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S.O. 21381

Report of Test 6810-4R-SS-DA

for

JODESHA BROADCASTING, INC.

KFMY Raymond, WA

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-4R-SS-DA to meet the needs of KFMY and to comply with the requirements of the FCC construction permit, file number BMPH-20000419ACG.

RESULTS:

The measured azimuth pattern for the 6810-4R-SS-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 BMPH-20000419ACG indicates that the Horizontal radiation component shall not exceed 44 kW at any azimuth and is restricted to the following values at the azimuths specified:

0 to 10 Degrees T: 13.90 kW
120 to 140 Degrees T: 17.52 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 215 Degrees T to 220 Degrees T and at 275 Degrees T to 288 Degrees T. At the restricted azimuth of 0 to 10 Degrees T the Horizontal component is 5.27 dB down from the maximum of 44 kW, or 13.07 kW.

At the restricted azimuth of 120 to 140 Degrees T, the Horizontal component is 4.22 dB down from the maximum of 44 kW, or 16.64 kW.
The R.M.S. of the Horizontal component is 0.800. The total Horizontal power gain is 2.181. The R.M.S. of the Vertical component is 0.750. The total Vertical power gain is 2.138. See Figure Four for calculations. The R.M.S. of the FCC composite pattern is 0.920. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-4R-SS-DA was mounted on a pole of exact scale to a tapered wooden utility pole. The pole was wrapped with a metal screen to simulate a steel pole. The spacing of the antenna to the pole was varied and a vertical parasitic element was added 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 BMPH-20000419ACG, a single level of the 6810-4R-SS-DA was set up on the Howell Laboratories scale model antenna pattern measuring range. A scale of 4.5:1 was used.

SUPERVISION:

The tests were carried out under the direction of Robert A. Surette, Manager of RF Engineering. 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 both full size and scale model pattern measurements since 1974 as an RF Engineer with Shively Labs and with Dielectric Communications (a unit of General Signal). He is currently an Associate Member of the Association of Federal Communications Consulting Engineers and a Member of IEEE.

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 8505 Network Analyzer
PC Based Controller
Hewlett Packard 7550A Graphics Plotter

The test equipment is calibrated to MIL-STD-45662.

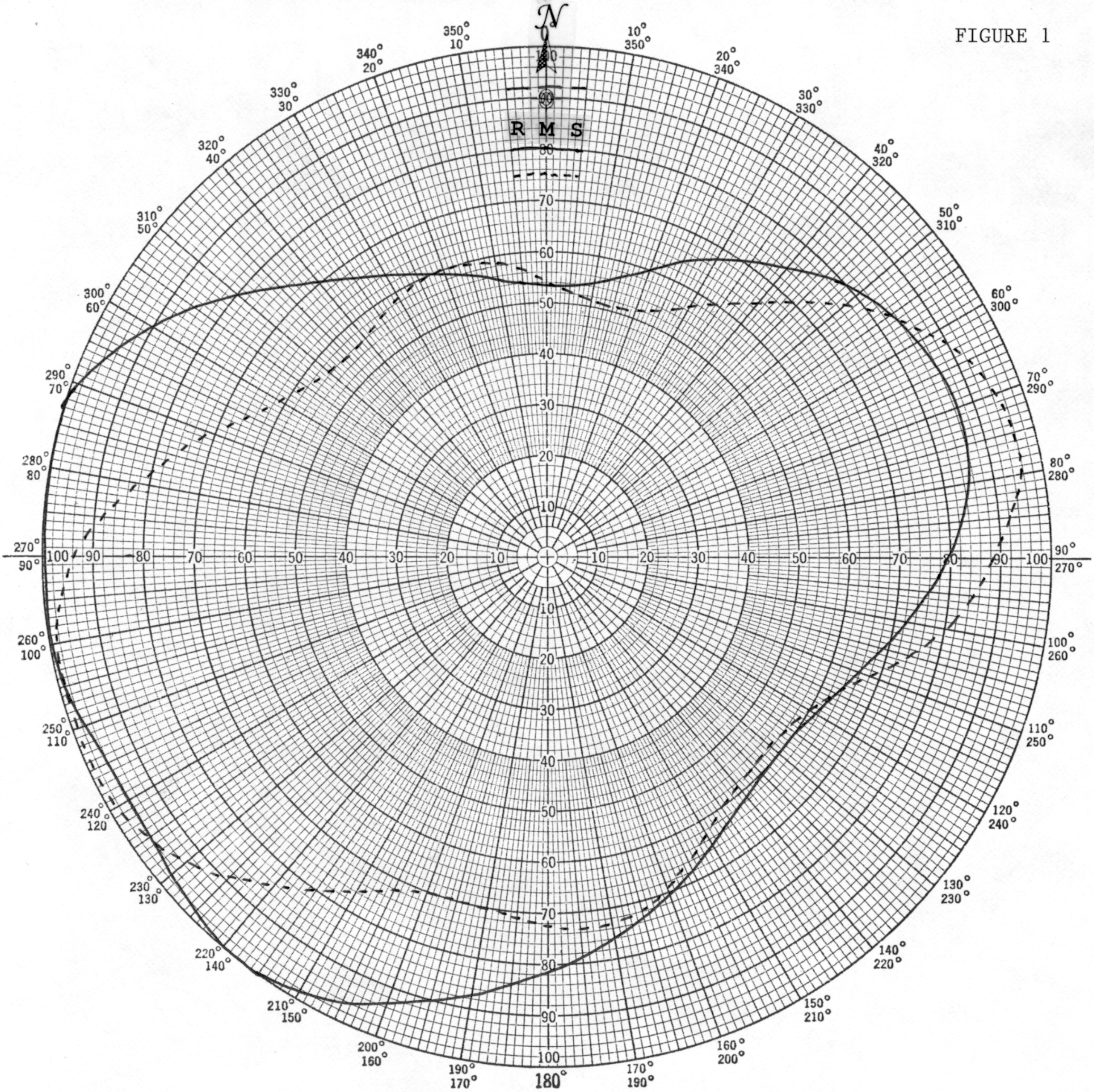
TEST PROCEDURES:

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 439.65 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 21381
February 2, 2001

FIGURE 1



Shively Labs

PROJECT NAME KFMY RAYMOND, WA

PROJECT NUMBER 21381 DATE 1/15/01

MODEL (X) FULL SCALE ( ) FREQUENCY 439.65/97.7 MHz

POLARIZATION HORIZ (———); VERT (----)

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

OBSERVER RAS

ANTENNA TYPE 6810-4R-SS-DA

PATTERN TYPE DIRECTIONAL AZIMUTH

REMARKS: SEE FIGURE 2 FOR MECHANICAL DETAILS

Figure 1A

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TABULATION OF HORIZONTAL POLARIZATION
KFMY RAYMOND, WA

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.535	180	0.815
10	0.545	190	0.875
20	0.600	200	0.930
30	0.675	210	0.989
40	0.745	220	1.000
45	0.780	225	0.985
50	0.810	230	0.970
60	0.850	240	0.960
70	0.865	250	0.975
80	0.850	260	0.995
90	0.795	270	0.995
100	0.725	280	1.000
110	0.660	290	0.990
120	0.615	300	0.905
130	0.600	310	0.800
135	0.605	315	0.750
140	0.615	320	0.705
150	0.655	330	0.640
160	0.705	340	0.590
170	0.760	350	0.555

Figure 1B

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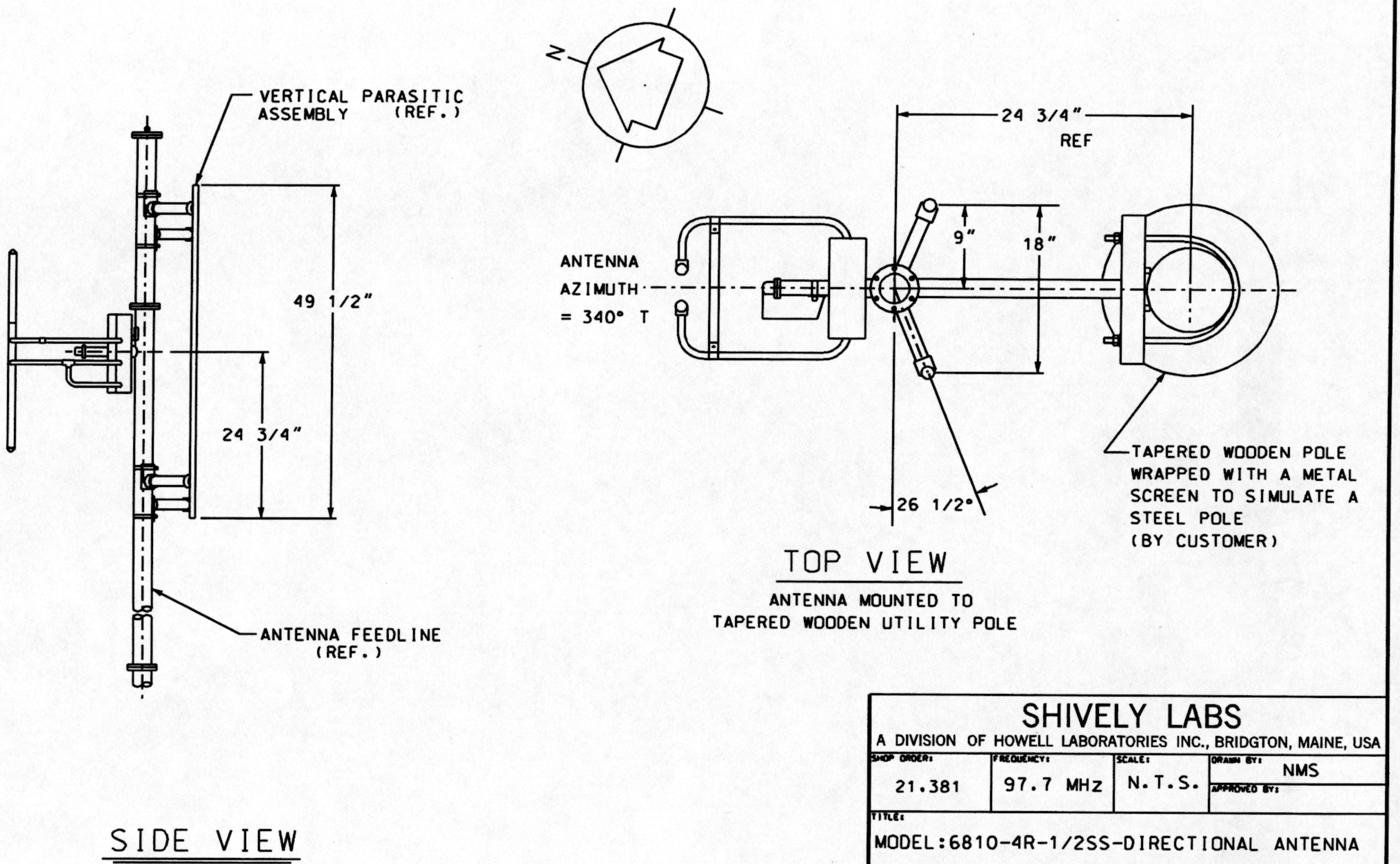
TABULATION OF VERTICAL POLARIZATION
KFMY RAYMOND, WA

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.545	180	0.725
10	0.515	190	0.700
20	0.515	200	0.700
30	0.570	210	0.760
40	0.650	220	0.845
45	0.700	225	0.890
50	0.775	230	0.930
60	0.880	240	0.985
70	0.945	250	0.990
80	0.960	260	0.990
90	0.890	270	0.940
100	0.810	280	0.825
110	0.685	290	0.710
120	0.600	300	0.610
130	0.575	310	0.565
135	0.580	315	0.560
140	0.585	320	0.560
150	0.630	330	0.590
160	0.690	340	0.600
170	0.730	350	0.590



SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE, USA			
SHOP ORDER: 21.381	FREQUENCY: 97.7 MHz	SCALE: N.T.S.	DRAWN BY: NMS APPROVED BY:
TITLE: MODEL:6810-4R-1/2SS-DIRECTIONAL ANTENNA			
DATE: 9/18/00	FIGURE 2		

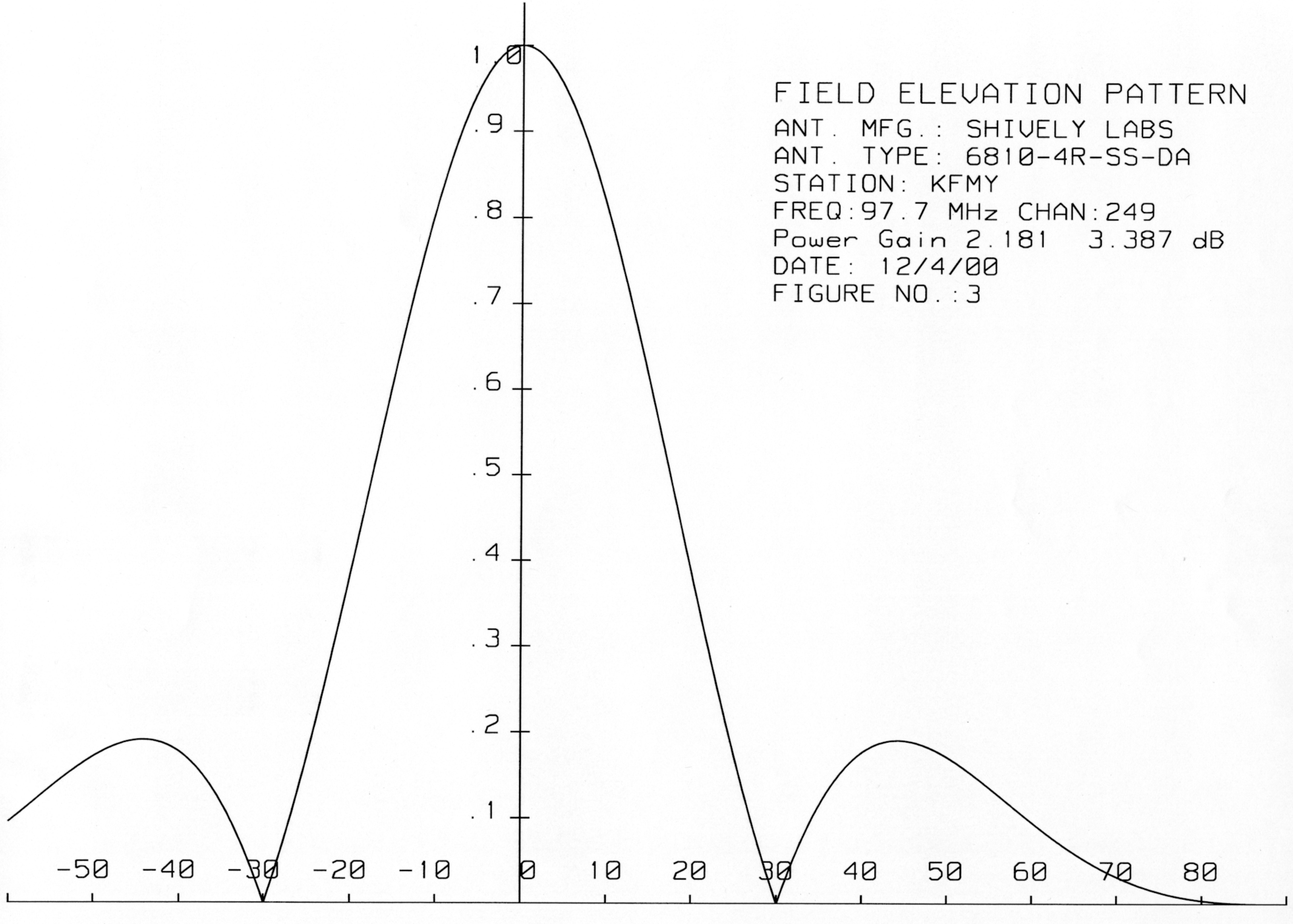

FIELD ELEVATION PATTERN
ANT. MFG.: SHIVELY LABS
ANT. TYPE: 6810-4R-SS-DA
STATION: KFMY
FREQ:97.7 MHz CHAN:249
Power Gain 2.181 3.387 dB
DATE: 12/4/00
FIGURE NO.:3
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
-50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80

FIGURE 4

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VALIDATION OF GAIN CALCULATION

KFMY RAYMOND, WA

MODEL 6810-4R-SS-DA

Elevation Gain of 6810-4R-SS-DA equals 1.309

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

Horizontal RMS divided by Vertical RMS equals
$0.800 \div 0.750 = 1.0667$

Elevation Gain of Horizontal Component equals
$1.309 \times 1.0667 = 1.396$

Elevation Gain of Vertical Component equals
$1.309 \times 0.9375 = 1.227$

Horizontal Azimuth Gain equals $1/(RMS)^2$
$1/(0.800)^2 = 1.5625$

Vertical Azimuth Gain equals $1/(RMS \div Max\ Vert)^2$
$1/(0.750 \div 0.990)^2 = 1.7424$

*** Total Horizontal Gain is Elevation Gain times Azimuth Gain**
1.396 x 1.5625 = 2.181

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
1.227 x 1.742 = 2.138

ERP divided by Horizontal Gain equals Antenna Input Power
44 kW ÷ 2.181 = 20.17

Antenna Input Power times Vertical Gain equals Vertical ERP
20.17 x 2.138 = 43.12

Maximum Value of the Vertical Component squared times the Maximum ERP equals the Vertical ERP
$(0.990)^2 \times 44$ kW = 43.12

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