Shively Labs
a division of Howell Laboratories,Inc.

P. O. Box 389 Harrison Rd.,
Bridgton, Maine 04009 USA

- An Employee-Owned Company -

(207) 647-3327
888-SHIVELY
Fax: (207) 647-8273
E-mail: sales@shively.com
Web site: www.shively.com

S.O. 22407

Report of Test 6810-8R-DA

for

AMERICAN FAMILY ASSOCIATION

WBKU Ahoskie, NC

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-8R-DA to meet the needs of WBKU and to comply with the requirements of the FCC construction permit, file number BMPED-20010518ABS.

RESULTS:

The measured azimuth pattern for the 6810-8R-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 BMPED-20010518ABS indicates that the Horizontal radiation component shall not exceed 87.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

10 to 20 Degrees T: 48.9 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 78 Degrees T to 84 Degrees T and at 246 Degrees T to 261 Degrees T. At the restricted azimuth of 10 to 20 Degrees T the Horizontal component is 3.6 dB down from the maximum of 87.0 kW, or 37.9 kW.

The R.M.S. of the Horizontal component is 0.807. The total Horizontal power gain is 7.000. The R.M.S. of the Vertical component is 0.790. The total Vertical power gain is 6.860. See Figure Four for calculations. The R.M.S. of the FCC composite pattern is 0.950. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-8R-DA was mounted on a tower of exact scale to a Pirod 24″ tower. The spacing of the antenna to the tower was varied to achieve the horizontal pattern shown in Figure 1. Vertical parasitic elements were 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-20010518ABS, a single level of the 6810-8R-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.

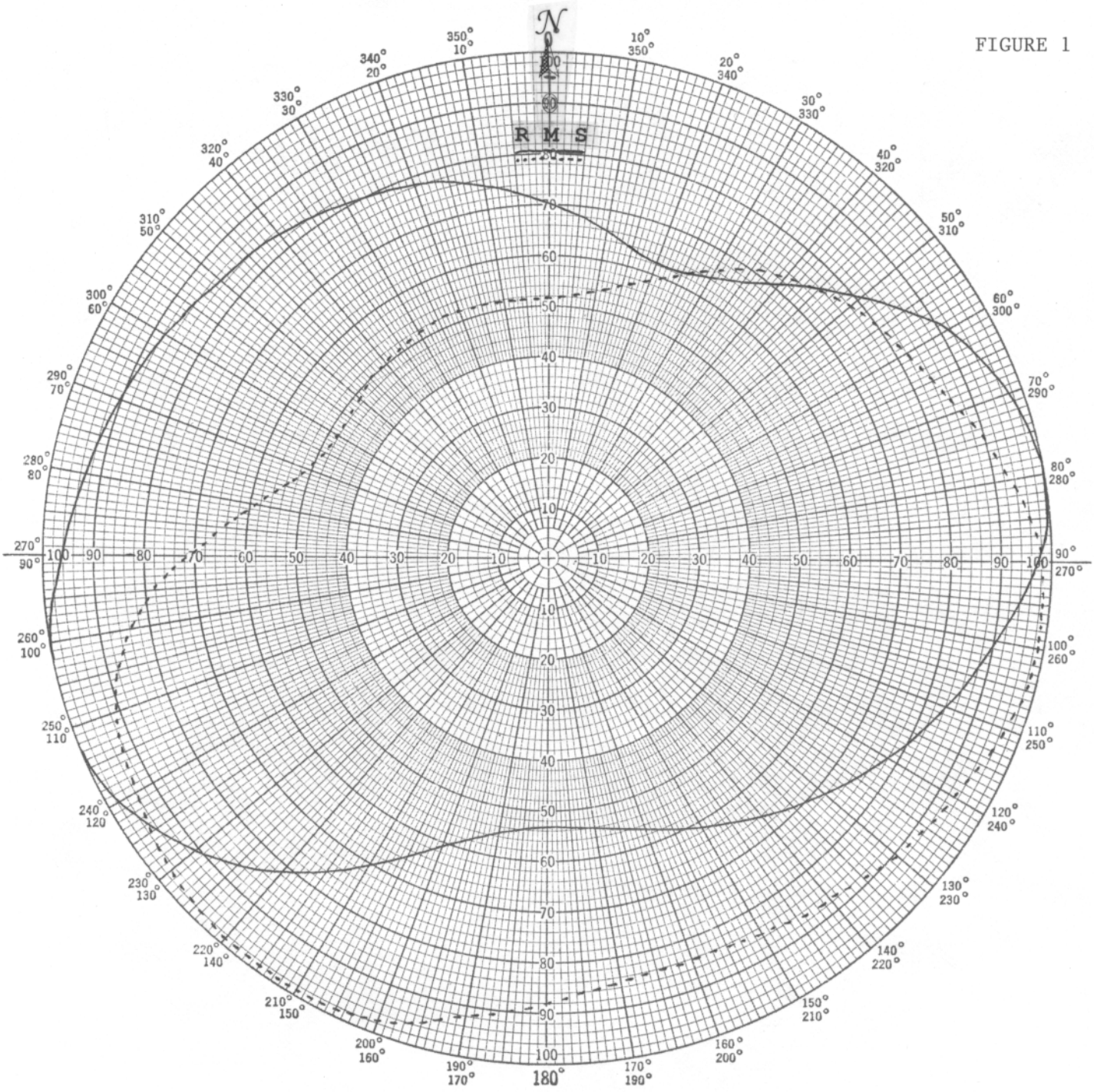
TEST PROCEDURES:

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 412.65 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 22407
May 30, 2002

FIGURE 1



Shively Labs

PROJECT NAME WBKU AHOSKIE, NC

PROJECT NUMBER 22407 DATE 5/30/02

MODEL (X) FULL SCALE ( ) FREQUENCY 412.65/91.7 MHz

POLARIZATION HORIZ (——); VERT (----)

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

OBSERVER RAS

ANTENNA TYPE 6810-8R-DA

PATTERN TYPE DIRECTIONAL AZIMUTH

REMARKS: SEE FIGURE 2 FOR MECHANICAL DETAILS

Figure 1A

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TABULATION OF HORIZONTAL POLARIZATION
WBKU AHOSKIE, NC

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.700	180	0.530
10	0.660	190	0.550
20	0.625	200	0.610
30	0.645	210	0.705
40	0.710	220	0.810
45	0.760	225	0.865
50	0.810	230	0.910
60	0.915	240	0.975
70	0.975	250	1.000
80	1.000	260	1.000
90	0.970	270	0.960
100	0.905	280	0.930
110	0.845	290	0.905
120	0.780	300	0.880
130	0.720	310	0.850
135	0.690	315	0.840
140	0.660	320	0.830
150	0.610	330	0.805
160	0.570	340	0.785
170	0.540	350	0.750

Figure 1B

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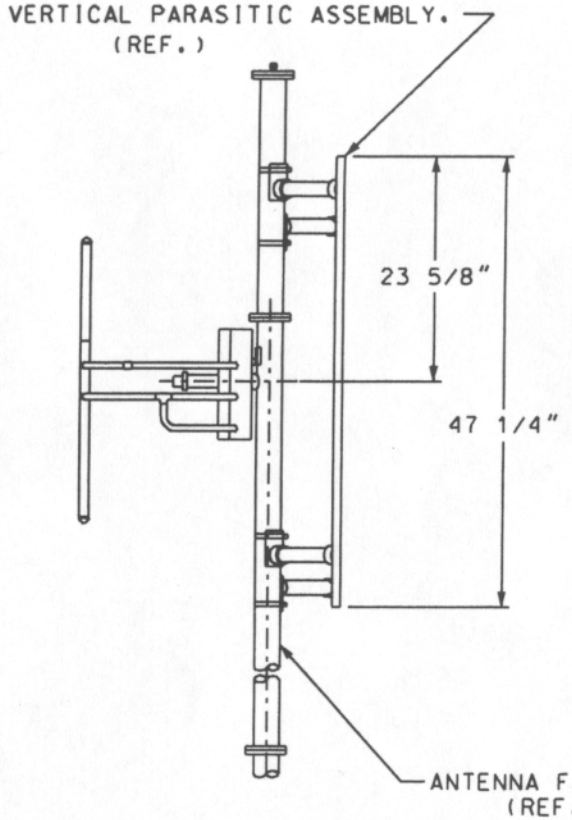
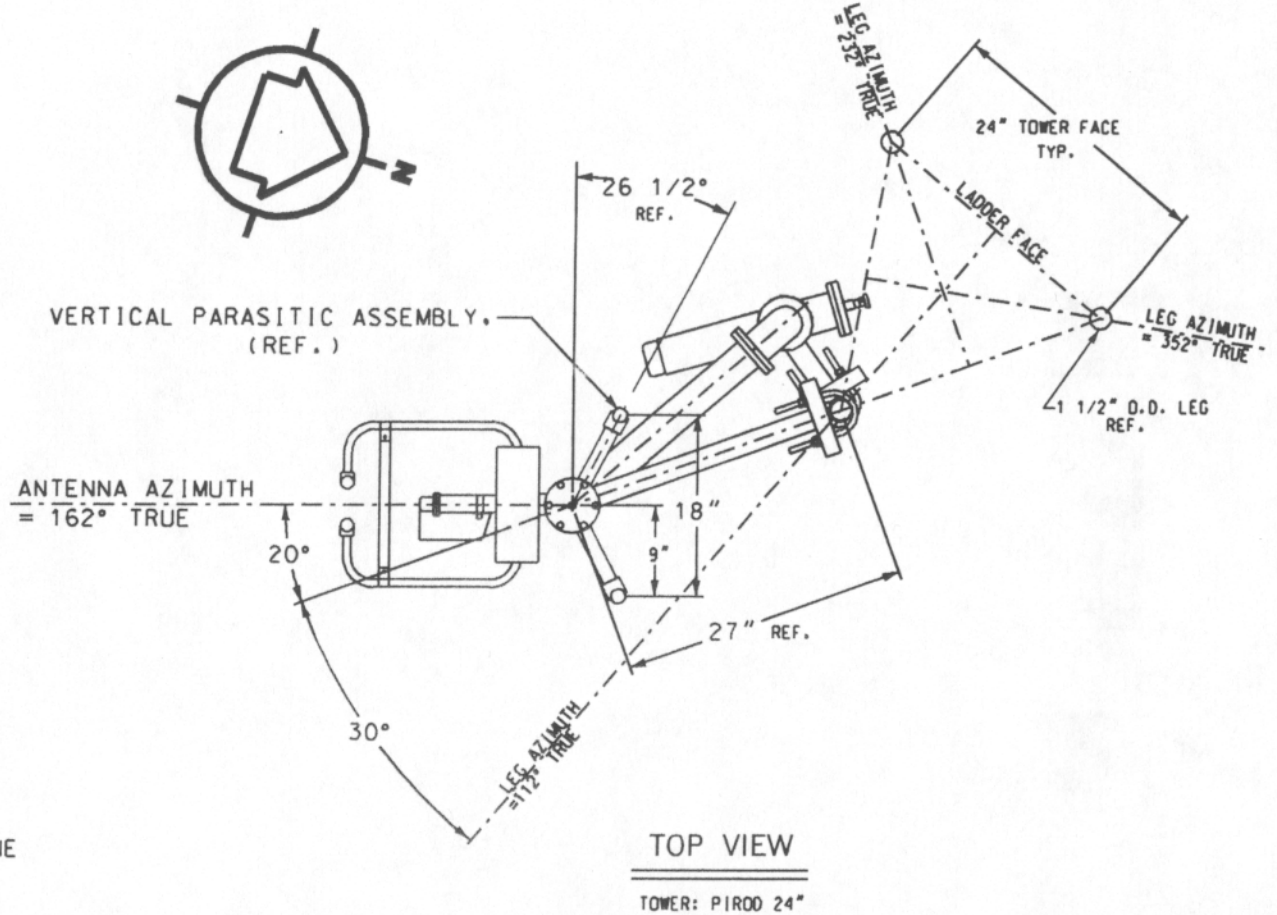
TABULATION OF VERTICAL POLARIZATION
WBKU AHOSKIE, NC

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.515	180	0.890
10	0.535	190	0.920
20	0.585	200	0.975
30	0.660	210	0.990
40	0.730	220	0.990
45	0.760	225	0.980
50	0.780	230	0.970
60	0.820	240	0.940
70	0.870	250	0.910
80	0.930	260	0.840
90	0.980	270	0.715
100	0.990	280	0.590
110	0.970	290	0.510
120	0.930	300	0.480
130	0.905	310	0.490
135	0.890	315	0.500
140	0.875	320	0.500
150	0.855	330	0.515
160	0.840	340	0.520
170	0.850	350	0.515



SIDE VIEW



TOP VIEW

TOWER: PIROD 24"

SHIVELY LABS

A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE

SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY: NMS
22407	91.7 MHz.	N.T.S.	APPROVED BY:

MODEL: 6810-8R-CF-DIRECTIONAL ANTENNA

DATE: 3/26/02

FIGURE 2

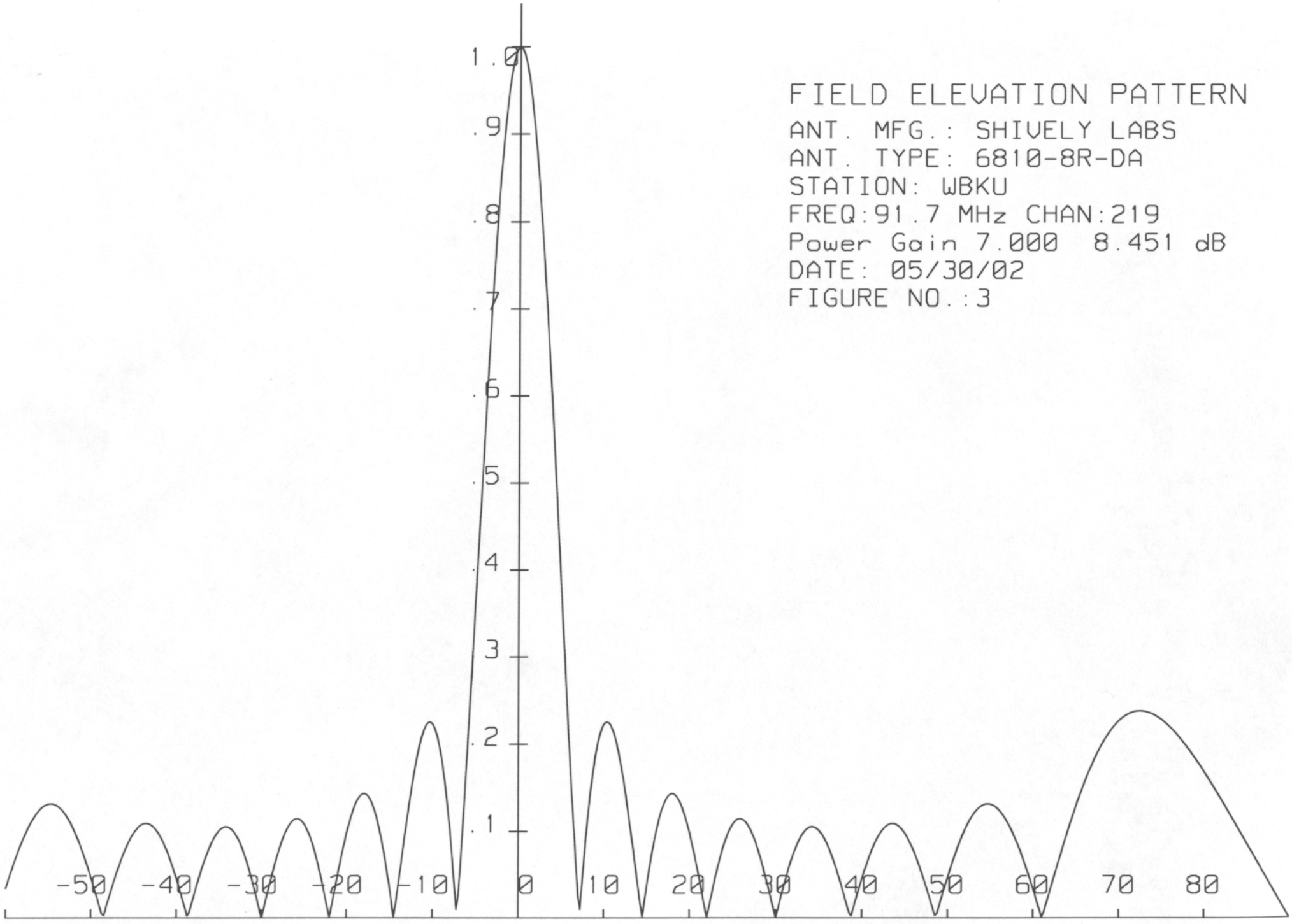

FIELD ELEVATION PATTERN
ANT. MFG.: SHIVELY LABS
ANT. TYPE: 6810-8R-DA
STATION: WBKU
FREQ:91.7 MHz CHAN:219
Power Gain 7.000 8.451 dB
DATE: 05/30/02
FIGURE NO.:3
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
70
80

FIGURE 4

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VALIDATION OF GAIN CALCULATION

WBKU AHOSKIE, NC

MODEL 6810-8R-DA

Elevation Gain of 6810-8R-DA equals 4.463

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

Horizontal RMS divided by Vertical RMS equals
$0.807 \div 0.790 = 1.0215$

Elevation Gain of Horizontal Component equals
$4.463 \times 1.0215 = 4.559$

Elevation Gain of Vertical Component equals
$4.463 \times 0.9789 = 4.369$

Horizontal Azimuth Gain equals $1/(RMS)^2$
$1/(0.807)^2 = 1.536$

Vertical Azimuth Gain equals $1/(RMS \div Max\ Vert)^2$
$1/(0.790 \div 0.990)^2 = 1.570$

*** Total Horizontal Gain is Elevation Gain times Azimuth Gain**
$4.559 \times 1.536 = 7.00$

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
$4.369 \times 1.570 = 6.86$

ERP divided by Horizontal Gain equals Antenna Input Power
$87.0\ kW \div 7.00 = 12.43\ kW$

Antenna Input Power times Vertical Gain equals Vertical ERP
$12.43\ kW \times 6.86 = 85.27$

Maximum Value of the Vertical Component squared times the Maximum ERP equals the Vertical ERP
$(0.990)^2 \times 87.0\ kW = 85.27$

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