Shively Labs
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- An Employee-Owned Company -

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S.O. 23534

Report of Test 6812-1-Translator-DA

for

BONNEVILLE HOLDING COMPANY

W282AM 104.3 MHz LEESBURG, VA

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6812-1-Translator-DA to meet the needs of W282AM and to comply with the requirements of the FCC construction permit, file number BNPFT-20030826AEW.

RESULTS:

The measured azimuth pattern for the 6812-1-Translator-DA is shown in Figure 1. Figure 1A shows the Tabulation of the Horizontal Polarization. Figure 1B shows the Tabulation of the Vertical Polarization. The calculated elevation pattern of the antenna is shown in Figure 3.

The R.M.S. of the Horizontal component is 0.691. The total Horizontal power gain is 0.966. The R.M.S. of the Vertical component is 0.689. The total Vertical power gain is 0.937. See Figure 4 for calculations.

METHOD OF DIRECTIONALIZATION:

The 6812-1-Translator-DA was mounted on a tower of exact scale to the Pinnacle tower at Leesburg, VA. 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 BNPFT-20030826AEW, a single level of the 6812-1-Translator-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.

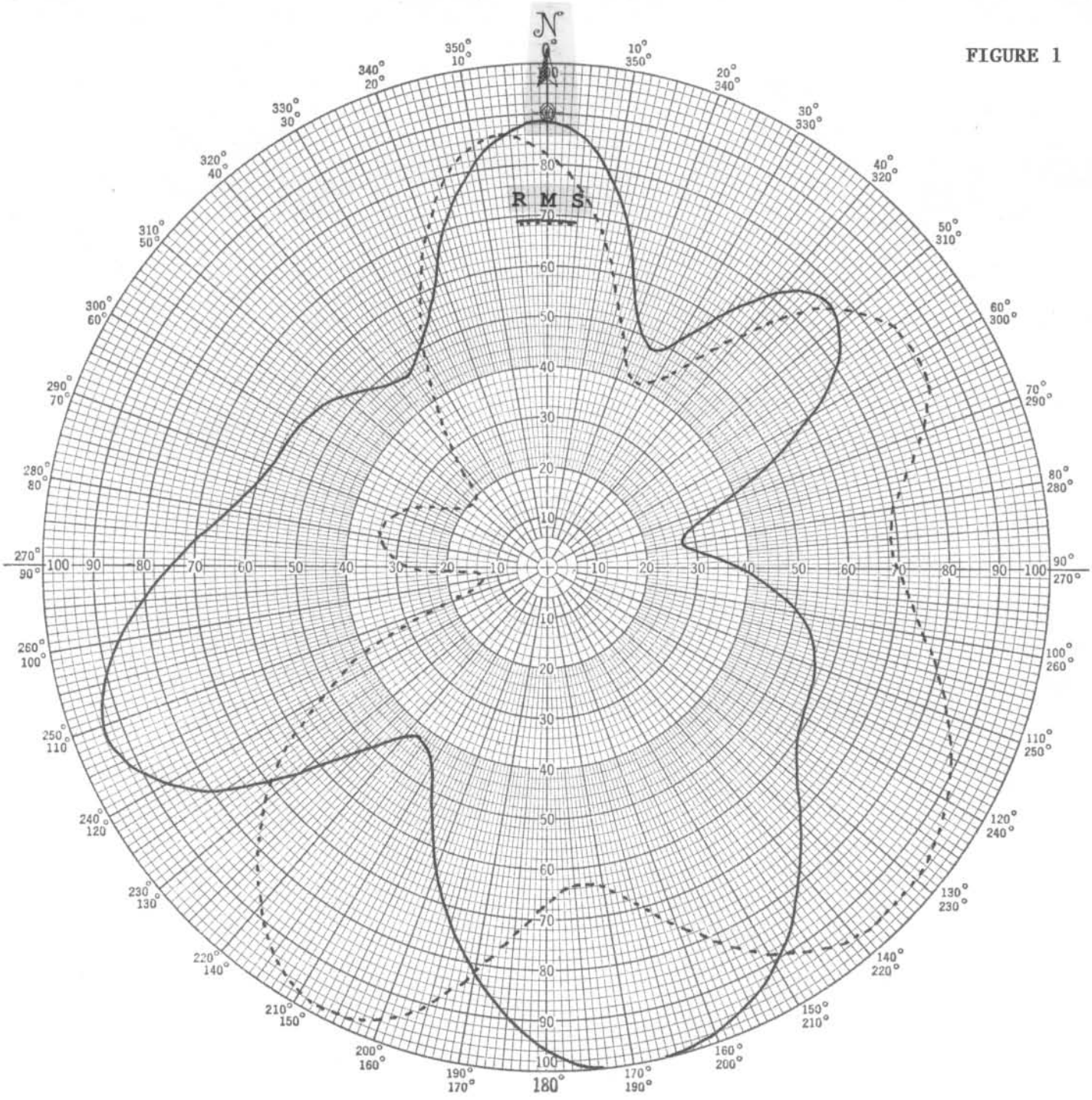
TEST PROCEDURES:

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 469.35 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
Manager of RF Engineering
S/O 23534
August 20, 2004

FIGURE 1



Shively Labs

PROJECT NAME W282AM LEESBURG, VA

PROJECT NUMBER 23534 DATE 8/10/04

MODEL (X) FULL SCALE ( ) FREQUENCY 469.35/104.3 MHz

POLARIZATION HORIZ (——); VERT (- - - -)

CURVE PLOTTED IN: VOLTAGE (X) POWER( ) DB( )

OBSERVER RAS

ANTENNA TYPE 6812-1-TRANSLATOR-DA

PATTERN TYPE TRANSLATOR DIRECTIONAL

REMARKS: SEE FIGURE 2 FOR MECHANICAL DETAILS

Figure 1A

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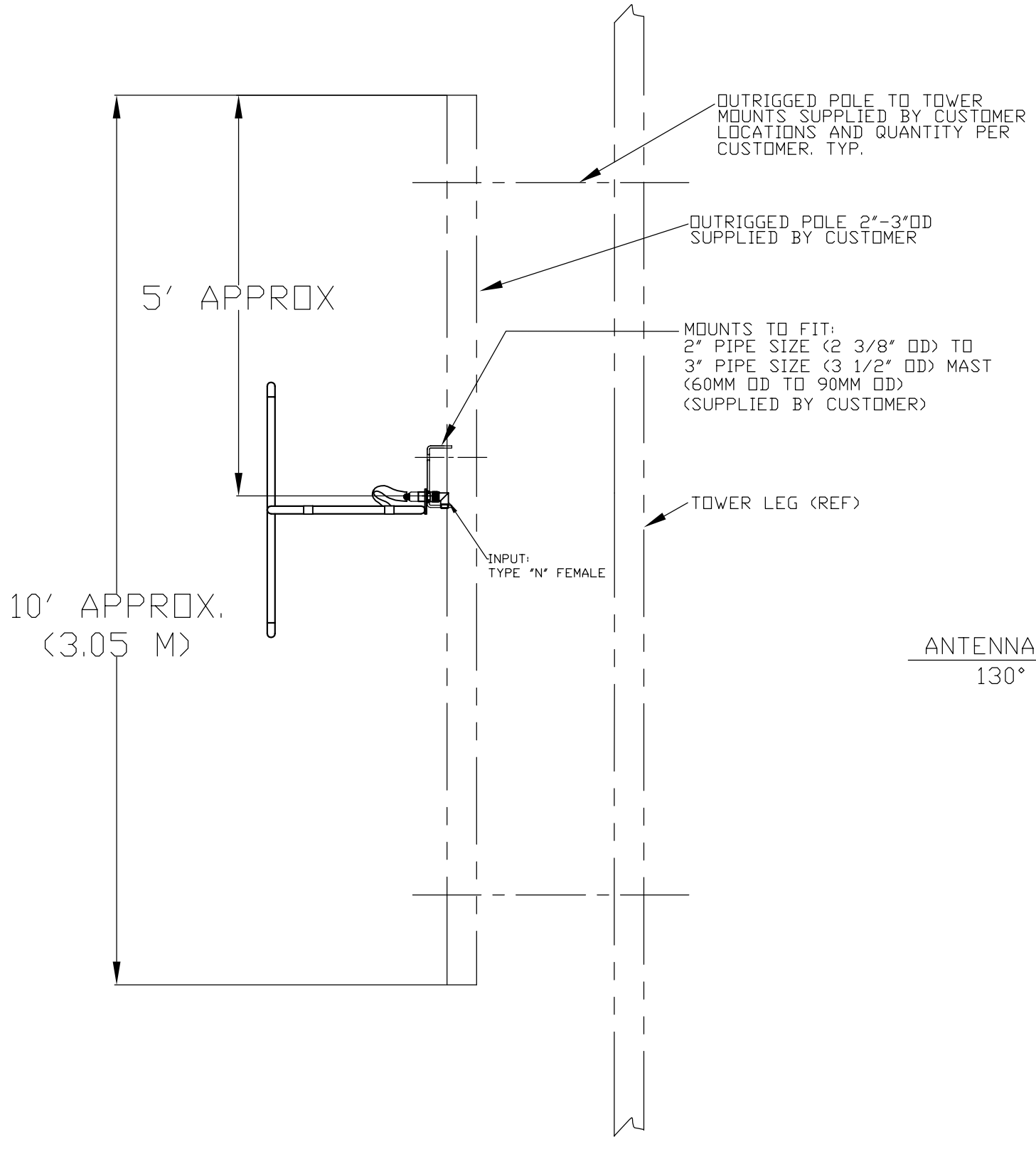
TABULATION OF HORIZONTAL POLARIZATION
W282AM Translator for WTOP-FM

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.885	180	0.955
10	0.770	190	0.820
20	0.530	200	0.645
30	0.520	210	0.455
40	0.720	220	0.440
45	0.765	225	0.520
50	0.755	230	0.640
60	0.610	240	0.865
70	0.370	250	0.935
80	0.275	260	0.860
90	0.385	270	0.745
100	0.510	280	0.640
110	0.565	290	0.585
120	0.590	300	0.565
130	0.650	310	0.525
135	0.710	315	0.500
140	0.780	320	0.480
150	0.910	330	0.510
160	0.980	340	0.640
170	1.000	350	0.820

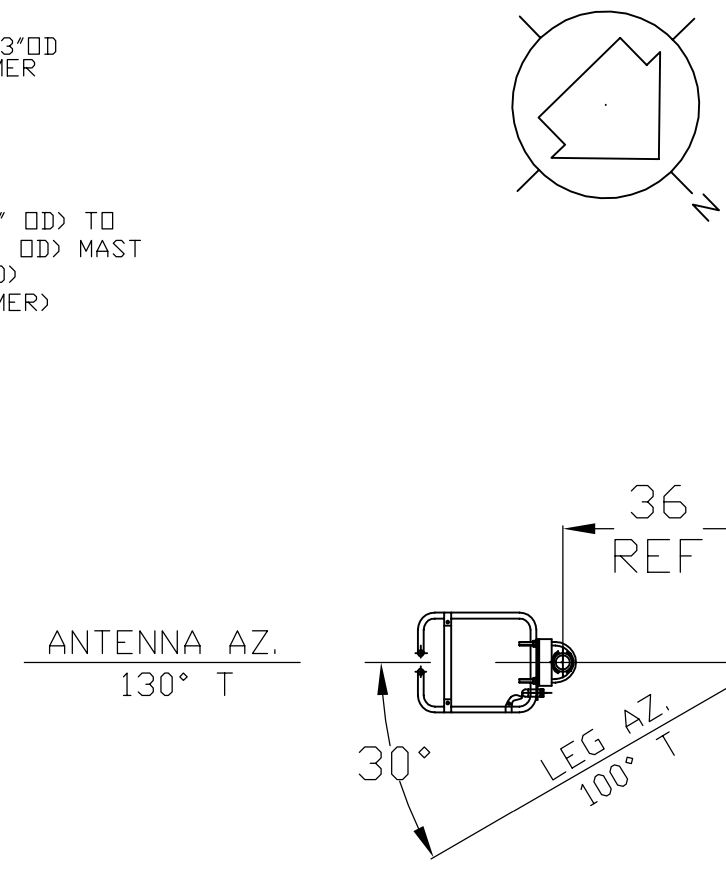
Figure 1B

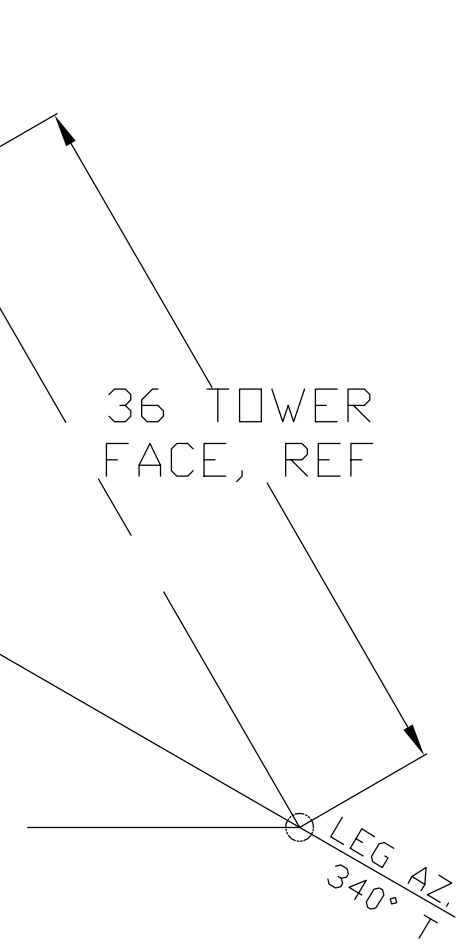
S/O 23534
TABULATION OF VERTICAL POLARIZATION
W282AM Translator for WTOP-FM

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.820	180	0.670
10	0.660	190	0.815
20	0.450	200	0.960
30	0.430	210	0.980
40	0.600	220	0.880
45	0.720	225	0.810
50	0.795	230	0.725
60	0.845	240	0.520
70	0.795	250	0.220
80	0.700	260	0.130
90	0.700	270	0.280
100	0.760	280	0.335
110	0.850	290	0.325
120	0.920	300	0.240
130	0.960	310	0.200
135	0.960	315	0.200
140	0.955	320	0.215
150	0.865	330	0.500
160	0.755	340	0.700
170	0.640	350	0.850



SIDE VIEW





SHIVELY LABS

A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE USA

SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY: AMG
23534	104.3 MHz	N.T.S.	APPROVED BY:

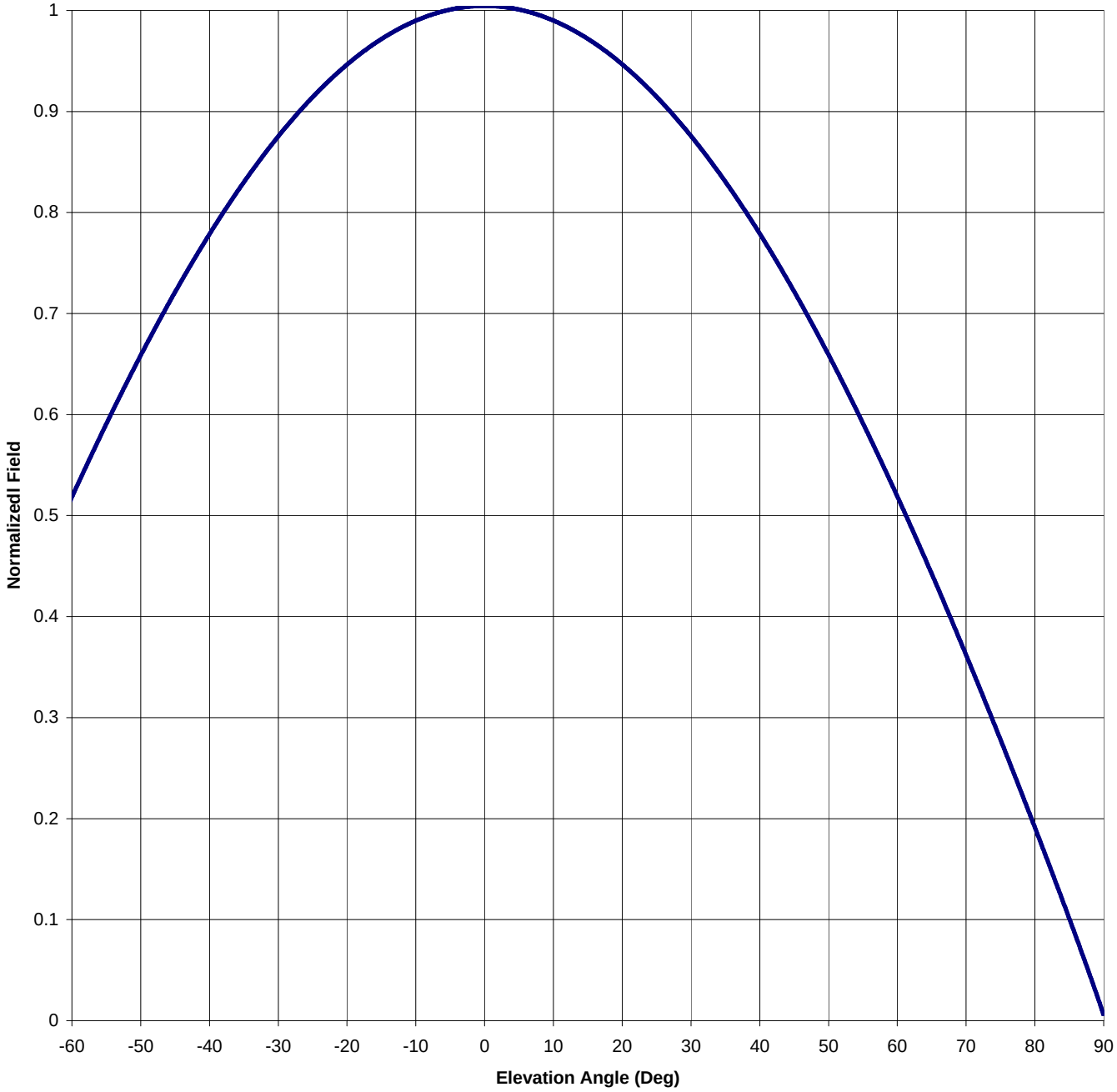
MODEL:

MODEL-6812-1-DIRECTIONAL ANTENNA

DATE: 8/9/04

FIGURE 2

Antenna Mfg.:	**Shively Labs**			**Date: 8/10/2004**
Antenna Type:	**6812-1 Translator**			
Station:	**W282AM**	**Beam Tilt**	**0**	
Frequency:	**104.3**	**Gain (Max)**	**0.966**	**-0.150 dB**
Channel #:	**282**	**Gain (Horizon)**	**0.966**	**-0.150 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs **Date:** 8/10/2004

Antenna Type: 6812-1 Translator

Station: W282AM **Beam Tilt** 0

Frequency: 104.3 **Gain (Max)** 0.966 -0.150 dB

Channel #: 282 **Gain (Horizon)** 0.966 -0.150 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	0.729	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		

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VALIDATION OF TOTAL POWER GAIN CALCULATION

Translator for WTOP-FM

6812-1 Translator

Elevation Gain of Antenna 0.46

The RMS values are calculated utilizing the data of a planimeter

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

H RMS 0.691 V RMS 0.689 H/V Ratio 1.003

Elevation Gain of Horizontal Component 0.461

Elevation Gain of Vertical Component 0.459

Horizontal Azimuth Gain equals 1/(RMS)SQ. 2.094

Vertical Azimuth Gain equals 1/(RMS/Max Vert)SQ. 2.044

Max. Vertical 0.985

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

Total Horizontal Power Gain = **0.966**

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

Total Vertical Power Gain = **0.937**

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ERP divided by Horizontal Power Gain equals Antenna Input Power

0.1 KW ERP Equals 0.103 KW Antenna Input Power

Antenna Input power times Vertical Power Gain equals Vertical ERP

0.103 KW Times 0.937 KW Equals 0.097 KW ERP

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

0.985 Equals 0.097 KW Vertical ERP

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