20	1.000	200	0.489
30	1.000	210	0.489
40	1.000	220	0.609
50	1.000	230	0.758
60	1.000	240	0.944
70	1.000	250	1.000
80	1.000	260	1.000
90	1.000	270	1.000
100	1.000	280	1.000
110	1.000	290	1.000
120	1.000	300	1.000
130	1.000	310	1.000
140	1.000	320	1.000
150	0.944	330	1.000
160	0.758	340	1.000
170	0.609	350	1.000



SIDE VIEW



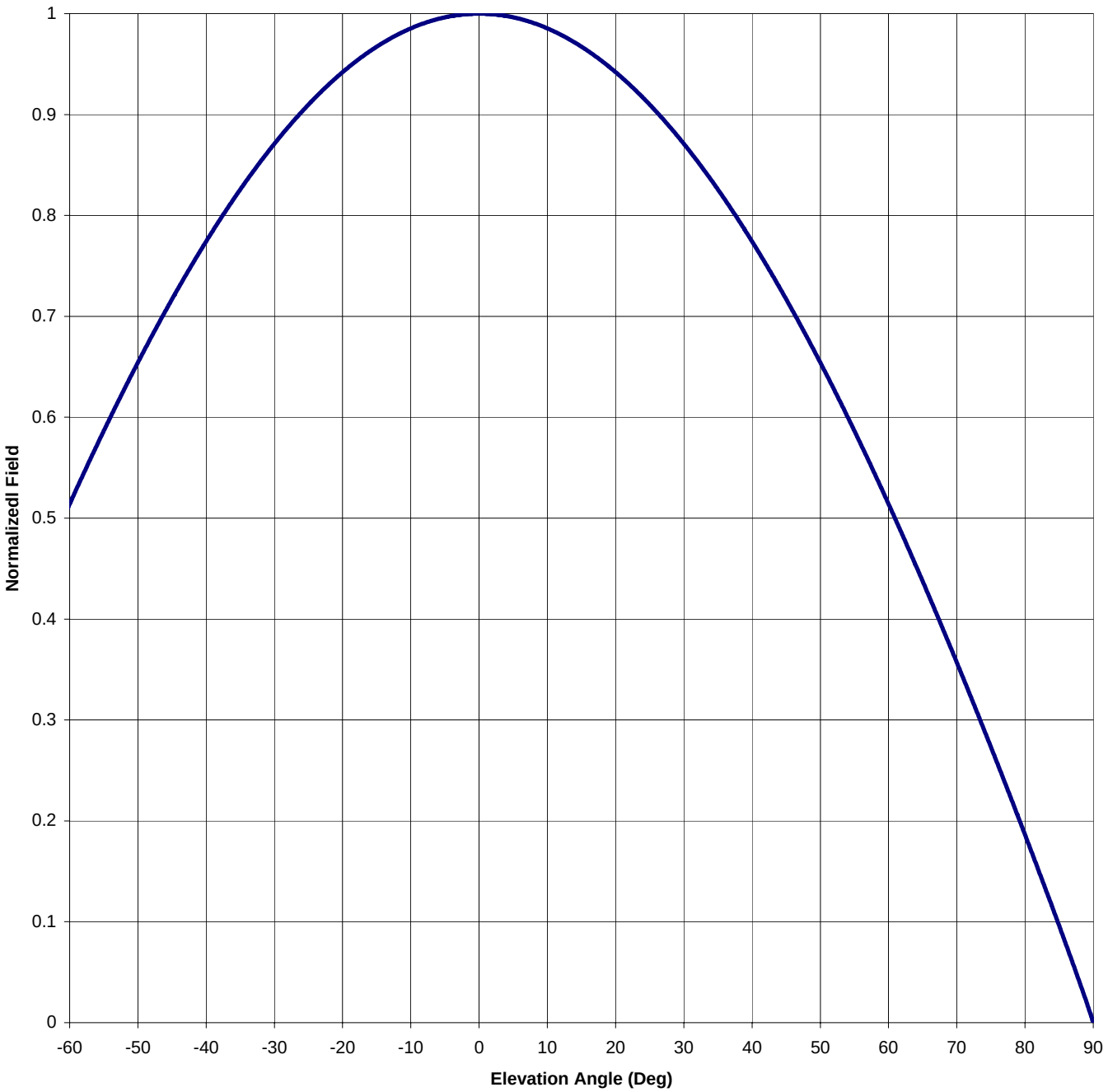
TOP VIEW

TOWER: FRED NUDD 78

ANTENNA HEADING: 34° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER: 26442	FREQUENCY: 101.9 MHz.	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY:
MODEL: 6810–1R–DIRECTIONAL ANTENNA			
DATE: 3/13/08	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date: 4/3/2008**
Antenna Type:	**6810-1R-DA**			
Station:	**WVRR**	**Beam Tilt**	**0**	
Frequency:	**101.9**	**Gain (Max)**	**0.909**	**-0.413 dB**
Channel #:	**270**	**Gain (Horizon)**	**0.909**	**-0.413 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs
Antenna Type: 6810-1R-DA
Station: WVRR
Frequency: 101.9
Channel #: 270
Figure: 3

Date: 4/3/2008

Beam Tilt	**0**	
Gain (Max)	**0.909**	**-0.413 dB**
Gain (Horizon)	**0.909**	**-0.413 dB**

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		

S.O. 26442 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WVRR 101.9 MHz Westminster, VT

MODEL 6810-1R-DA

Elevation Gain of Antenna 0.46

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

H RMS 0.74 V RMS 0.684 H/V Ratio 1.082

Elevation Gain of Horizontal Component 0.498

Elevation Gain of Vertical Component 0.425

Horizontal Azimuth Gain equals $1/(RMS)^2$. 1.826

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 2.095

Max. Vertical 0.99

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

Total Horizontal Power Gain = **0.909**

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

Total Vertical Power Gain = **0.891**

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ERP divided by Horizontal Power Gain equals Antenna Input Power

1.05 KW ERP Times H Gain 0.909 equals 1.16 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

1.16 KW Times V Gain 0.891 equals 1.03 kW V ERP

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

(0.99)^2 Times 1.05 Equals 1.03 kW Vertical ERP

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