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S.O. 21914

Report of Test 6810-5R-SS-DA

for

ADDISON BROADCASTING COMPANY, INC.

WXAL ADDISON, VT

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-5R-SS-DA to meet the needs of WXAL and to comply with the requirements of the FCC construction permit, file number BPH-19990528ID.

RESULTS:

The measured azimuth pattern for the 6810-5R-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 BPH-19990528ID indicates that the Horizontal radiation component shall not exceed 25.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

35 Degrees T: 3.61 kW
152 Degrees T: 12.25 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 206 Degrees T to 295 Degrees T. At the restricted azimuth of 35 Degrees T the Vertical component is 9.0 dB down from the maximum of 25.0 kW, or 3.15 kW.

At the restricted azimuth of 152 Degrees T, the Horizontal component is 3.22 dB down from the maximum of 25.0 kW, or 11.9 kW.

The R.M.S. of the Horizontal component is 0.760. The total Horizontal power gain is 2.873. The R.M.S. of the Vertical component is 0.740. The total Vertical power gain is 2.817. See Figure Four for calculations. The R.M.S. of the FCC composite pattern is .900. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-5R-SS-DA was mounted on a tower of exact scale to a Rohn 45 tower. The spacing of the antenna to the tower was varied and vertical parasitic elements were 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 BPH-19990528ID, a single level of the 6810-5R-SS-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.

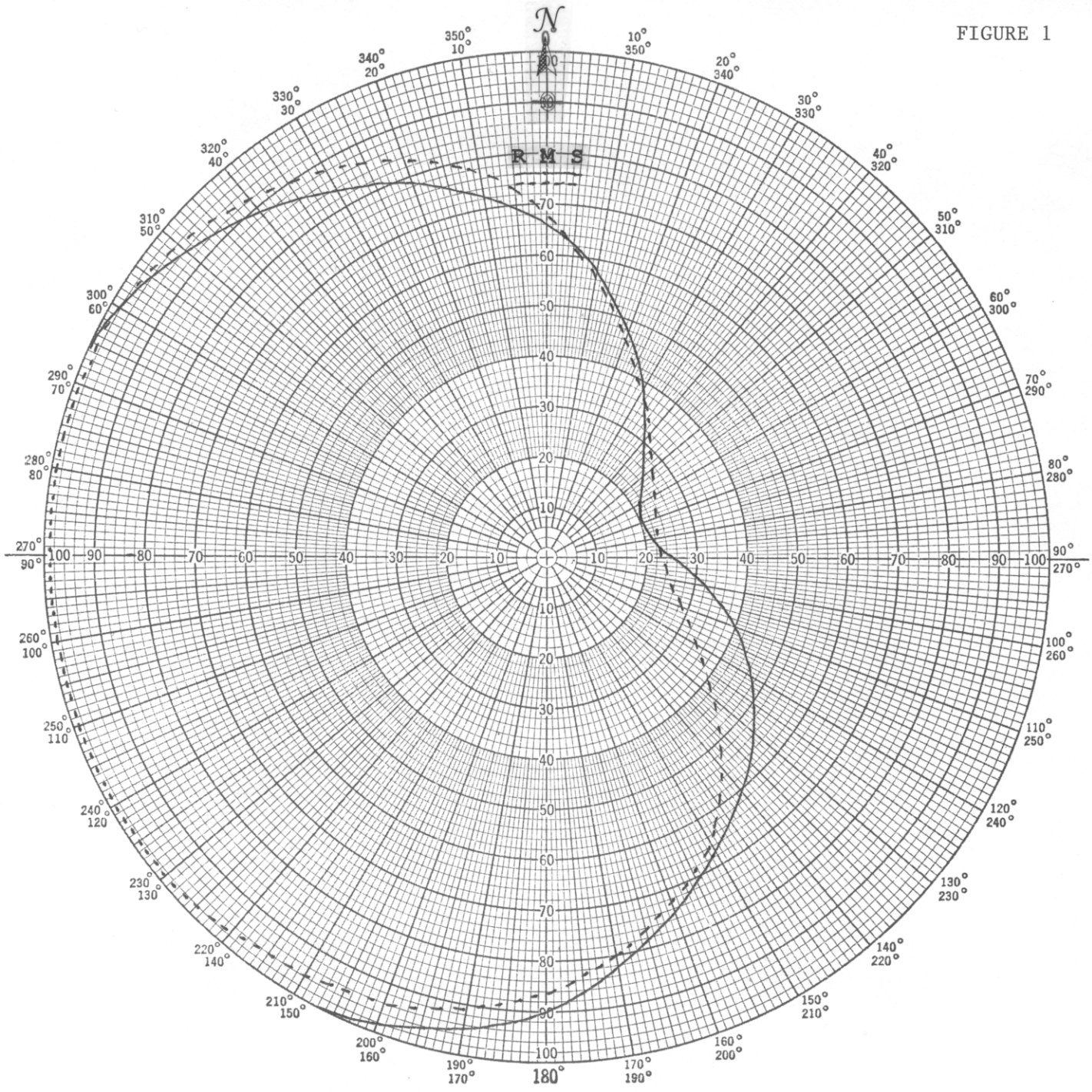
TEST PROCEDURES:

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 421.65 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 21914
July 17, 2001

FIGURE 1



Shively Labs

PROJECT NAME WXAL ADDISON, VT

PROJECT NUMBER 21914 DATE 7/16/01

MODEL (X) FULL SCALE ( ) FREQUENCY 421.65/93.7 MHz

POLARIZATION HORIZ (——); VERT (----)

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

OBSERVER RAS

ANTENNA TYPE 6810-5R-SS-DA

PATTERN TYPE DIRECTIONAL AZIMUTH

REMARKS: SEE FIGURE 2 FOR MECHANICAL DETAILS

Figure 1A

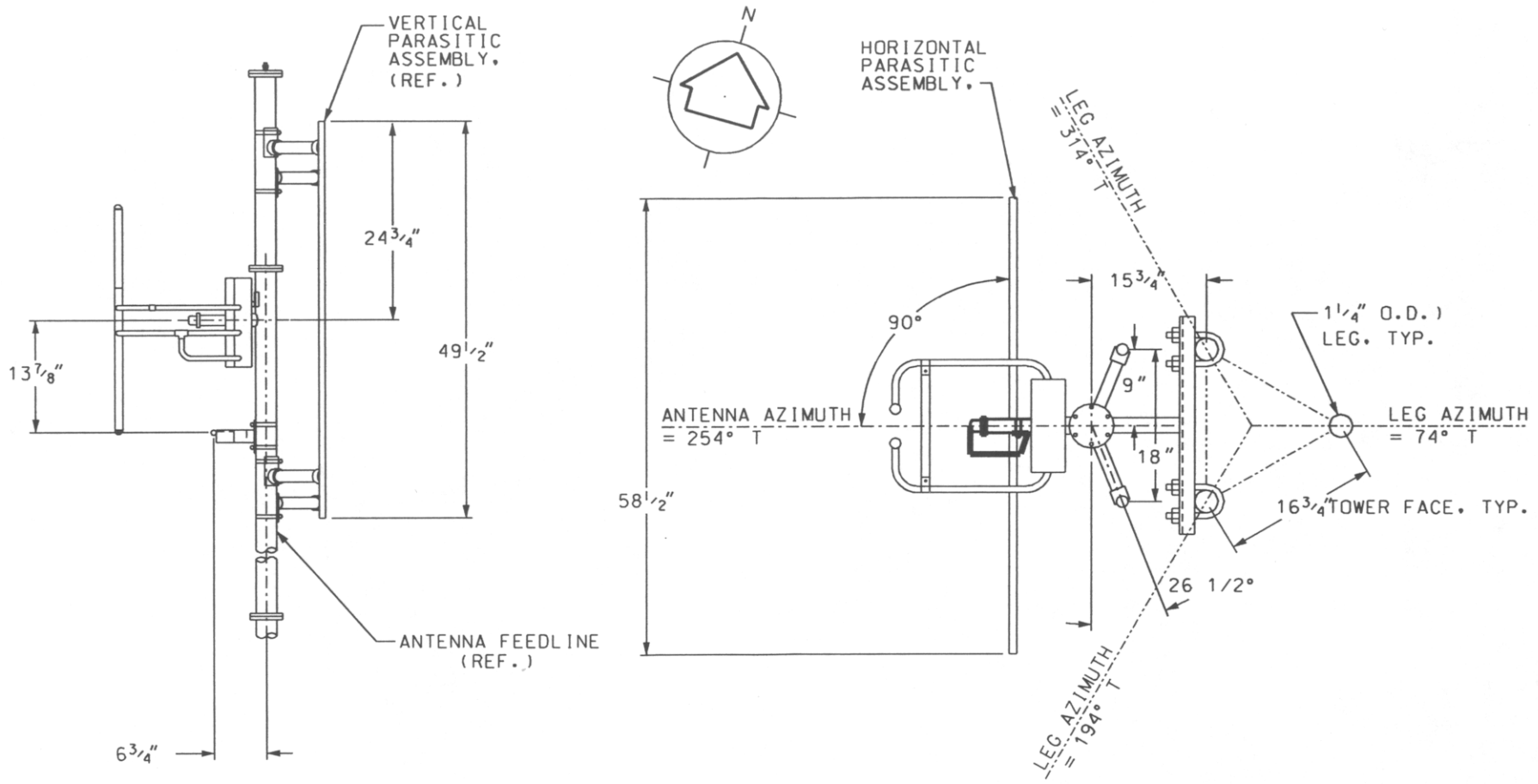
S/O 21914
TABULATION OF HORIZONTAL POLARIZATION
WXAL ADDISON, VT

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.660	180	0.900
10	0.580	190	0.945
20	0.480	200	0.980
30	0.390	210	1.000
40	0.300	220	1.000
45	0.270	225	1.000
50	0.250	230	1.000
60	0.215	240	1.000
70	0.205	250	1.000
80	0.215	260	1.000
90	0.250	270	1.000
100	0.325	280	1.000
110	0.400	290	1.000
120	0.470	300	0.980
130	0.540	310	0.940
135	0.570	315	0.915
140	0.605	320	0.890
150	0.670	330	0.835
160	0.750	340	0.790
170	0.825	350	0.725

Figure 1B

S/O 21914
TABULATION OF VERTICAL POLARIZATION
WXAL ADDISON, VT

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.680	180	0.860
10	0.570	190	0.905
20	0.460	200	0.940
30	0.390	210	0.960
40	0.350	220	0.970
45	0.320	225	0.980
50	0.280	230	0.990
60	0.250	240	0.990
70	0.235	250	0.990
80	0.225	260	0.990
90	0.230	270	0.990
100	0.250	280	0.990
110	0.290	290	0.990
120	0.345	300	0.980
130	0.430	310	0.960
135	0.490	315	0.940
140	0.540	320	0.920
150	0.655	330	0.880
160	0.725	340	0.830
170	0.800	350	0.770



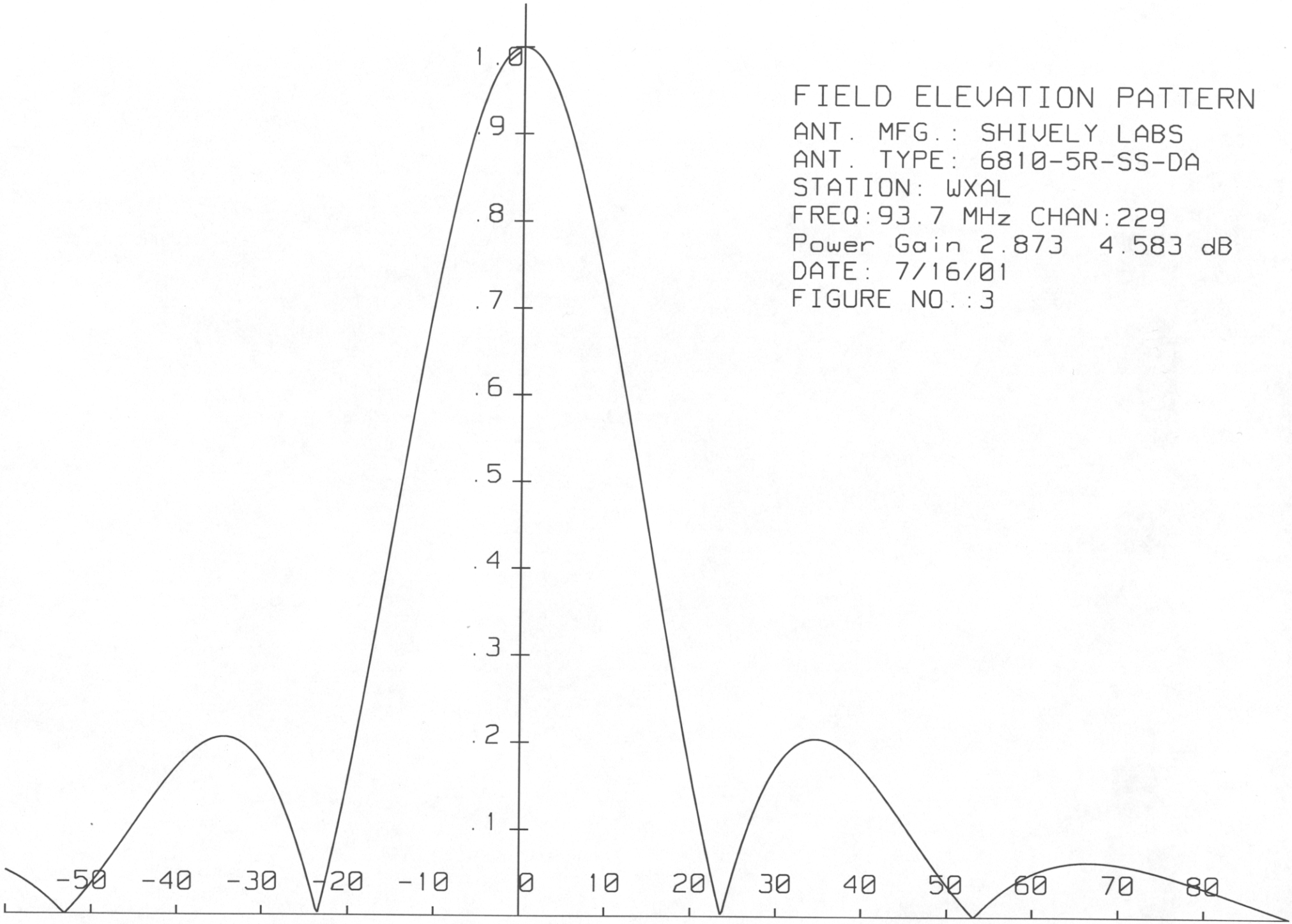
SHIVELY LABS
A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE

SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
21914 ADDISON, VT	93.7 MHz.	N.T.S.	NMS
			APPROVED BY:

TITLE:
MODEL-6810-5R-SS-DIRECTIONAL ANTENNA)

DATE: 6/1/01

FIGURE 2



FIELD ELEVATION PATTERN
ANT. MFG.: SHIVELY LABS
ANT. TYPE: 6810-5R-SS-DA
STATION: WXAL
FREQ:93.7 MHz CHAN:229
Power Gain 2.873 4.583 dB
DATE: 7/16/01
FIGURE NO.:3

FIGURE 4

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VALIDATION OF GAIN CALCULATION

WXAL ADDISON, VT

MODEL 6810-5R-SS-DA

Elevation Gain of 6810-5R-SS-DA equals 1.616

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

Horizontal RMS divided by Vertical RMS equals
$0.76 \div 0.74 = 1.027$

Elevation Gain of Horizontal Component equals
$1.616 \times 1.027 = 1.660$

Elevation Gain of Vertical Component equals
$1.616 \times 0.974 = 1.574$

Horizontal Azimuth Gain equals $1/(RMS)^2$
$1/(0.760)^2 = 1.731$

Vertical Azimuth Gain equals $1/(RMS \div Max\ Vert)^2$
$1/(0.74 \div 0.99)^2 = 1.79$

*** Total Horizontal Gain is Elevation Gain times Azimuth Gain**
1.66 x 1.731 = 2.873

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
1.574 x 1.79 = 2.817

ERP divided by Horizontal Gain equals Antenna Input Power
25.0 kW ÷ 2.873 = 8.70

Antenna Input Power times Vertical Gain equals Vertical ERP
8.70 x 2.817 = 24.51

Maximum Value of the Vertical Component squared times the Maximum ERP equals the Vertical ERP
$(0.99)^2 \times 25.0$ kW = 24.50

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