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S.O. 22599

Report of Test 6810-2R-DA

for

ALPINE BROADCASTING, LTD.

KKIT 99.9 MHZ ANGEL FIRE, NM

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-2R-DA to meet the needs of KKIT and to comply with the requirements of the FCC construction permit, file number BPH-20011120AAA.

RESULTS:

The measured azimuth pattern for the 6810-2R-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-20011120AAA indicates that the Horizontal radiation component shall not exceed 1.75 kW at any azimuth and is restricted to the following values at the azimuths specified:

30 Degrees T: 0.16 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 193 Degrees T to 284 Degrees T. At the restricted azimuth of 30 Degrees T the Horizontal component is 13.76 dB down from the maximum of 1.75 kW, or 0.08 kW.

The R.M.S. of the Horizontal component is 0.765. The total Horizontal power gain is 1.75. The R.M.S. of the Vertical component is 0.740. The total Vertical power gain is 1.713. See Figure Four for calculations. The R.M.S. of the FCC composite pattern is 0.840. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-2R-DA was mounted on a tower of exact scale to an Allied 36 tower. The spacing of the antenna to the tower 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-20011120AAA, a single level of the 6810-2R-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.

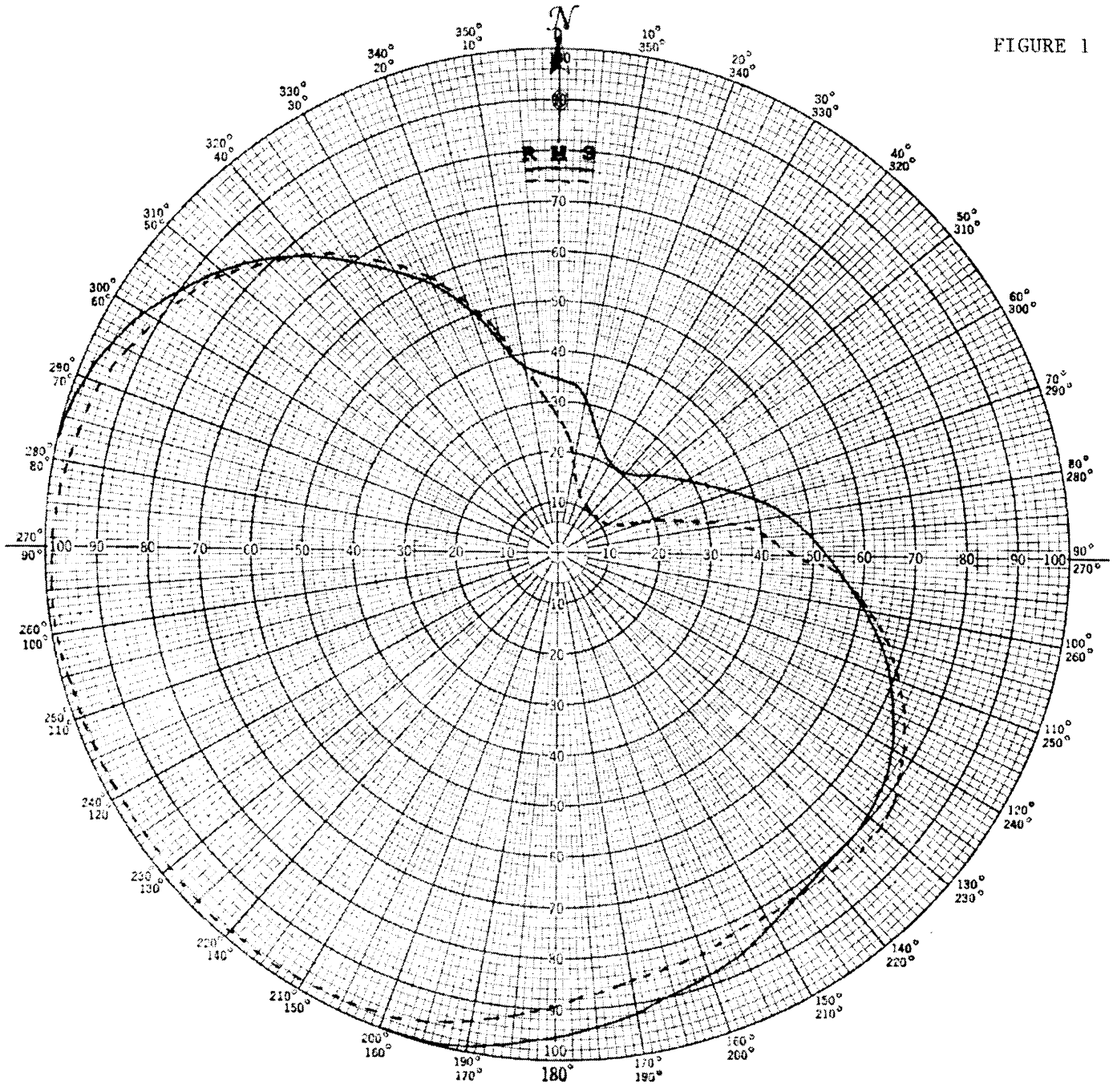
TEST PROCEDURES:

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 449.55 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 22599
August 27, 2002

FIGURE 1



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PROJECT NAME KKIT ANGEL FIRE, NM

PROJECT NUMBER 22599 DATE 8/23/02

MODEL (X) FULL SCALE ( ) FREQUENCY 449.55/99.9 MHz

POLARIZATION HORIZ (——); VERT (----)

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

OBSERVER RAS

ANTENNA TYPE 6810-2R-DA

PATTERN TYPE DIRECTIONAL AZIMUTH

REMARKS: SEE FIGURE 2 FOR MECHANICAL DETAILS

Figure 1A

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TABULATION OF HORIZONTAL POLARIZATION
KKIT ANGEL FIRE, NM

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.345	180	0.955
10	0.310	190	0.990
20	0.240	200	1.000
30	0.205	210	1.000
40	0.205	220	1.000
45	0.220	225	1.000
50	0.240	230	1.000
60	0.290	240	1.000
70	0.360	250	1.000
80	0.455	260	1.000
90	0.530	270	1.000
100	0.610	280	1.000
110	0.690	290	0.980
120	0.755	300	0.935
130	0.795	310	0.860
135	0.800	315	0.815
140	0.805	320	0.760
150	0.840	330	0.640
160	0.880	340	0.510
170	0.920	350	0.370

Figure 1B

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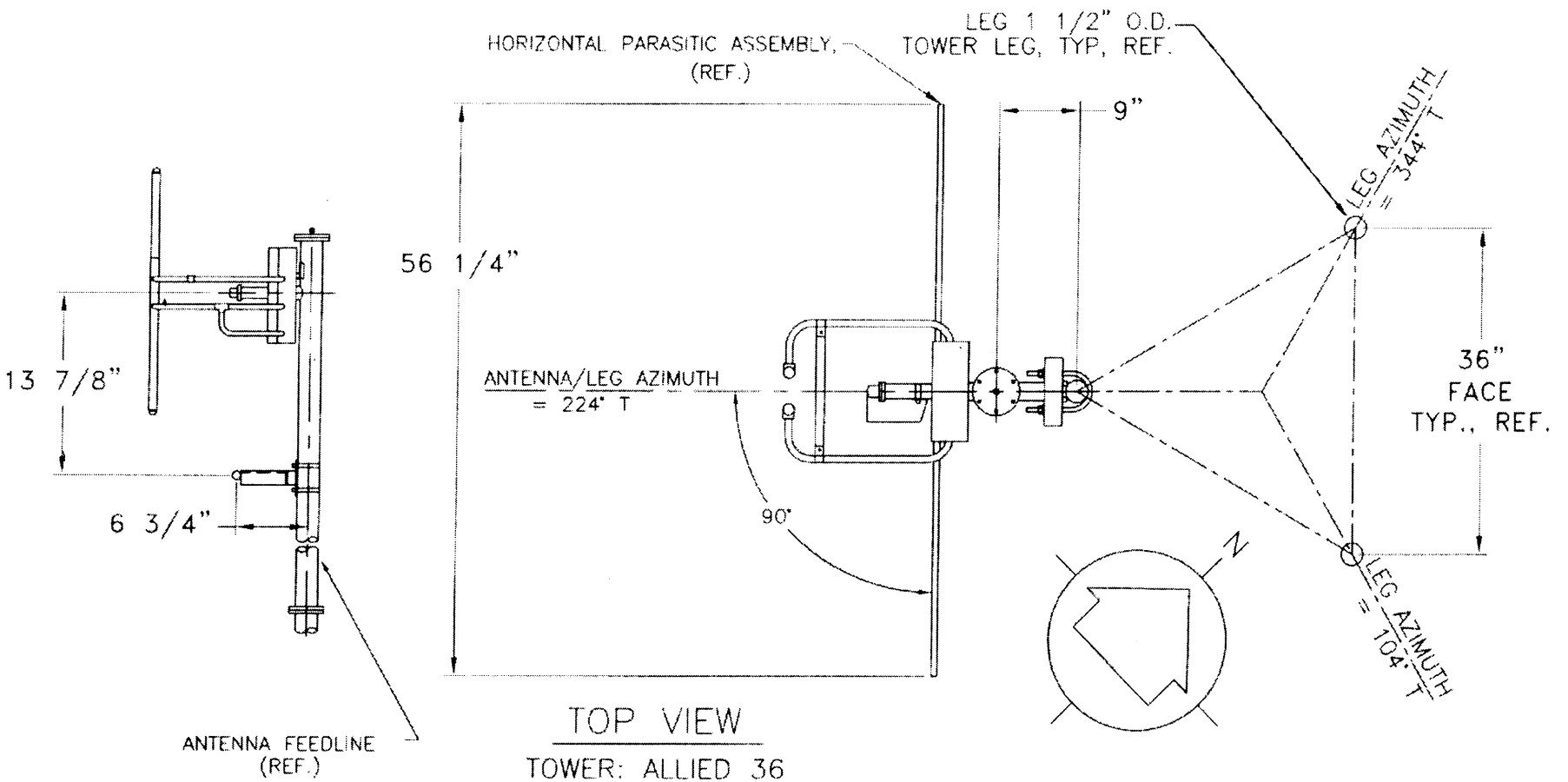
TABULATION OF VERTICAL POLARIZATION
KKIT ANGEL FIRE, NM

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.270	180	0.890
10	0.180	190	0.940
20	0.120	200	0.970
30	0.110	210	0.980
40	0.100	220	0.985
45	0.100	225	0.985
50	0.105	230	0.980
60	0.110	240	0.980
70	0.190	250	0.985
80	0.350	260	0.990
90	0.460	270	0.990
100	0.620	280	0.970
110	0.710	290	0.950
120	0.780	300	0.905
130	0.825	310	0.850
135	0.830	315	0.810
140	0.820	320	0.765
150	0.820	330	0.660
160	0.840	340	0.520
170	0.850	350	0.360



SIDE VIEW

TOP VIEW

TOWER: ALLIED 36
(36" WIDE STRAIGHT FACE TOWER SECTION ATOP A TAPERED SELF-SUPPORTING TOWER SECTION)

SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC.,BRIDGTON, MAINE			
SHOP ORDER: 22599	FREQUENCY: 99.9 MHz.	SCALE: N.T.S.	DRAWN BY: APL APPROVED BY:
MODEL: 6810-2R-DIRECTIONAL ANTENNA			
DATE: UPDATED 08-20-02	FIGURE 2		

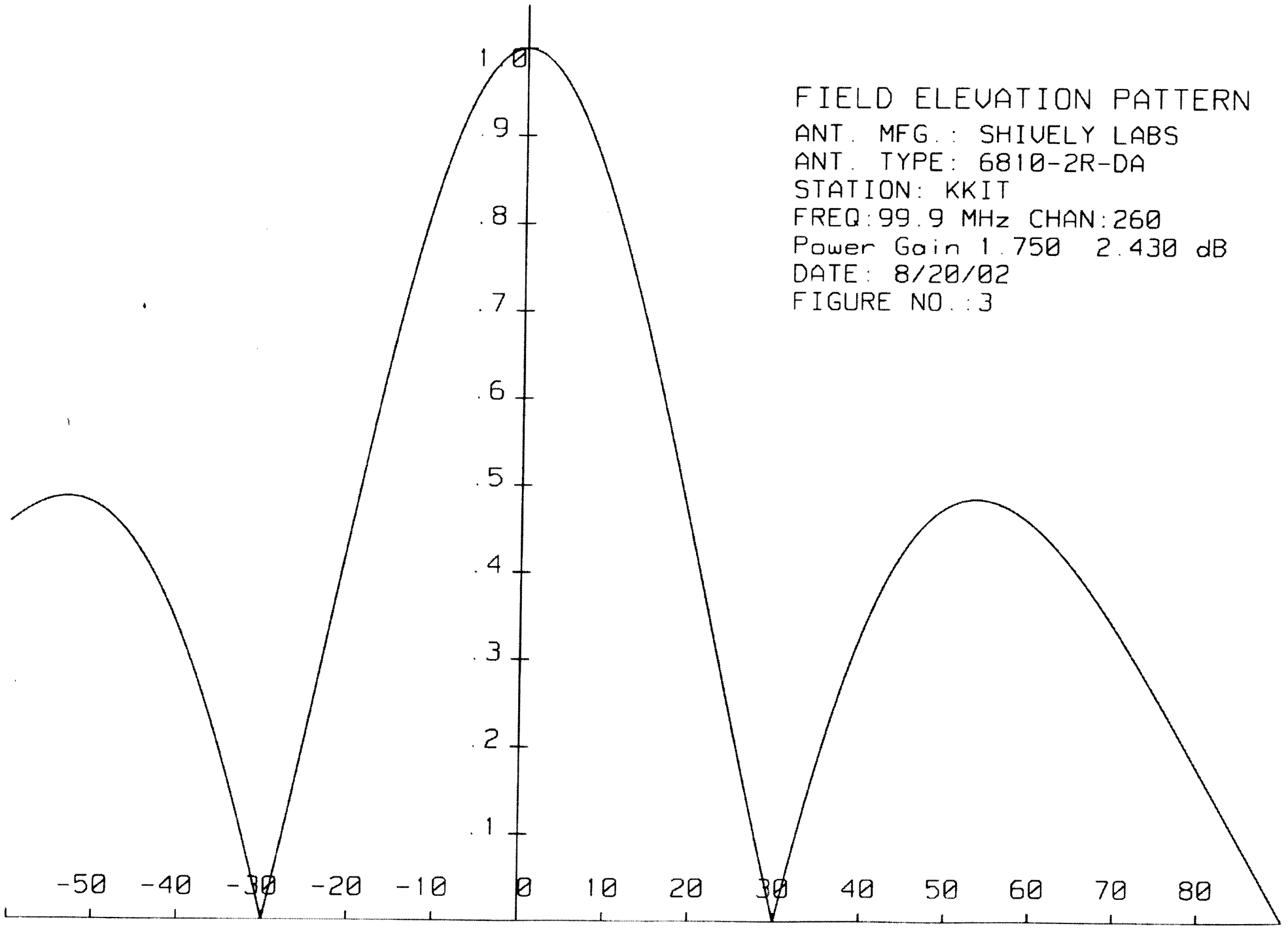

1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
70
80
FIELD ELEVATION PATTERN
ANT. MFG.: SHIVELY LABS
ANT. TYPE: 6810-2R-DA
STATION: KKIT
FREQ:99.9 MHz CHAN:260
Power Gain 1.750 2.430 dB
DATE: 8/20/02
FIGURE NO.:3

FIGURE 4

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VALIDATION OF GAIN CALCULATION

KKIT ANGEL FIRE, NM

MODEL 6810-2R-DA

Elevation Gain of 6810-2R-DA equals 0.99

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

Horizontal RMS divided by Vertical RMS equals
$0.765 \div 0.740 = 1.034$

Elevation Gain of Horizontal Component equals
$0.99 \times 1.034 = 1.024$

Elevation Gain of Vertical Component equals
$0.99 \times 0.967 = 0.957$

Horizontal Azimuth Gain equals $1/(\text{RMS})^2$
$1/(0.765)^2 = 1.709$

Vertical Azimuth Gain equals $1/(\text{RMS} \div \text{Max Vert})^2$
$1/(0.740 \div 0.99)^2 = 1.790$

* **Total Horizontal Gain is Elevation Gain times Azimuth Gain**
  $1.024 \times 1.709 = 1.750$

* **Total Vertical Gain is Elevation Gain times Azimuth Gain**
  $0.957 \times 1.790 = 1.713$

ERP divided by Horizontal Gain equals Antenna Input Power
$1.75 \text{ kW} \div 1.75 = 1.0 \text{ kW}$

Antenna Input Power times Vertical Gain equals Vertical ERP
$1.0 \times 1.713 = 1.713 \text{ kW}$

Maximum Value of the Vertical Component squared times the Maximum ERP equals the Vertical ERP
$(0.99)^2 \times 1.75 \text{ kW} = 1.715 \text{ kW}$

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