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S.O. 25376

Report of Test 6513-2-H/V(Slant)-DA

for

WZXM 88.7 MHz Middletown, PA

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6513-2-H/V(Slant)-DA to meet the needs of WZXM and to comply with the requirements of the FCC construction permit, file number BPED-20060605AAB.

RESULTS:

The measured azimuth pattern for the 6513-2-H/V(Slant)-DA is shown in Figure 1. Figure 1A shows the Tabulation of the Vertical Polarization. The horizontal component of this antenna was developed by constructing the dipole 5.9° off of vertical. The horizontal azimuth pattern of this antenna is omni-directional and therefore is not shown. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BPED-20060605AAB indicates that the Vertical radiation component shall not exceed 7.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

280 Degrees T: 0.600 kW

From Figure 1, the maximum radiation of the Vertical component occurs at 163 Degrees T to 181 Degrees T. At the restricted azimuth of 280 Degrees T the Vertical component is 18.416 dB down from the maximum of 7.0 kW, or 0.101 kW.

The R.M.S. of the Vertical component is 0.732. The total Vertical power gain is 3.659. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.849. The R.M.S. of the measured composite pattern is 0.732. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.722. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6513-2-H/V(Slant)-DA was mounted on a tower of precise scale to the Stainless G-5 tower at the WZXM site. The spacing of the antenna to the tower was varied 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 BPED-20060605AAB, a single level of the 6513-2-H/V(Slant)-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 399.15 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 1.

Respectfully submitted by:

Robert A. Surette
Director of Sales Engineering
S/O 25376
February 8, 2007

Shively Labs

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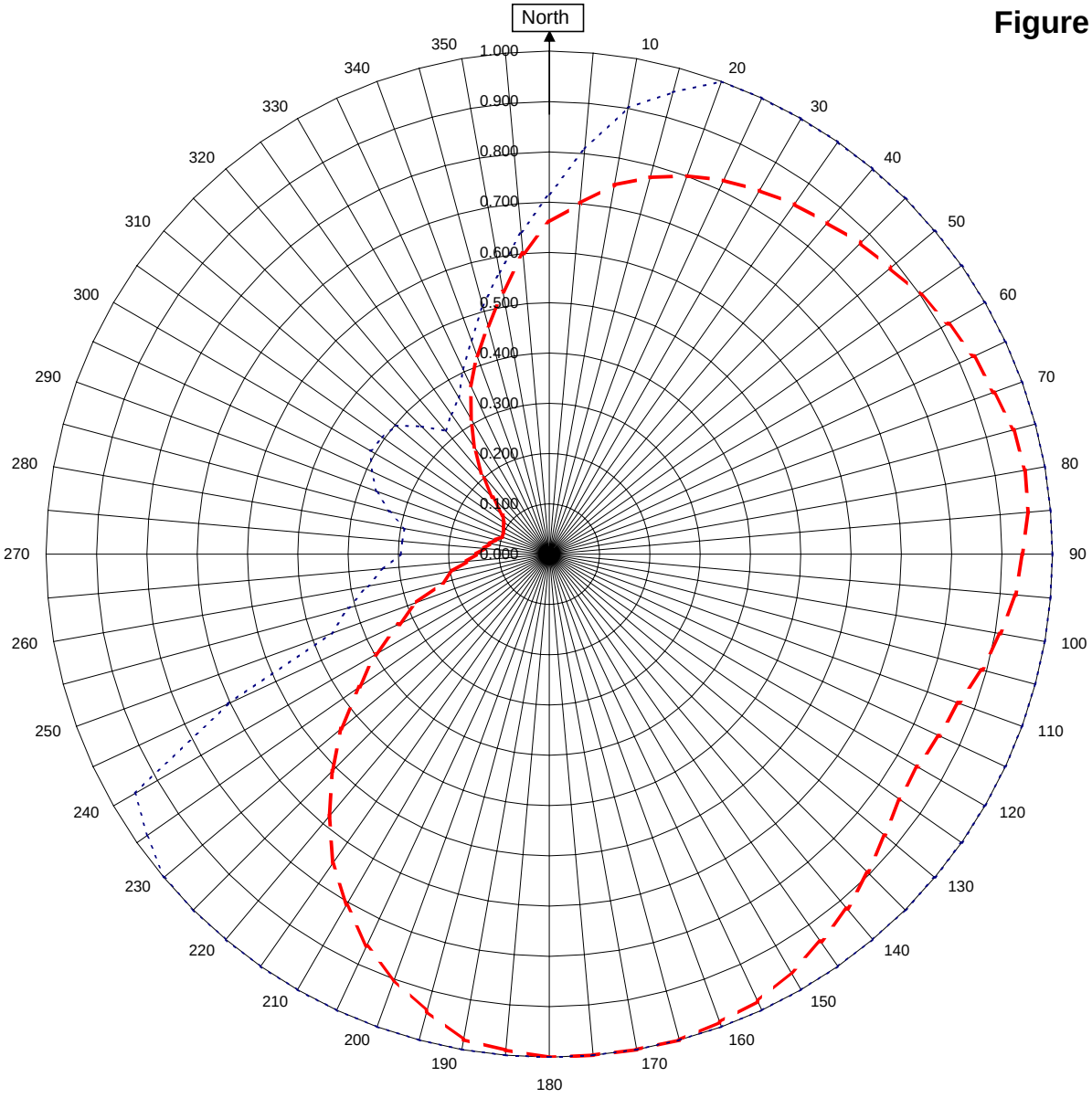
Figure 1



WZXM Middletown, PA

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February 8, 2006

Horizontal RMS	0.000
Vertical RMS	0.732
H/V Composite RMS	0.732
FCC Composite RMS	0.849

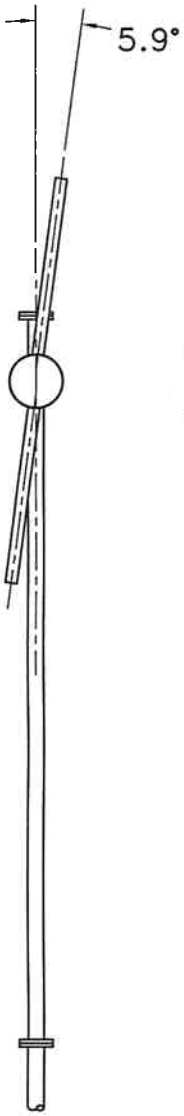
Frequency	88.7 / 399.15 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6513-2-H/V(Slant)-DA
Pattern Type	Directional Azimuth

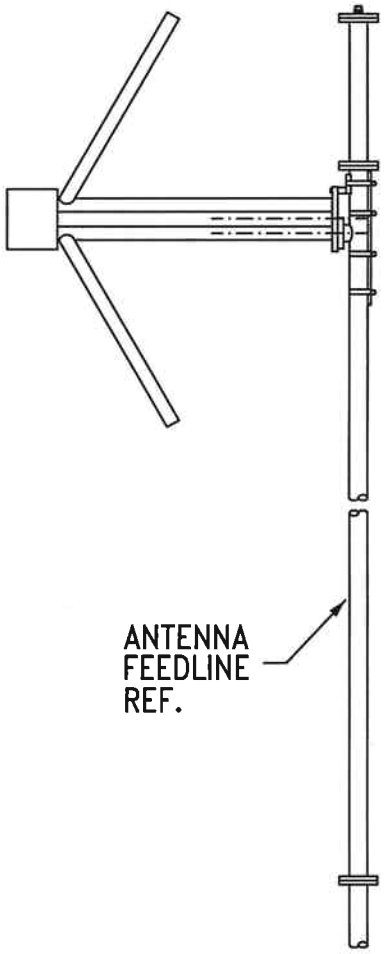
Figure 1a

Tabulation of Vertical Azimuth Pattern
WZXM Middletown, PA

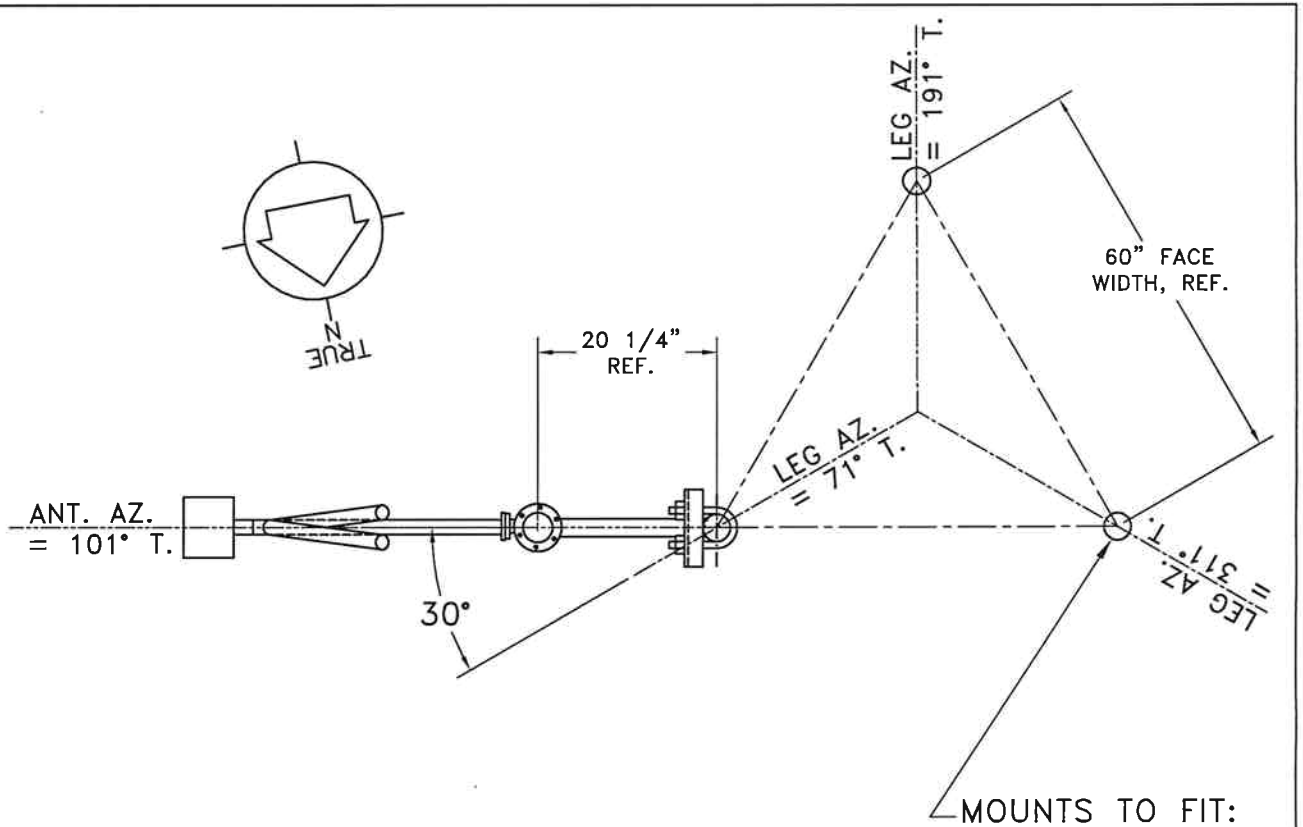
Azimuth	Rel Field	Azimuth	Rel Field
0	0.660	180	1.000
10	0.745	190	0.980
20	0.800	200	0.900
30	0.835	210	0.805
40	0.860	220	0.680
45	0.875	225	0.610
50	0.885	230	0.540
60	0.915	240	0.400
70	0.940	250	0.280
80	0.960	260	0.195
90	0.940	270	0.145
100	0.910	280	0.120
110	0.865	290	0.100
120	0.845	300	0.105
130	0.870	310	0.120
135	0.895	315	0.160
140	0.920	320	0.210
150	0.960	330	0.310
160	0.990	340	0.420
170	1.000	350	0.530



FRONT VIEW



SIDE VIEW

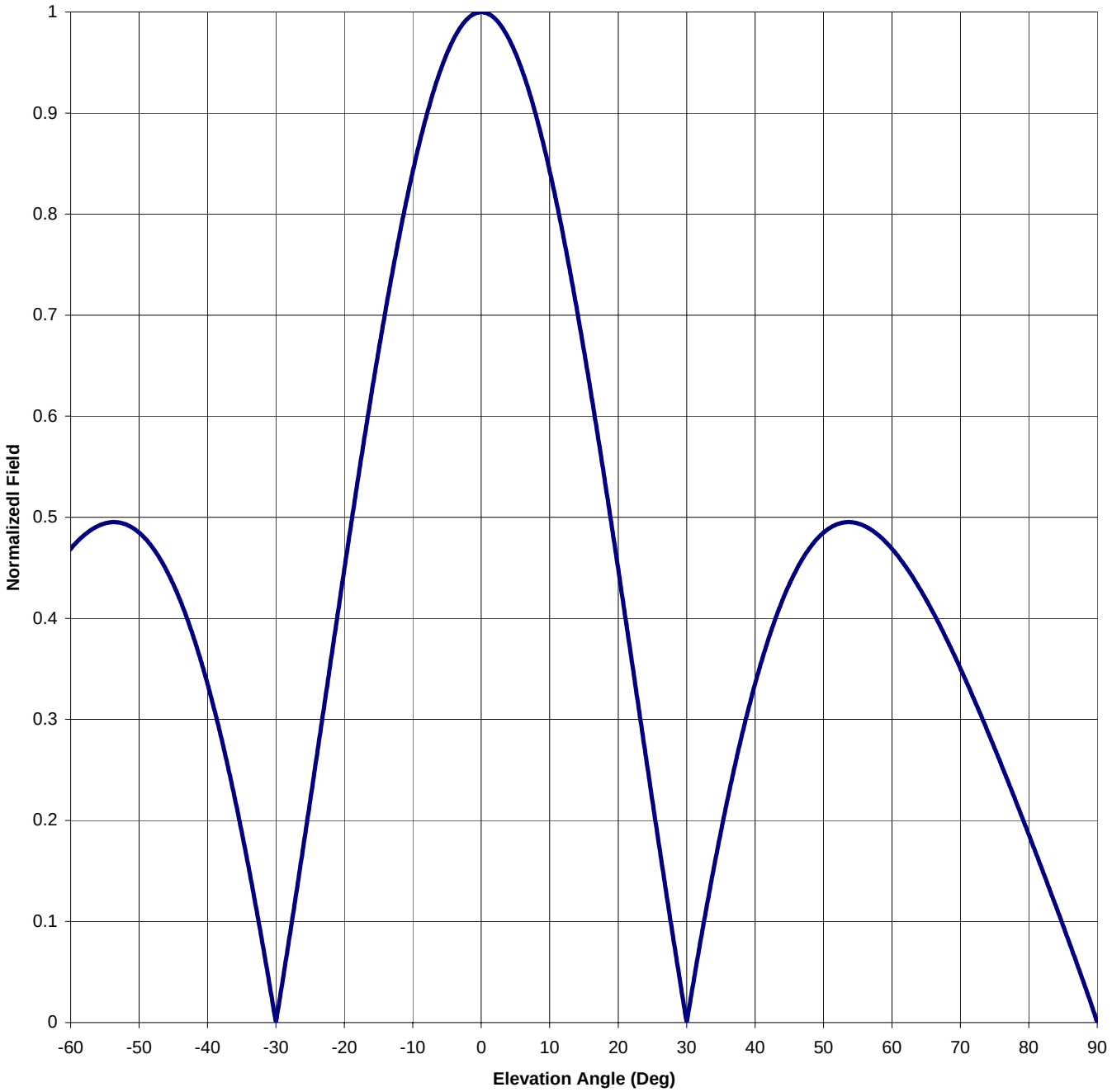


TOP VIEW
TOWER: STAINLESS G5

ANTENNA HEADING: 101° TRUE NORTH

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE, USA			
SHOP ORDER: 25376	FREQUENCY: 88.7 MHz.	SCALE: N.T.S.	DRAWN BY: ASP APPROVED BY:
TITLE: MODEL 6513-2-H/V-DIRECTIONAL ANTENNA FM STATION			
DATE: 2/7/07	FIGURE 2		

Antenna Mfg.:	**Shively Labs**			**Date:**	**2/8/2007**
Antenna Type:	**6513-2-H/V(Slant)-DA**				
Station:	**WZXM**	**Beam Tilt**	**0**		
Frequency:	**88.7**	**Gain (Max)**	**3.659**	**5.634**	**dB**
Channel #:	**204**	**Gain (Horizon)**	**3.659**	**5.634**	**dB**
Figure:	**3**				



Antenna Mfg.: Shively Labs **Date:** 2/8/2007

Antenna Type: 6513-2-H/V(Slant)-DA

Station: WZXM **Beam Tilt** 0

Frequency: 88.7 **Gain (Max)** 3.659 5.634 dB

Channel #: 204 **Gain (Horizon)** 3.659 5.634 dB

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	0.418	0	1.000	46	0.448
-89	0.021	-43	0.400	1	0.998	47	0.460
-88	0.040	-42	0.380	2	0.993	48	0.470
-87	0.059	-41	0.359	3	0.985	49	0.478
-86	0.078	-40	0.335	4	0.974	50	0.485
-85	0.096	-39	0.310	5	0.959	51	0.490
-84	0.114	-38	0.282	6	0.942	52	0.493
-83	0.133	-37	0.253	7	0.921	53	0.495
-82	0.151	-36	0.221	8	0.898	54	0.495
-81	0.168	-35	0.188	9	0.871	55	0.494
-80	0.186	-34	0.154	10	0.843	56	0.491
-79	0.204	-33	0.117	11	0.811	57	0.488
-78	0.221	-32	0.079	12	0.778	58	0.482
-77	0.238	-31	0.040	13	0.742	59	0.476
-76	0.255	-30	0.001	14	0.704	60	0.469
-75	0.272	-29	0.043	15	0.665	61	0.461
-74	0.288	-28	0.086	16	0.624	62	0.451
-73	0.304	-27	0.130	17	0.582	63	0.441
-72	0.320	-26	0.174	18	0.538	64	0.430
-71	0.335	-25	0.220	19	0.494	65	0.418
-70	0.351	-24	0.265	20	0.449	66	0.406
-69	0.365	-23	0.311	21	0.403	67	0.393
-68	0.379	-22	0.357	22	0.357	68	0.379
-67	0.393	-21	0.403	23	0.311	69	0.365
-66	0.406	-20	0.449	24	0.265	70	0.351
-65	0.418	-19	0.494	25	0.220	71	0.335
-64	0.430	-18	0.538	26	0.174	72	0.320
-63	0.441	-17	0.582	27	0.130	73	0.304
-62	0.451	-16	0.624	28	0.086	74	0.288
-61	0.461	-15	0.665	29	0.043	75	0.272
-60	0.469	-14	0.704	30	0.001	76	0.255
-59	0.476	-13	0.742	31	0.040	77	0.238
-58	0.482	-12	0.778	32	0.079	78	0.221
-57	0.488	-11	0.811	33	0.117	79	0.204
-56	0.491	-10	0.843	34	0.154	80	0.186
-55	0.494	-9	0.871	35	0.188	81	0.168
-54	0.495	-8	0.898	36	0.221	82	0.151
-53	0.495	-7	0.921	37	0.253	83	0.133
-52	0.493	-6	0.942	38	0.282	84	0.114
-51	0.490	-5	0.959	39	0.310	85	0.096
-50	0.485	-4	0.974	40	0.335	86	0.078
-49	0.478	-3	0.985	41	0.359	87	0.059
-48	0.470	-2	0.993	42	0.380	88	0.040
-47	0.460	-1	0.998	43	0.400	89	0.021
-46	0.448	0	1.000	44	0.418	90	0.000
-45	0.434			45	0.434		

FIGURE 4

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VALIDATION OF GAIN CALCULATION

WZXM 88.7 MHz MIDDLETOWN, PA

MODEL 6513-2-H/V(Slant)-DA

Elevation Gain of 6513-2-H/V-DA equals 1.961

Vertical Azimuth Gain equals $1/(RMS)^2$
$1/(0.732)^2 = 1.866$

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
1.961 x 1.866 = 3.659

ERP divided by Vertical Gain equals Antenna Input Power
7.0 kW ÷ 3.659 = 1.913

Horizontal ERP = 1.913 x 0.0392