Shively Labs
a division of Howell Laboratories,Inc.
- An Employee-Owned Company -

P. O. Box 389 Harrison Rd.,
Bridgton, Maine 04009 USA
(207) 647-3327
888-SHIVELY
Fax: (207) 647-8273
E-mail: sales@shively.com
Web site: www.shively.com

S.O. 21,933

Report of Test 6513-2-SS-DA

for

UNIVERSITY OF MASSACHUSETTS

WNEF Newburyport, MA

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6513-2-SS-DA to meet the needs of WNEF and to comply with the requirements of the FCC construction permit, file number BMPED-20011030ADG.

RESULTS:

The measured azimuth pattern for the 6513-2-SS-DA is shown in Figure 1. Figure 1A shows the Tabulation of the Vertical Polarization. The calculated elevation pattern of the antenna is shown in Figure 3. Construction permit file number BMPED-20011030ADG indicates that the Vertical radiation component shall not exceed 0.47 kW at any azimuth and is restricted to the following values at the azimuths specified:

210 - 220 Degrees T: 0.015 kW

From Figure 1, the maximum radiation of the Vertical component occurs at 76 Degrees T to 80 Degrees T. At the restricted azimuth of 210 - 220 Degrees T the Vertical component is 44 dB down from the maximum of 0.47 kW, or 0.001 kW.

The R.M.S. of the Vertical component is 0.630. The total Vertical power gain is 3.533. See Figure Four for calculations. The R.M.S. of the FCC composite pattern is 0.690. Therefore this Pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6513-2-SS-DA was mounted to an outrigged pole of exact scale to a 3 ½" O.D. pole attached to an exact scale model of the self-supported tower defined by the site engineer. The spacing of the antenna to the pole was varied and a vertical parasitic element was 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-20011030ADG, a single level of the 6513-2-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.

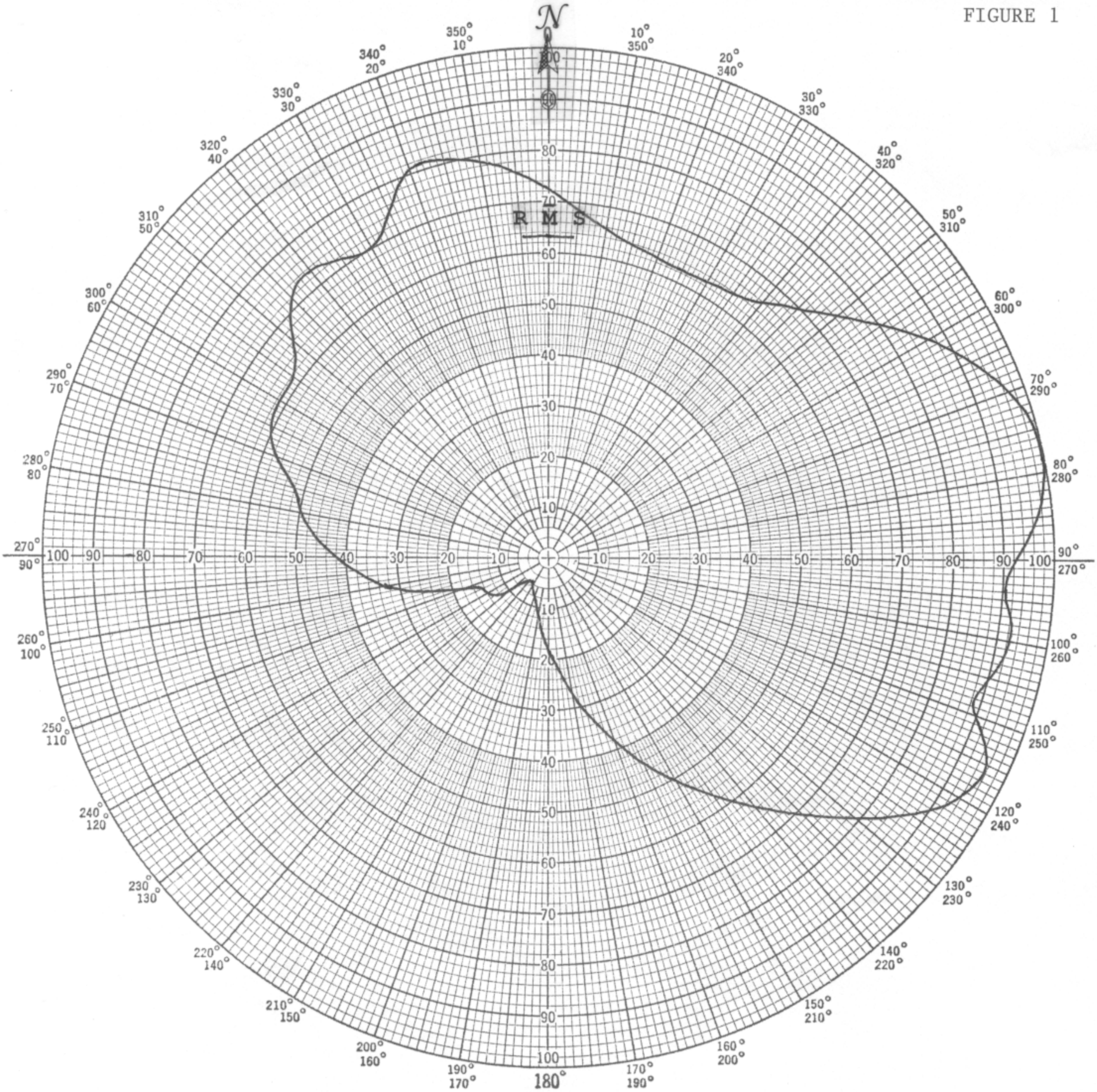
TEST PROCEDURES:

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 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 21,933
December 20, 2001

FIGURE 1



Shively Labs

PROJECT NAME WNEF NEWBURYPORT, MA

PROJECT NUMBER 21933 DATE 11/7/01

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

POLARIZATION VERTICAL

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

OBSERVER RAS

ANTENNA TYPE 6513-2-SS-DA

PATTERN TYPE DIRECTIONAL AZIMUTH

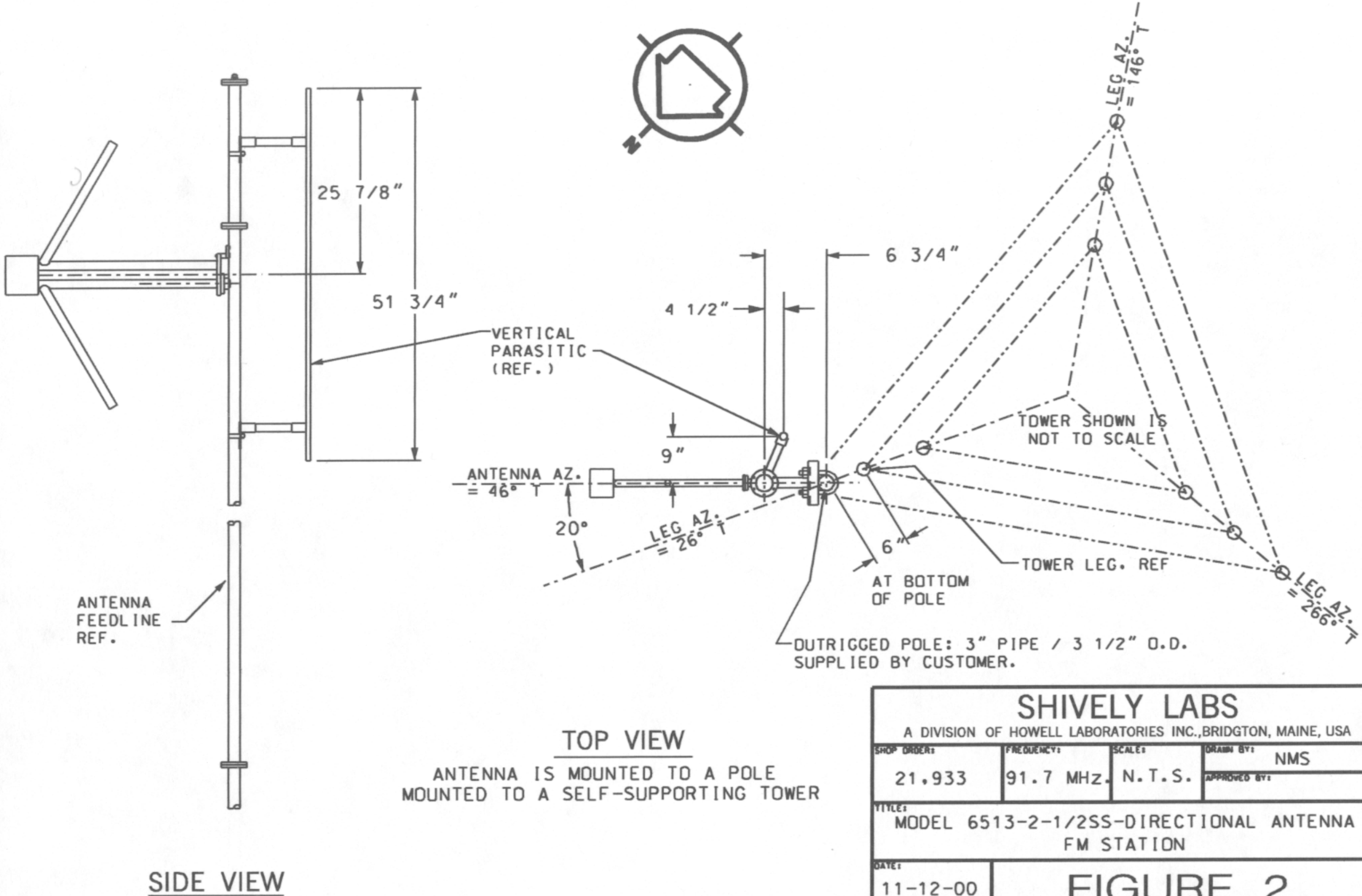
REMARKS: SEE FIGURE 2 FOR MECHANICAL DETAILS

SHIVELY LABS, A DIVISION OF HOWELL LABORATORIES, INC. BRIDGTON, ME 04009 (207) 647-3327

Figure 1A

S/O 21,933
TABULATION OF VERTICAL POLARIZATION
WNEF NEWBURYPORT, MA

DEGREE	RELATIVE FIELD	DEGREE	RELATIVE FIELD
0	0.730	180	0.190
10	0.655	190	0.120
20	0.630	200	0.008
30	0.630	210	0.006
40	0.660	220	0.006
45	0.695	225	0.007
50	0.745	230	0.110
60	0.870	240	0.140
70	0.970	250	0.180
80	1.000	260	0.330
90	0.925	270	0.420
100	0.925	280	0.495
110	0.895	290	0.575
120	0.935	300	0.615
130	0.790	310	0.660
135	0.710	315	0.720
140	0.640	320	0.735
150	0.510	330	0.700
160	0.380	340	0.810
170	0.270	350	0.790



SHIVELY LABS A DIVISION OF HOWELL LABORATORIES INC., BRIDGTON, MAINE, USA			
SHOP ORDER: 21.933	FREQUENCY: 91.7 MHz.	SCALE: N.T.S.	DRAWN BY: NMS APPROVED BY:
TITLE: MODEL 6513-2-1/2SS-DIRECTIONAL ANTENNA FM STATION			
DATE: 11-12-00	FIGURE 2		

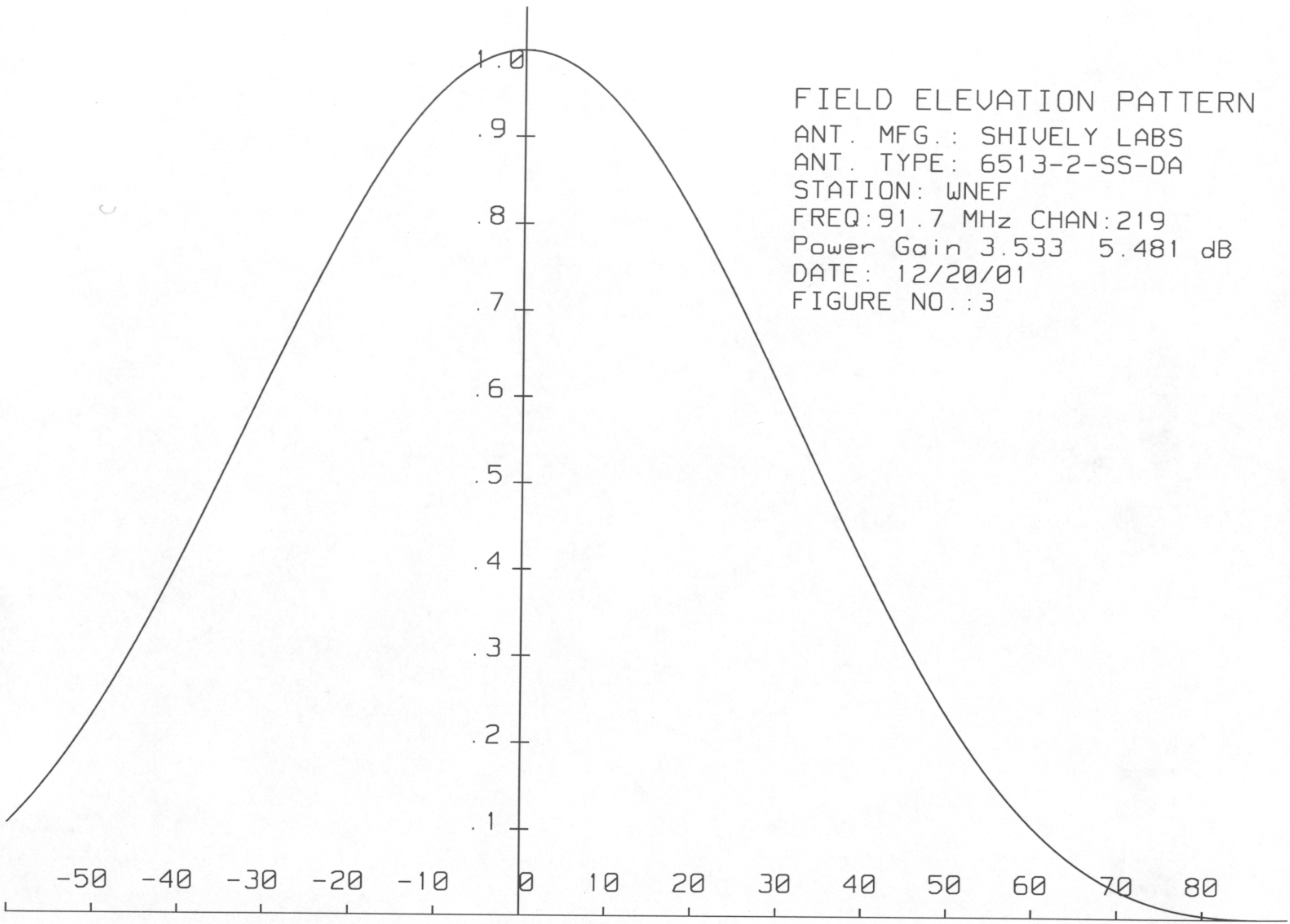

FIELD ELEVATION PATTERN
ANT. MFG.: SHIVELY LABS
ANT. TYPE: 6513-2-SS-DA
STATION: WNEF
FREQ:91.7 MHz CHAN:219
Power Gain 3.533 5.481 dB
DATE: 12/20/01
FIGURE NO.:3
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
-50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80

FIGURE 4

S.O. 21,933

VALIDATION OF GAIN CALCULATION

WNEF NEWBURYPORT, MA

MODEL 6513-2-SS-DA

Elevation Gain of 6513-2-SS-DA equals 1.402

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

Vertical Azimuth Gain equals $1/(RMS)^2$
$1/(0.630)^2 = 2.520$

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
1.402 x 2.520 = 3.533 kW

ERP divided by Vertical Gain equals Antenna Input Power

0.47 kW ÷ 3.533 = 0.133 kW