

S.O. 22885

Report of Test 6810NX-1R-DA

for

TRUCKSTER BROADCASTING, INC.

971003MF 101.5 MHz TRUCKEE, CA

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810NX-1R-DA to meet the needs of 971003MF and to comply with the requirements of the FCC construction permit, file number BPH-19971003MF.

RESULTS:

The measured azimuth pattern for the 6810NX-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. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BPH-19971003MF indicates that the Horizontal radiation component shall not exceed 0.140 kW at any azimuth and is restricted to the following values at the azimuths specified:

15 Degrees T: 0.014 kW

60 Degrees T: 0.014 kW

125 Degrees T: 0.014 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 201 Degrees T to 274 Degrees T. At the restricted azimuth of 15 Degrees T the Vertical component is 11.70 dB down from the maximum of 0.140 kW, or 0.010 kW. At the restricted azimuth of 60 Degrees T the Horizontal component is 12.396 dB down from the maximum of 0.140 kW, or 0.008 kW. At the restricted azimuth of 125 Degrees T the Vertical component is 10.752 dB down from the maximum of 0.140 kW, or 0.012 kW.

The R.M.S. of the Horizontal component is 0.670. The total Horizontal power gain is 1.04. The R.M.S. of the Vertical component is 0.660. The total Vertical power gain is 1.02. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.710. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810NX-1R-DA was mounted on a pole of exact scale to a 6 1/2" O.D. pole. The spacing of the antenna to the pole 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-19971003MF, a single level of the 6810NX-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 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:

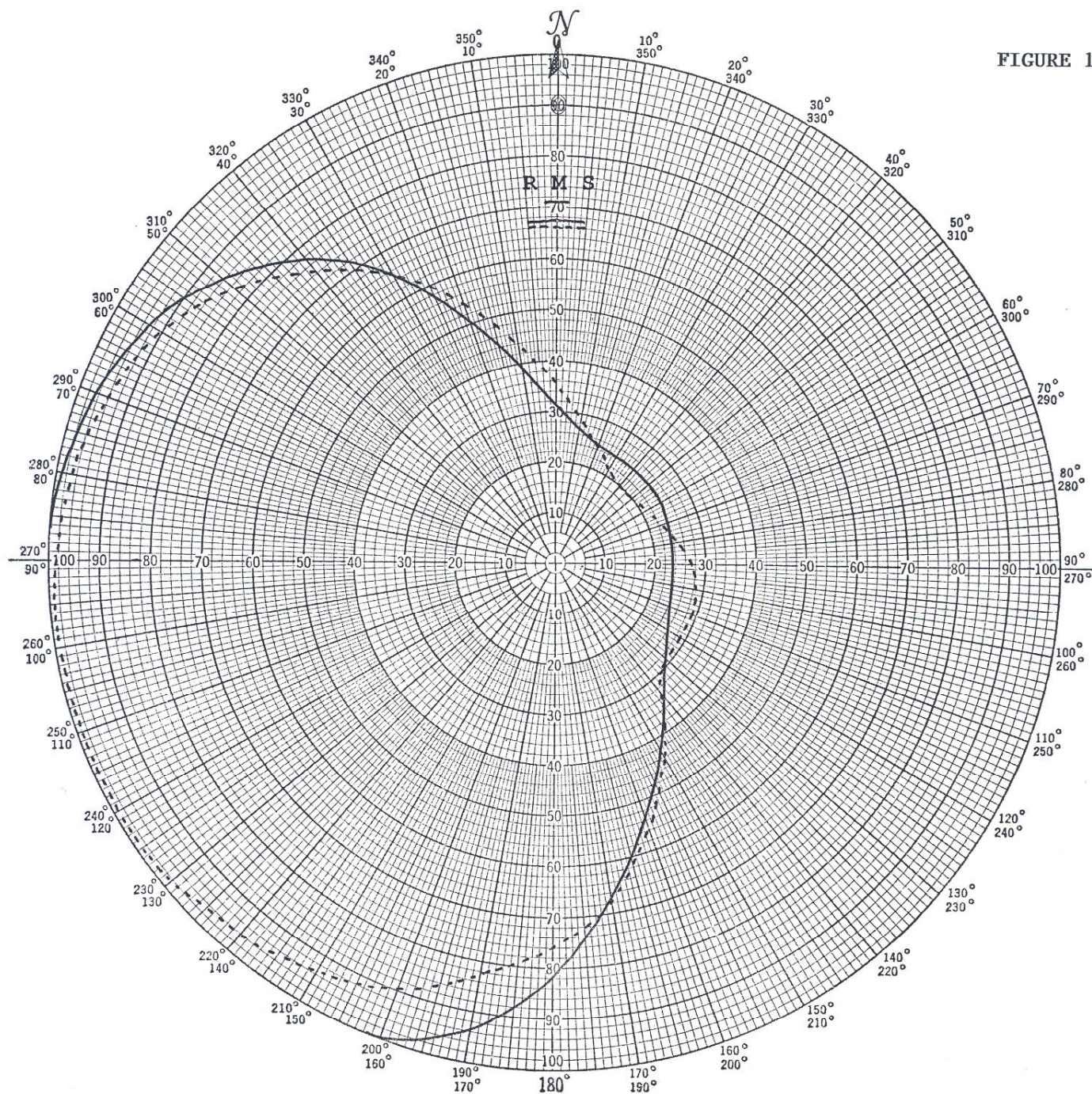
The corner reflector is mounted so that the horizontal and vertical azimuth patterns are measured independently by rotating the corner reflector by 90 degrees. The network analyzer was set to 456.75 MHz. Calibrated pads are used to check the linearity of the measuring system. For example, 6 dB padding 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
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S/O 22885
March 13, 2003

FIGURE 1



Shively Labs

PROJECT NAME 971003MF TRUCKEE, CA
 PROJECT NUMBER 22885 DATE 3/14/03
 MODEL (☒) FULL SCALE () FREQUENCY 456.75/101.5 MHz
 POLARIZATION HORIZ (——); VERT (----)
 CURVE PLOTTED IN: VOLTAGE (☒) POWER () DB ()
 OBSERVER RAS

ANTENNA TYPE 6810NX-1R-DA
 PATTERN TYPE DIRECTIONAL AZIMUTH
 REMARKS: SEE FIGURE 2 FOR MECHANICAL
DETAILS

SHIVELY LABS, A DIVISION OF HOWELL LABORATORIES, INC. BRIDGTON, ME 04009 (207) 647-3327

Figure 1A

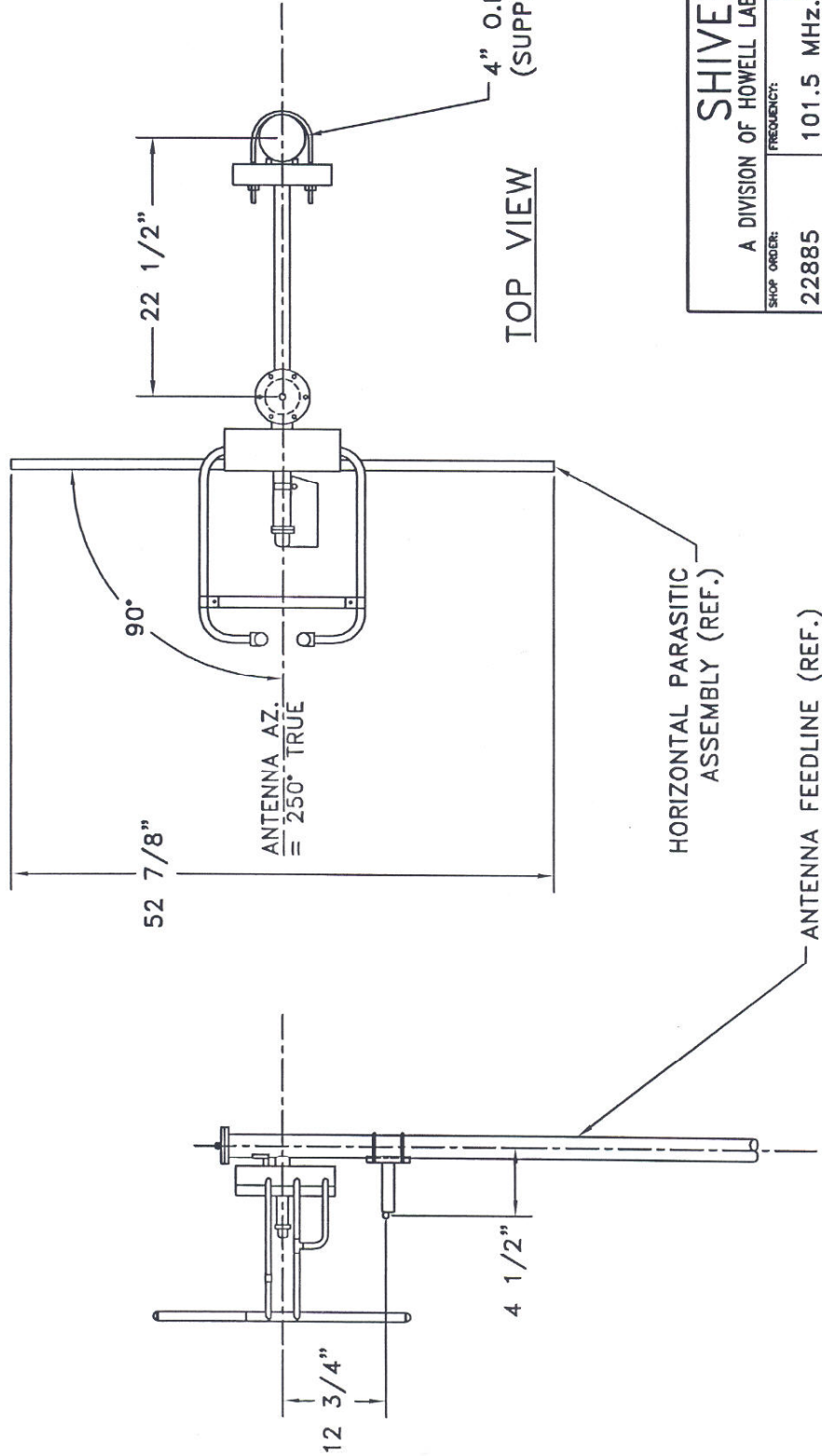
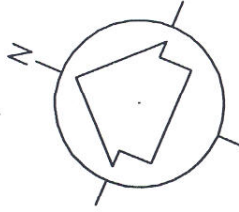
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TABULATION OF HORIZONTAL POLARIZATION
971003MF TRUCKEE, CA

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.315	180	0.820
10	0.270	190	0.935
20	0.250	200	1.000
30	0.240	210	1.000
40	0.240	220	1.000
45	0.240	225	1.000
50	0.240	230	1.000
60	0.240	240	1.000
70	0.240	250	1.000
80	0.235	260	1.000
90	0.235	270	1.000
100	0.240	280	0.990
110	0.245	290	0.965
120	0.260	300	0.930
130	0.290	310	0.860
135	0.310	315	0.820
140	0.345	320	0.775
150	0.420	330	0.650
160	0.530	340	0.510
170	0.670	350	0.390

Figure 1B

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TABULATION OF VERTICAL POLARIZATION
971003MF TRUCKEE, CA

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.360	180	0.760
10	0.290	190	0.825
20	0.245	200	0.900
30	0.210	210	0.935
40	0.200	220	0.960
45	0.200	225	0.965
50	0.200	230	0.980
60	0.210	240	0.990
70	0.225	250	0.990
80	0.250	260	0.990
90	0.270	270	0.985
100	0.285	280	0.970
110	0.290	290	0.940
120	0.290	300	0.900
130	0.290	310	0.830
135	0.300	315	0.790
140	0.340	320	0.745
150	0.440	330	0.650
160	0.560	340	0.540
170	0.675	350	0.440



TOP VIEW

SIDE VIEW

SHIVELY LABS

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SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
22885	101.5 MHz.	N.T.S.	WS
TITLE:	APPROVED BY:		

MODEL-6810NX-1R-DIRECTIONAL ANTENNA

DATE:
3/12/03

FIGURE 2

FIELD ELEVATION PATTERN

ANT. MFG.: SHIVELY LABS

ANT. TYPE: 6810-1R-DA

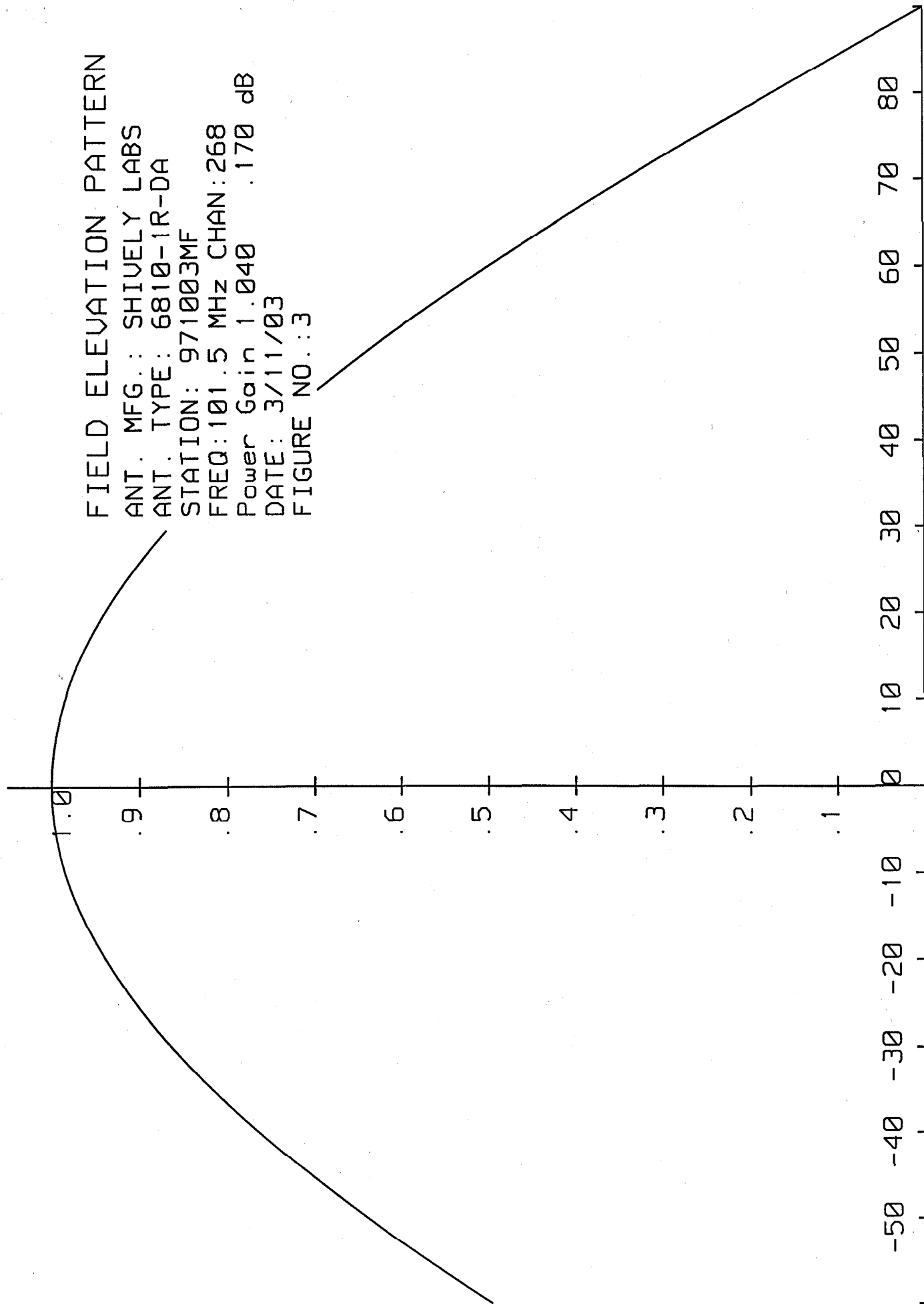
STATION: 971003MF

FREQ: 101.5 MHz CHAN: 268

Power Gain 1.040 .170 dB

DATE: 3/11/03

FIGURE NO.: 3



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VALIDATION OF GAIN CALCULATION

971003MF TRUCKEE, CA

MODEL 6810NX-1R-DA

Elevation Gain of 6810NX-1R-DA equals 0.46

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

Horizontal RMS divided by Vertical RMS equals

$$0.67 \div 0.66 = 1.015$$

Elevation Gain of Horizontal Component equals

$$0.46 \times 1.015 = 0.467$$

Elevation Gain of Vertical Component equals

$$0.46 \times 0.985 = 0.453$$

Horizontal Azimuth Gain equals $1/(\text{RMS})^2$

$$1/(0.67)^2 = 2.228$$

Vertical Azimuth Gain equals $1/(\text{RMS} \div \text{Max Vert})^2$

$$1/(0.66 \div 0.99)^2 = 2.25$$

* Total Horizontal Gain is Elevation Gain times Azimuth Gain

$$0.467 \times 2.228 = 1.04$$

* Total Vertical Gain is Elevation Gain times Azimuth Gain

$$0.453 \times 2.25 = 1.02$$

ERP divided by Horizontal Gain equals Antenna Input Power

$$0.140 \text{ kW} \div 1.04 = 0.135 \text{ kW}$$

Antenna Input Power times Vertical Gain equals Vertical ERP

$$0.135 \times 1.02 = 0.138 \text{ kW}$$

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

$$(0.99)^2 \times 0.140 \text{ kW} = 0.137 \text{ kW}$$

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