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S.O. 22096

Report of Test 6810-5D-DA

for

NEW NORTHWEST BROADCASTERS, LLC

KXDD YAKIMA, WA

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6810-5D-DA to meet the needs KXDD and to comply with the requirements of the FCC construction permit, file number BPH-20010427AAR.

RESULTS:

The measured azimuth pattern for the 6810-5D-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-20010427AAR indicates that the Horizontal radiation component shall not exceed 100 kW at any azimuth and is restricted to the following values at the azimuths specified:

240 Degrees T: 32.0 kW

From Figure 1, the maximum radiation of the Horizontal component occurs at 063 Degrees T to 102 Degrees T and at 282 Degrees T to 332 Degrees T. At the restricted azimuth of 240 Degrees T the Horizontal component is 5.036 dB down from the maximum of 100 kW, or 31.4 kW.

The R.M.S. of the Horizontal component is 0.840. The total Horizontal power gain is 3.918. The R.M.S. of the Vertical component is 0.820. The total Vertical power gain is 3.845. See Figure Four for calculations. The R.M.S. of the FCC composite pattern is 0.965. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6810-5D-DA was mounted on a pole of exact scale to a 6 5/8" O.D. pole. The spacing of the antenna to the tower was varied and vertical parasitic elements were attached to the inter-bay feedline 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-20010427AAR, a single level of the 6810-5D-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.

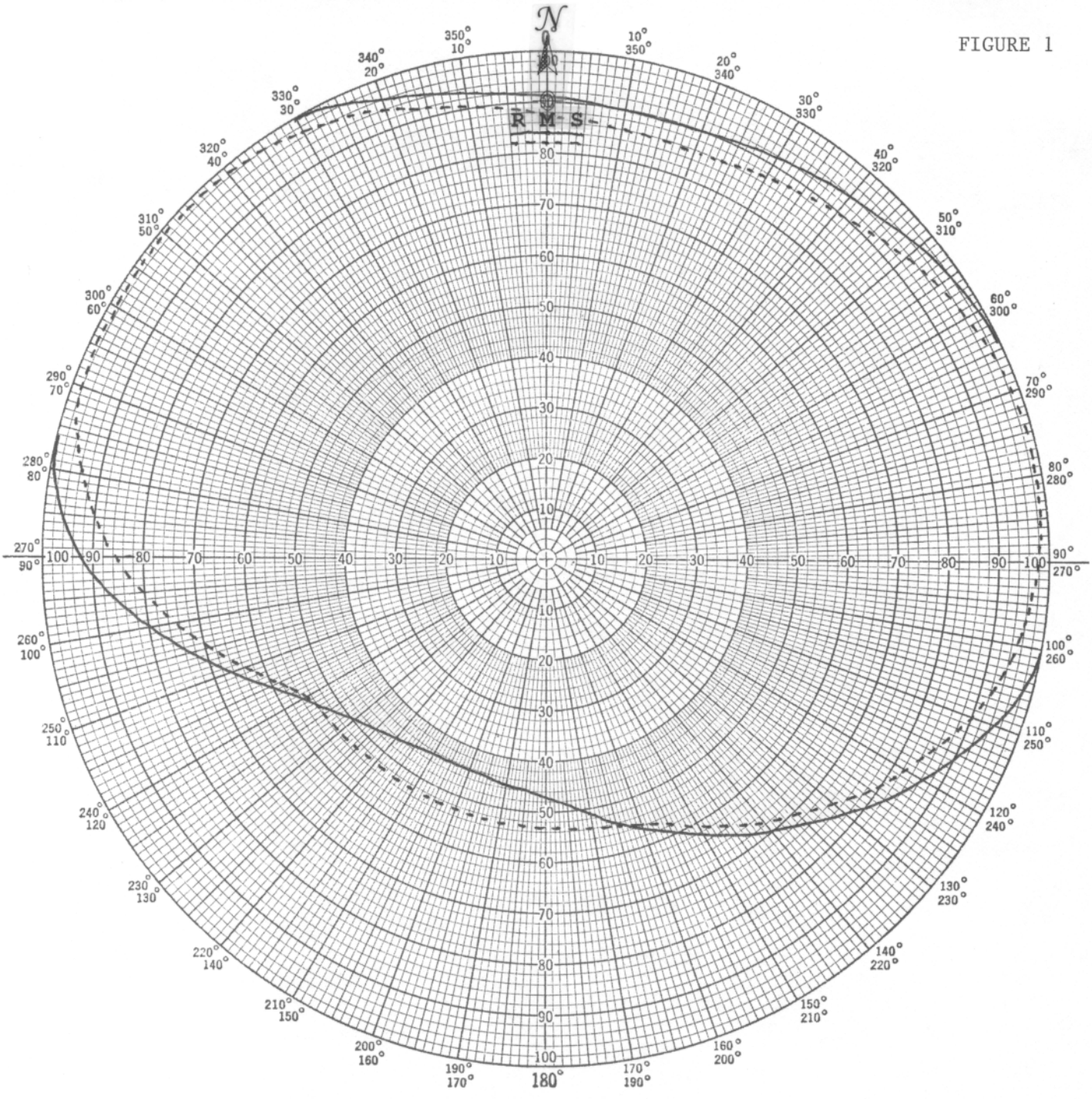
TEST PROCEDURES:

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 468.45 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 22096
February 22, 2002

FIGURE 1



Shively Labs

PROJECT NAME KXDD YAKIMA, WA

PROJECT NUMBER 22096 DATE 10/15/01

MODEL (X) FULL SCALE ( ) FREQUENCY 468.45/104.1 MHz

POLARIZATION HORIZ (———); VERT (----)

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

OBSERVER RAS

ANTENNA TYPE 6810-5D-DA

PATTERN TYPE DIRECTIONAL AZIMUTH

REMARKS:

Figure 1A

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TABULATION OF HORIZONTAL POLARIZATION
KXDD YAKIMA, WA

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.910	180	0.470
10	0.900	190	0.455
20	0.900	200	0.440
30	0.915	210	0.445
40	0.940	220	0.465
45	0.950	225	0.480
50	0.970	230	0.495
60	0.990	240	0.560
70	1.000	250	0.670
80	1.000	260	0.795
90	1.000	270	0.925
100	1.000	280	0.990
110	0.950	290	1.000
120	0.870	300	1.000
130	0.780	310	1.000
135	0.735	315	1.000
140	0.700	320	1.000
150	0.630	330	1.000
160	0.570	340	0.960
170	0.510	350	0.930

Figure 1B

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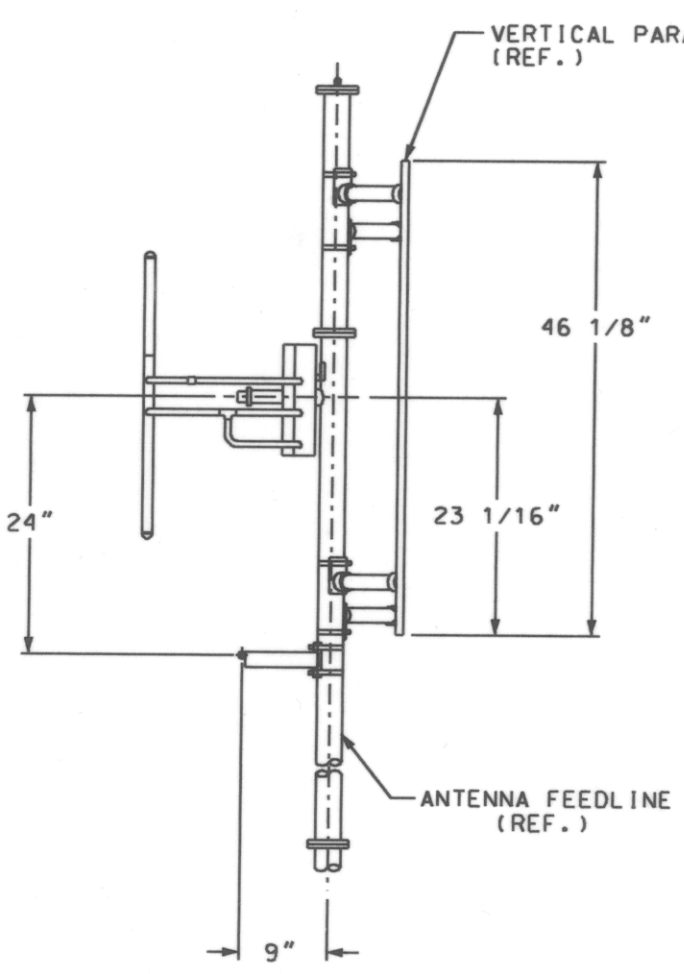
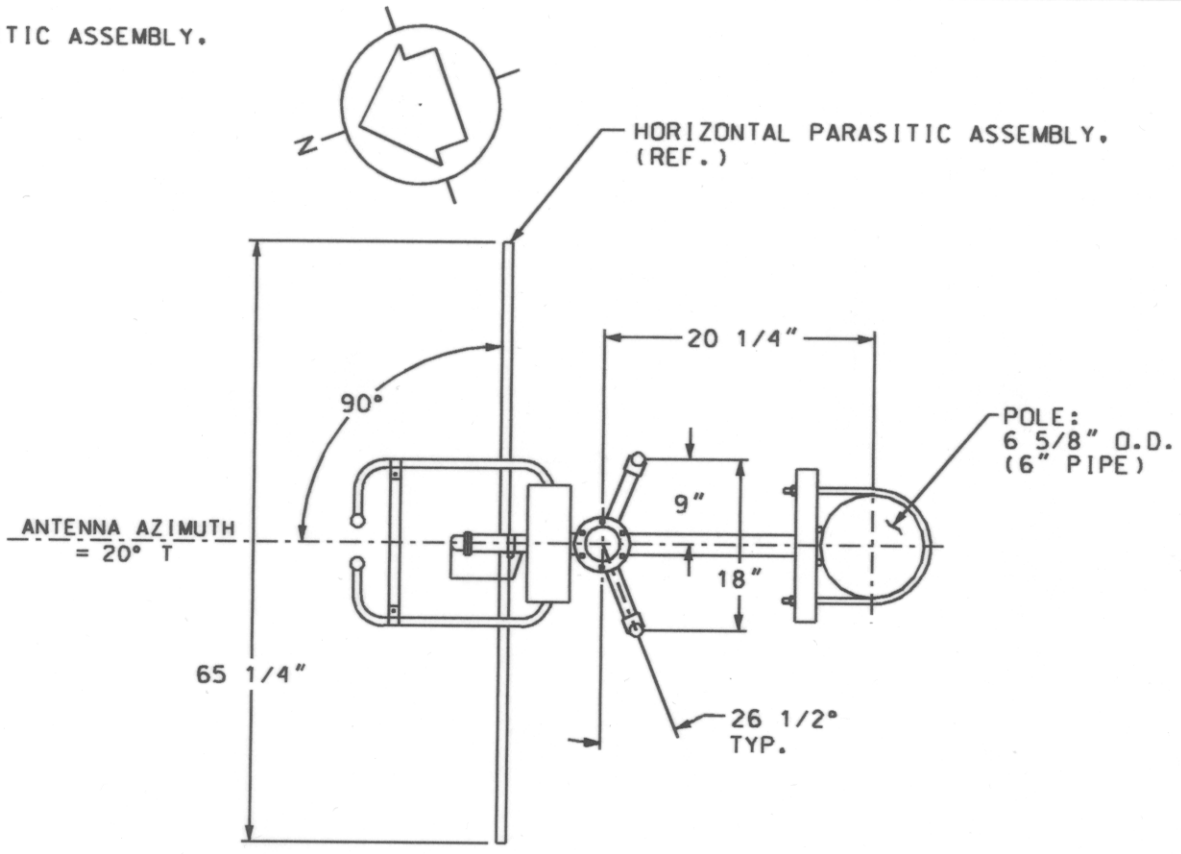
TABULATION OF VERTICAL POLARIZATION
KXDD YAKIMA, WA

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.870	180	0.530
10	0.860	190	0.530
20	0.860	200	0.530
30	0.870	210	0.530
40	0.900	220	0.530
45	0.915	225	0.530
50	0.930	230	0.535
60	0.960	240	0.550
70	0.985	250	0.640
80	0.990	260	0.745
90	0.980	270	0.850
100	0.950	280	0.930
110	0.900	290	0.980
120	0.825	300	0.985
130	0.750	310	0.990
135	0.705	315	0.990
140	0.675	320	0.990
150	0.610	330	0.970
160	0.560	340	0.940
170	0.540	350	0.905



SIDE VIEW



TOP VIEW

6 5/8" O.D. POLE (6" NOM. PIPE)
ATOP A 18" FACE WIDTH
UTILITY TOWER

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

SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
22.096	104.1 MHz	N.T.S.	NMS
			APPROVED BY:

TITLE:
MODEL-6810-5D-DIRECTIONAL ANTENNA

DATE: 9/24/01

FIGURE 2

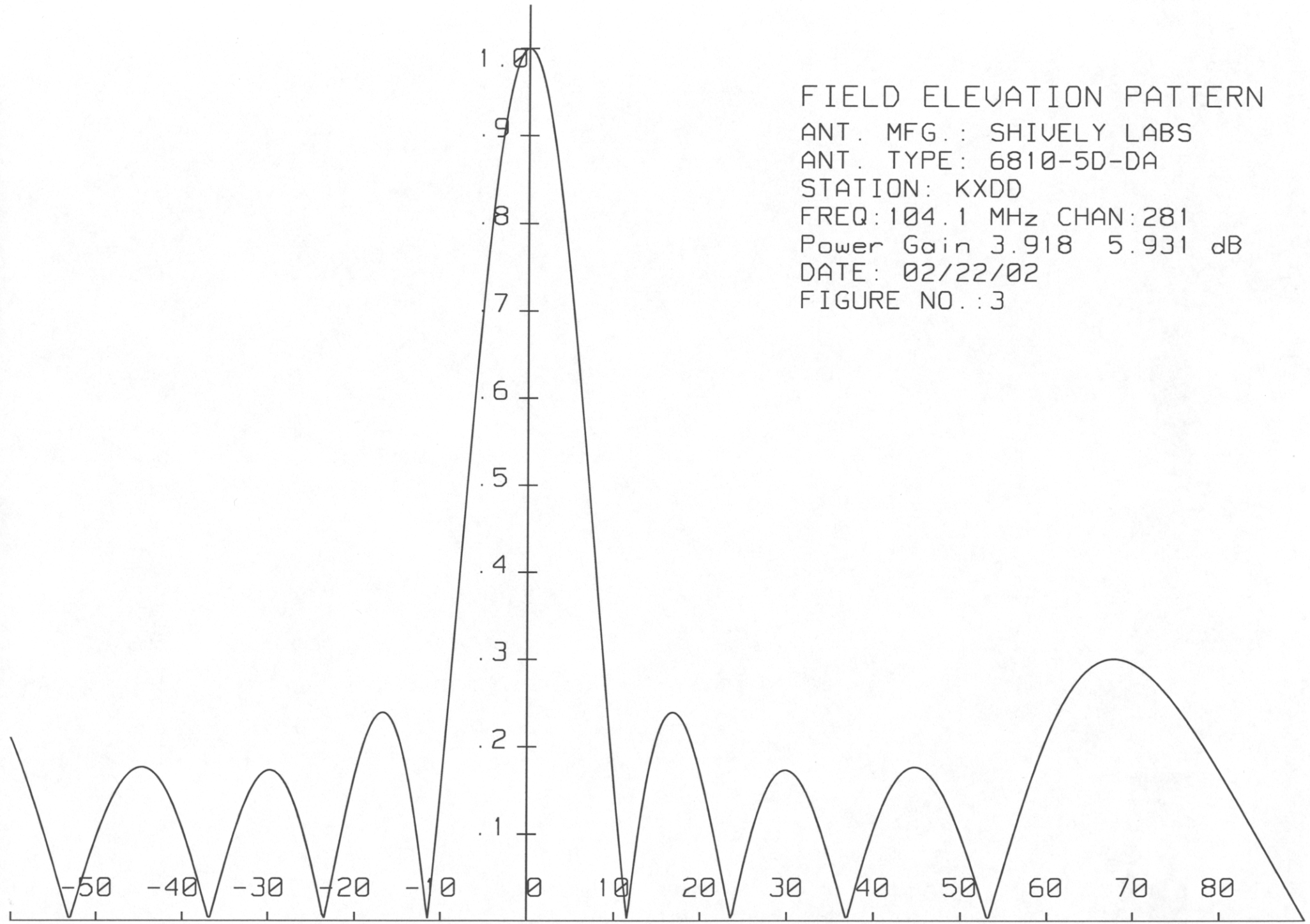

FIELD ELEVATION PATTERN
ANT. MFG.: SHIVELY LABS
ANT. TYPE: 6810-5D-DA
STATION: KXDD
FREQ:104.1 MHz CHAN:281
Power Gain 3.918 5.931 dB
DATE: 02/22/02
FIGURE NO.:3
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
70
80

FIGURE 4

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VALIDATION OF GAIN CALCULATION

KXDD YAKIMA, WA

MODEL 6810-5D-DA

Elevation Gain of 6810-5D-DA equals 2.70

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

Horizontal RMS divided by Vertical RMS equals
$0.840 \div 0.820 = 1.024$

Elevation Gain of Horizontal Component equals
$2.70 \times 1.024 = 2.765$

Elevation Gain of Vertical Component equals
$2.70 \times 1/1.024 = 2.637$

Horizontal Azimuth Gain equals $1/(RMS)^2$
$1/(0.840)^2 = 1.417$

Vertical Azimuth Gain equals $1/(RMS \div Max\ Vert)^2$
$1/(0.820 \div 0.990)^2 = 1.458$

*** Total Horizontal Gain is Elevation Gain times Azimuth Gain**
$2.765 \times 1.417 = 3.918$

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
$2.637 \times 1.458 = 3.845$

ERP divided by Horizontal Gain equals Antenna Input Power
$100\ kW \div 3.918 = 25.52$

Antenna Input Power times Vertical Gain equals Vertical ERP
$25.52 \times 3.845 = 98.12$

Maximum Value of the Vertical Component squared times the Maximum ERP equals the Vertical ERP
$(0.990)^2 \times 100\ kW = 98.01$

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