Shively Labs
a division of Howell Laboratories,Inc.

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

- An Employee-Owned Company -

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

S.O. 25259

Report of Test 6513-1-DA

for

WVFL 89.9 MHz FOND DU LAC, WI

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6513-1-DA to meet the needs of WVFL and to comply with the requirements of the FCC construction permit, file number BMPED-20050512ACX.

RESULTS:

The measured azimuth pattern for the 6513-1-DA is shown in Figure 1. Figure 1A shows the Tabulation of the Vertical Polarization. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BMPED-20050512ACX indicates that the Vertical radiation component shall not exceed 1.00 kW at any azimuth and is restricted to the following values at the azimuths specified:

160 Degrees T: 0.096 kW

170-220 Degrees T: 0.090 kW

280 Degrees T: 0.358 kW

From Figure 1, the maximum radiation of the Vertical component occurs at 349 Degrees T to 026 Degrees T. At the restricted azimuth of 160 Degrees T the Vertical component is 14.199 dB down from the maximum of 1.00 kW, or 0.038 kW. At the restricted azimuth of 170-220 Degrees T the Vertical component is 15.391 dB down from the maximum of 1.00 kW, or 0.029 kW. At the restricted azimuth of 280 Degrees T the Vertical component is 4.583 dB down from the maximum of 1.00 kW, or 0.348 kW.

The R.M.S. of the Vertical component is 0.676. The total Vertical power gain is 2.013. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.721. The R.M.S. of the measured composite pattern is 0.676. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.613. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

The 6513-1-DA was mounted on a tower of precise scale to the Pirod 48M tower at the WVFL site. The spacing of the antenna to the tower was varied and a vertical parasitic element was attached to the interbay feedline to achieve the vertical pattern shown in Figure 1. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BMPED-20050512ACX, a single level of the 6513-1-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 Edition 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 404.55 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.

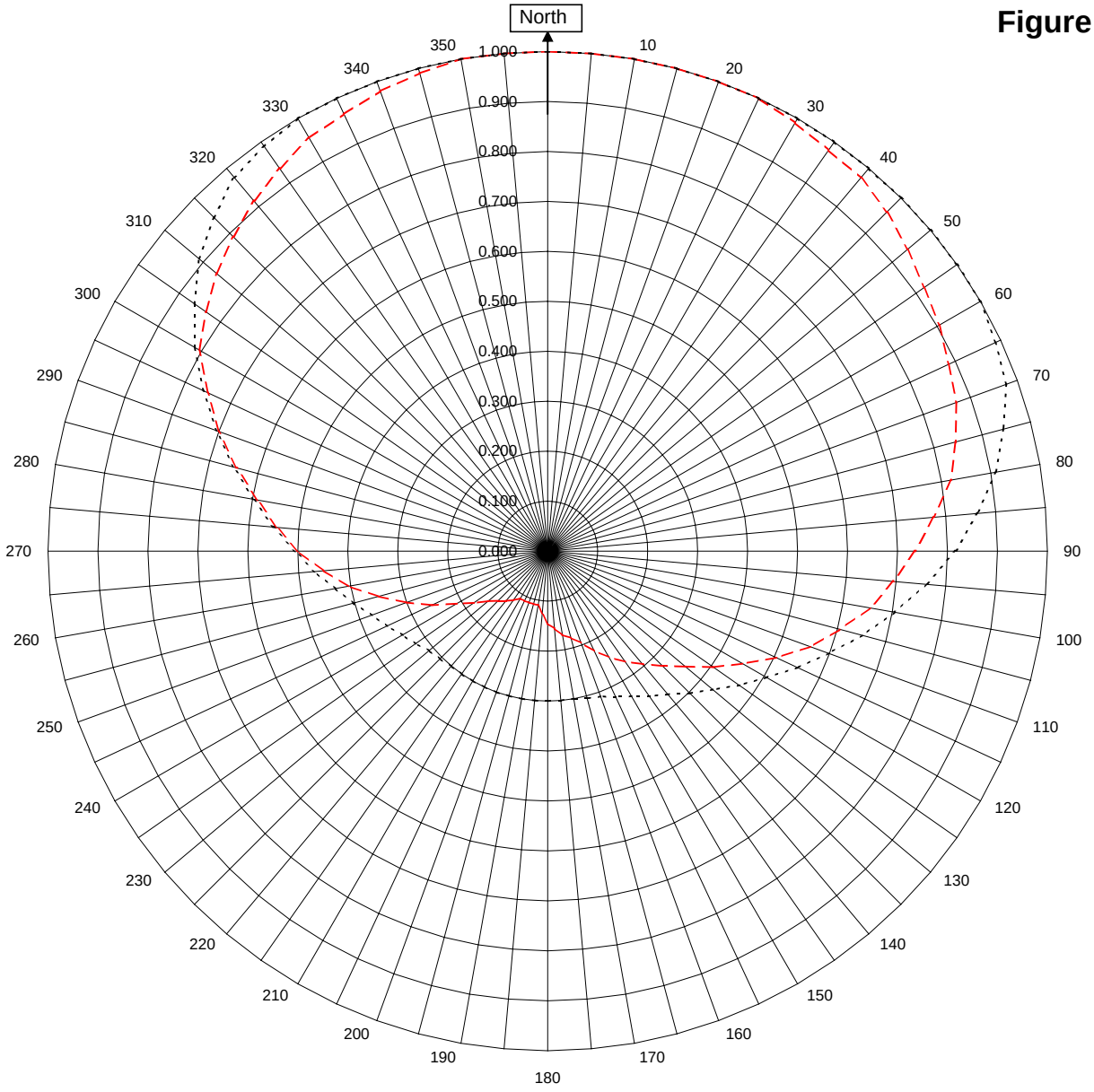
Respectfully submitted by:

Robert A. Surette
Director of Sales Engineering
S/O 25259
January 5, 2007

Shively Labs

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

Figure 1



WVFL Fond Du Lac, WI

25259

January 5, 2007

Horizontal RMS	0.000
Vertical RMS	0.676
H/V Composite RMS	0.676
FCC Composite RMS	0.721

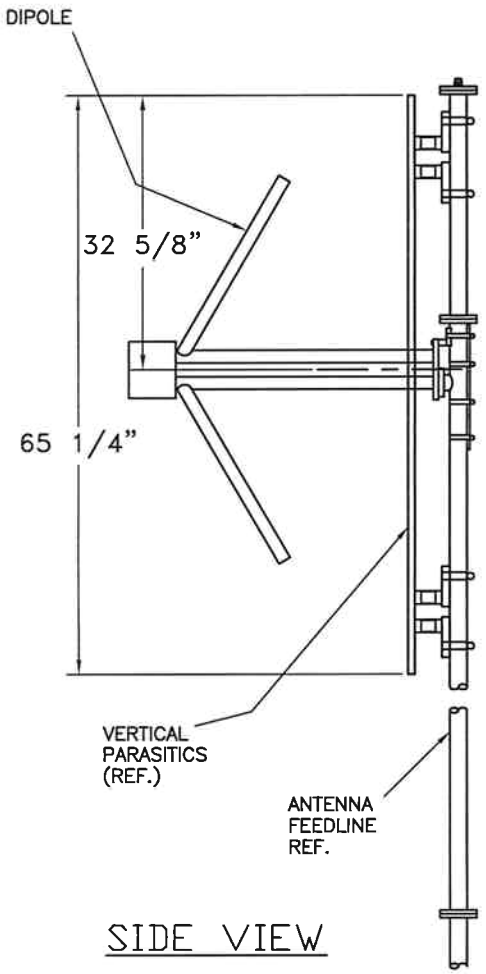
Frequency	89.9 / 404.55 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6513-1-DA
Pattern Type	Directional Azimuth

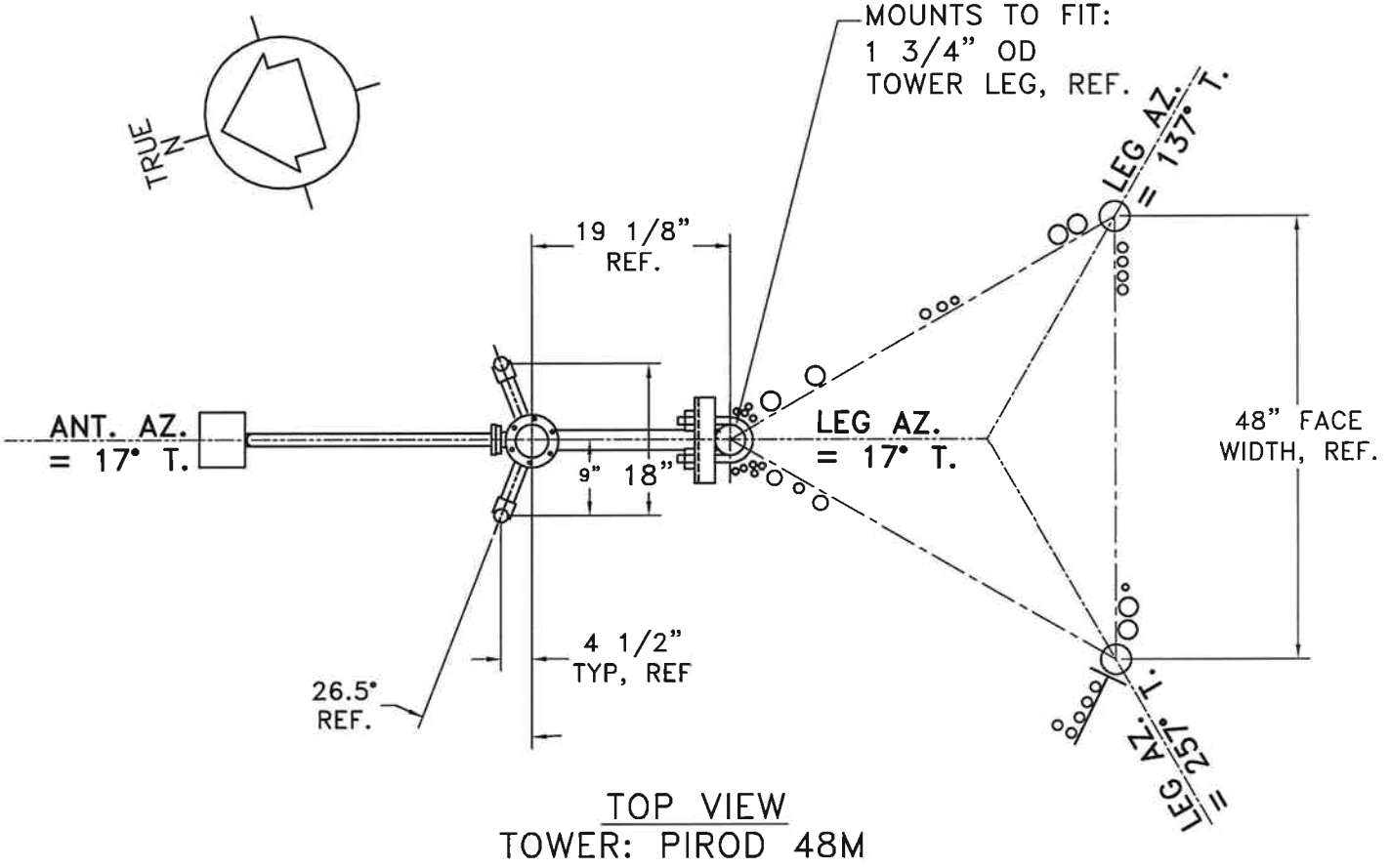
Figure 1A

Tabulation of Vertical Azimuth Pattern
WVFL Fond Du Lac, WI

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.145
10	1.000	190	0.110
20	1.000	200	0.110
30	0.990	210	0.110
40	0.975	220	0.130
45	0.960	225	0.140
50	0.940	230	0.155
60	0.905	240	0.210
70	0.870	250	0.300
80	0.820	260	0.405
90	0.735	270	0.500
100	0.655	280	0.590
110	0.560	290	0.700
120	0.450	300	0.805
130	0.360	310	0.865
135	0.325	315	0.890
140	0.295	320	0.915
150	0.245	330	0.955
160	0.195	340	0.980
170	0.170	350	1.000



SIDE VIEW



TOP VIEW
TOWER: PIROD 48M

ANTENNA HEADING: 17° TRUE NORTH

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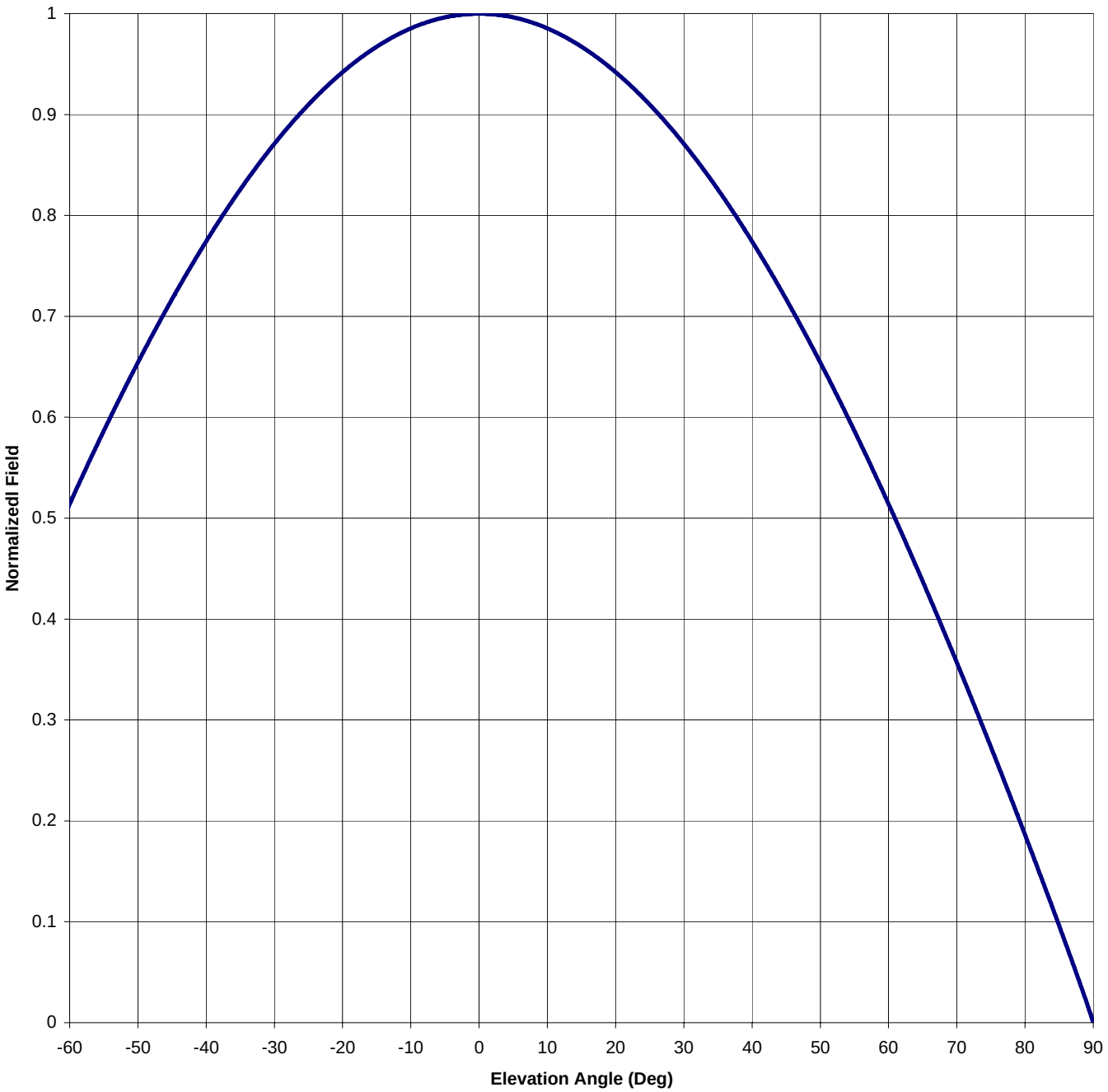
SHOP ORDER: 25259	FREQUENCY: 89.9	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY:
TITLE: MODEL 6513-1-DIRECTIONAL ANTENNA FM STATION			
DATE: 12/4/06	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date: 1/19/2007**
Antenna Type:	**6513-1-DA**			
Station:	**WVFL**	**Beam Tilt**	**0**	
Frequency:	**89.9**	**Gain (Max)**	**2.013**	**3.039 dB**
Channel #:	**210**	**Gain (Horizon)**	**2.013**	**3.039 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs
Antenna Type: 6513-1-DA
Station: WVFL
Frequency: 89.9
Channel #: 210
Figure: 3

Beam Tilt 0
Gain (Max) 2.013 — 3.039 dB
Gain (Horizon) 2.013 — 3.039 dB

Date: 1/19/2007

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. 25259 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WVFL Fond du Lac, WI

MODEL 6513-1-DA

Elevation Gain of Antenna 0.92

H RMS 0 V RMS 0.676 H/V Ratio 0.000

Elevation Gain of Vertical Component 0.920

Vertical Azimuth Gain equals 1/(RMS/Max Vert)SQ. 2.188

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

Total Vertical Power Gain = **2.013**

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ERP divided by Horizontal Power Gain equals Antenna Input Power

1 KW ERP Equals 0.497 KW Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.497 KW Times 2.013 KW Equals 1.000 KW ERP