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S.O. 22950

Report of Test 6513-2-DA

for

AMERICAN FAMILY ASSOCIATION

WPWV 90.1 MHz PRINCETON, WV

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6513-2-DA to meet the needs of WPWV and to comply with the requirements of the FCC construction permit, file number BMPED-20020925AAL.

RESULTS:

The measured azimuth pattern for the 6513-2-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-20020925AAL indicates that the Vertical radiation component shall not exceed 2.5 kW at any azimuth and is restricted to the following values at the azimuths specified:

120 through 130 Degrees T: 1.806 kW
250 through 270 Degrees T: 0.625 kW

From Figure 1, the maximum radiation of the Vertical component occurs at 170 Degrees T to 182 Degrees T and at 353 Degrees T to 006 Degrees T. At the restricted azimuth of 120 through 130 Degrees T the Vertical component is 1.514 dB down from the maximum of 2.5 kW, or 1.764 kW. At the restricted azimuth of 250 through 270 Degrees T the Vertical component is 12.58 dB down from the maximum of 2.5 kW, or 0.138 kW.

The R.M.S. of the Vertical component is 0.780. The total Vertical power gain is 3.255. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.91. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6513-2-DA was mounted on a tower of exact scale to a Rohn 6NST. 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-20020925AAL, a single level of the 6513-2-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.

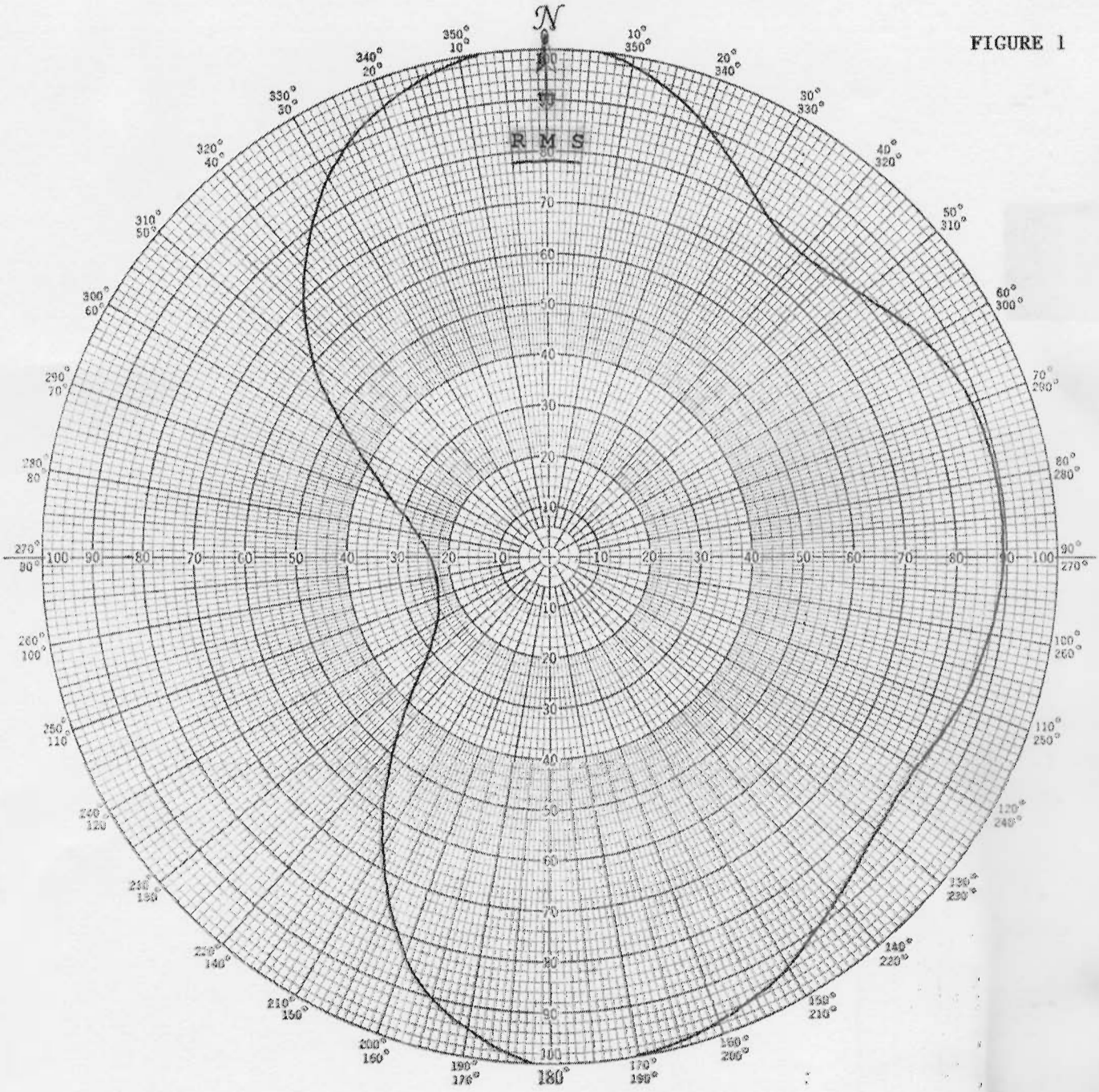
TEST PROCEDURES:

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 405.45 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 22950
June 17, 2003

FIGURE 1



Shively Labs

PROJECT NAME WPWV PRINCETON, WV

PROJECT NUMBER 22950 DATE

MODEL (X) FULL SCALE ( ) FREQUENCY 405.45/90.1 MHz

POLARIZATION VERTICAL

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

OBSERVER RAS

ANTENNA TYPE 6513-2-DA

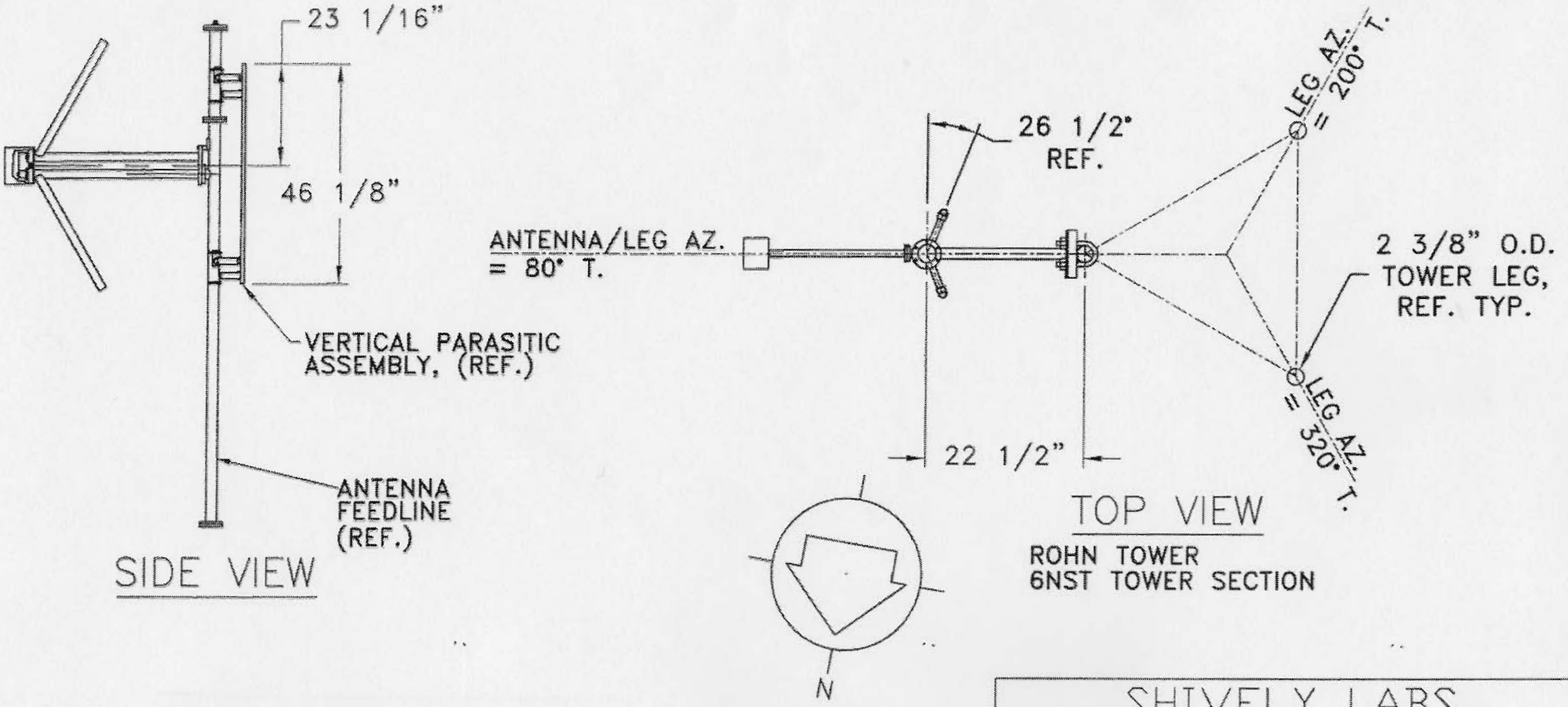
PATTERN TYPE DIRECTIONAL AZIMUTH

REMARKS: SEE FIGURE 2 FOR MECHANICAL DETAILS

Figure 1A

S/O 22950
TABULATION OF VERTICAL POLARIZATION
WPWV PRINCETON, WV

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	1.000	180	1.000
10	0.980	190	0.945
20	0.910	200	0.840
30	0.820	210	0.660
40	0.780	220	0.470
45	0.790	225	0.390
50	0.805	230	0.320
60	0.855	240	0.255
70	0.885	250	0.235
80	0.895	260	0.230
90	0.890	270	0.235
100	0.880	280	0.270
110	0.860	290	0.330
120	0.830	300	0.440
130	0.840	310	0.610
135	0.855	315	0.680
140	0.880	320	0.745
150	0.935	330	0.865
160	0.975	340	0.945
170	1.000	350	0.990



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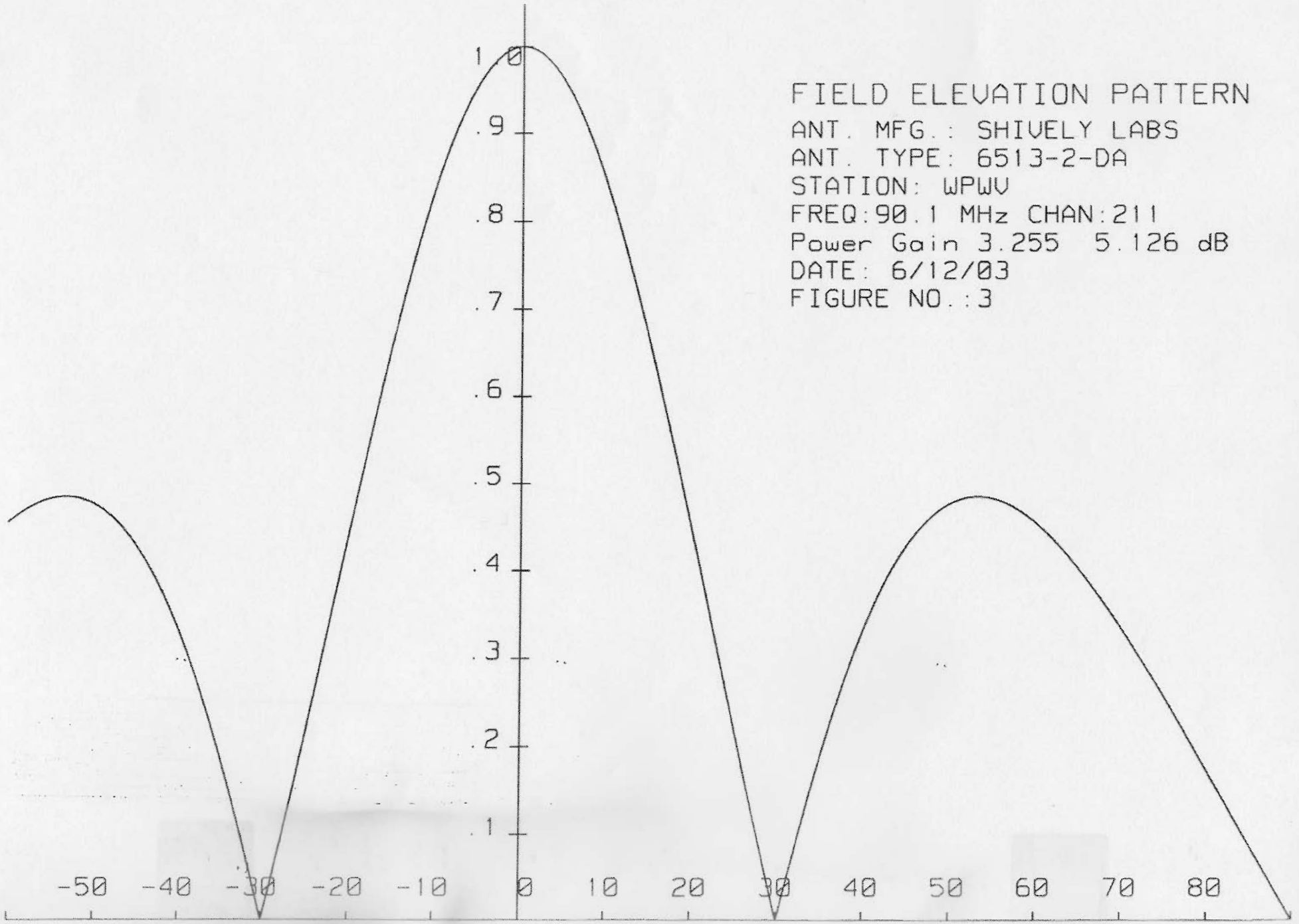
SHOP ORDER 22950	FREQUENCY 90.1 MHz	SCALE N.T.S.	DRAWN BY: APL APPROVED BY:
MODEL 6513-2-DIRECTIONAL ANTENNA			
DATE 06/16/03	FIGURE 2		



FIELD ELEVATION PATTERN
ANT. MFG.: SHIVELY LABS
ANT. TYPE: 6513-2-DA
STATION: WPWV
FREQ:90.1 MHz CHAN:211
Power Gain 3.255 5.126 dB
DATE: 6/12/03
FIGURE NO.:3

FIGURE 4

S.O. 22950

VALIDATION OF GAIN CALCULATION

WPWV PRINCETON, WV

MODEL 6513-2-DA

Elevation Gain of 6513-2-DA equals 1.98

The RMS values are calculated utilizing the data of a planimeter.

Vertical Azimuth Gain equals $1/(RMS)^2$
$1/(0.78)^2 = 1.644$

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
1.98 x 1.644 = 3.255

ERP divided by Vertical Gain equals Antenna Input Power
2.5 kW ÷ 3.255 = 0.768 kW