Shively Labs
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S.O. 24437

Report of Test Scala FMV/50N

for

CSN INTERNATIONAL

WWFP 90.5 MHz BRIGANTINE, NJ

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a Scala FMV/50N to meet the needs of WWFP and to comply with the requirements of the FCC construction permit, file number BMPED-20041101ABZ.

RESULTS:

The measured azimuth pattern for the Scala FMV/50N 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-20041101ABZ indicates that the Vertical radiation component shall not exceed 0.077 kW at any azimuth and is restricted to the following values at the azimuths specified:

240 Degrees T: 0.002 kW

From Figure 1, the maximum radiation of the Vertical component occurs at 015 Degrees T to 060 Degrees T. At the restricted azimuth of 240 Degrees T the Vertical component is 18.78 dB down from the maximum of 0.077 kW, or 0.001 kW.

The R.M.S. of the Vertical component is 0.607. The total Vertical power gain is 2.464. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.6537. The R.M.S. of the measured composite pattern is 0.607. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.5556. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the Scala FMV/50N antenna was mounted on a pole of exact scale to a 2" pole. The spacing of the antenna to the tower was varied and vertical parasitic elements were attached to the pole 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-20041101ABZ, a single level of the Scala FMV/50N 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 407.25 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 24437
January 19, 2006

Shively Labs

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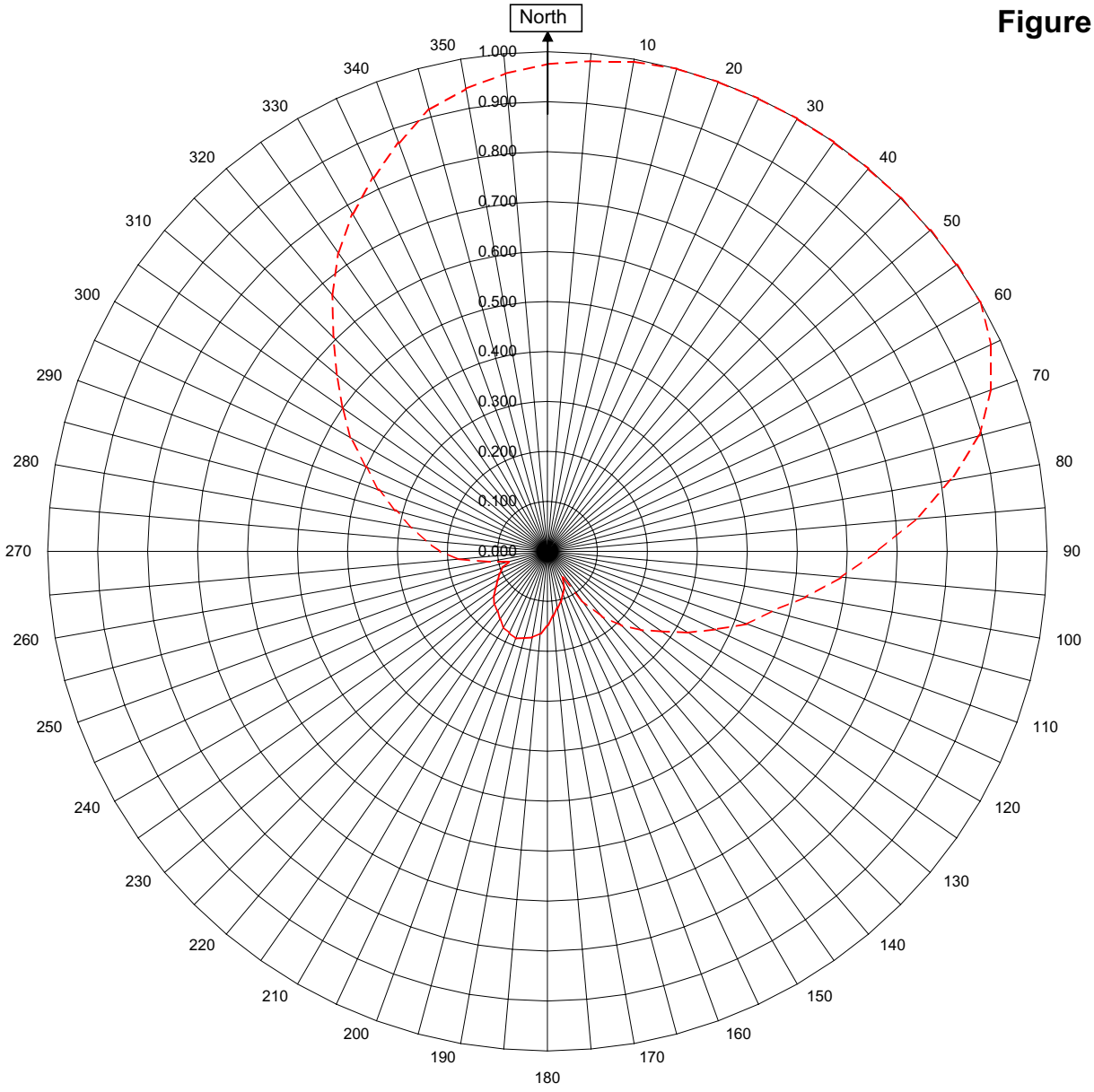
Figure 1



WWFP
Brigantine, NJ

24437

January 19, 2006

_____Horizontal RMS	0.000
_ _ _ _ _ _ _ _ _ Vertical RMS	0.607
H/V Composite RMS	0.607

Frequency	90.5 / 407.25 mHz
Plot	Relative Field
Scale	4.5 : 1

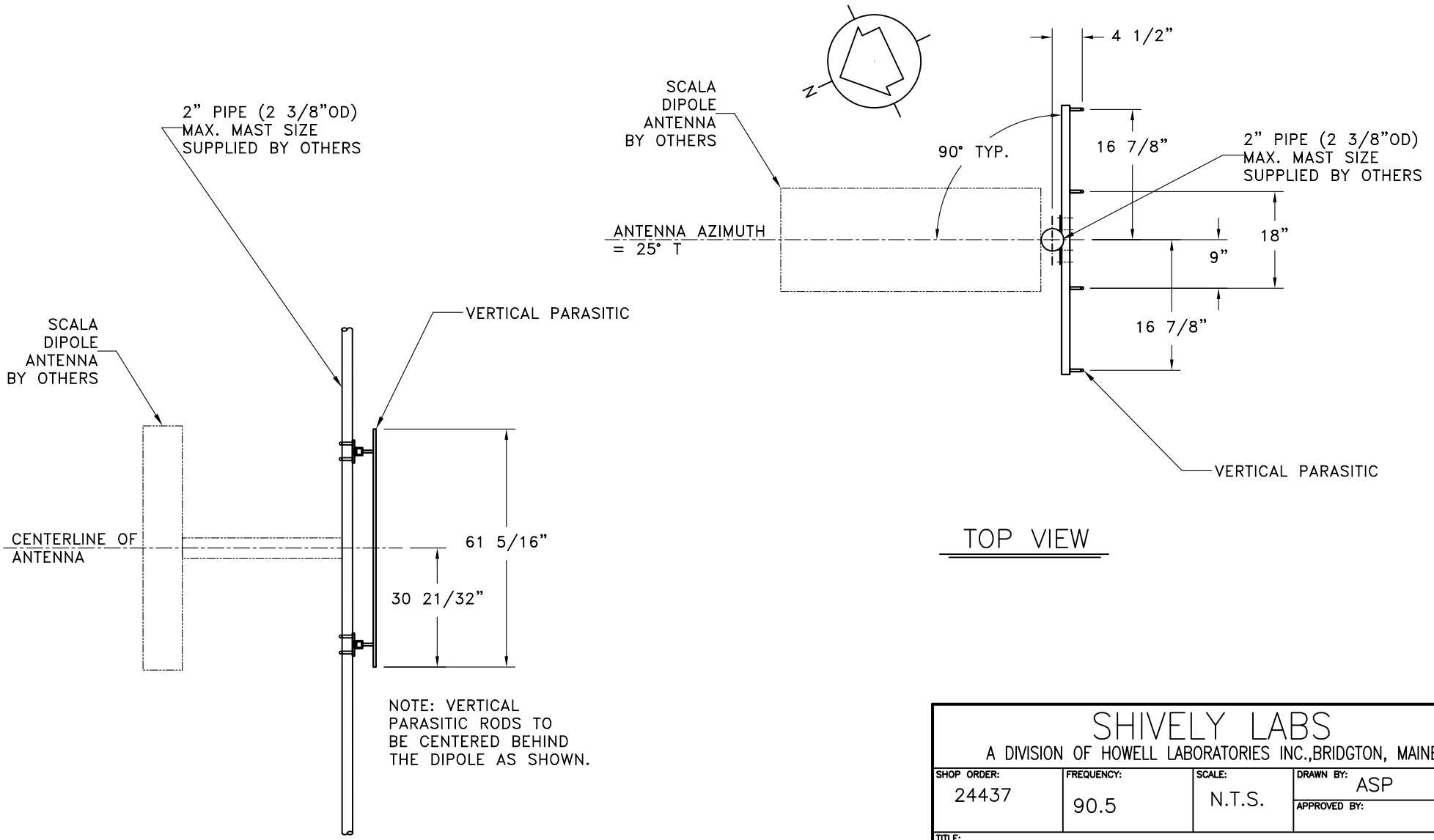
Antenna Model	Scala FMV/50N
Pattern Type	Directional Azimuth

See Figure 2 for Mechanical Details

Figure 1a

Tabulation of Vertical Azimuth Pattern
WWFP Brigantine, NJ

Azimuth	Rel Field	Azimuth	Rel Field
0	0.975	180	0.150
10	0.995	190	0.175
20	1.000	200	0.185
30	1.000	210	0.175
40	1.000	220	0.155
45	1.000	225	0.150
50	1.000	230	0.140
60	1.000	240	0.115
70	0.945	250	0.095
80	0.820	260	0.120
90	0.660	270	0.215
100	0.525	280	0.275
110	0.425	290	0.360
120	0.325	300	0.455
130	0.245	310	0.550
135	0.210	315	0.605
140	0.170	320	0.670
150	0.060	330	0.780
160	0.090	340	0.870
170	0.115	350	0.940



ANTENNA HEADING: 25° TRUE NORTH

SHIVELY LABS

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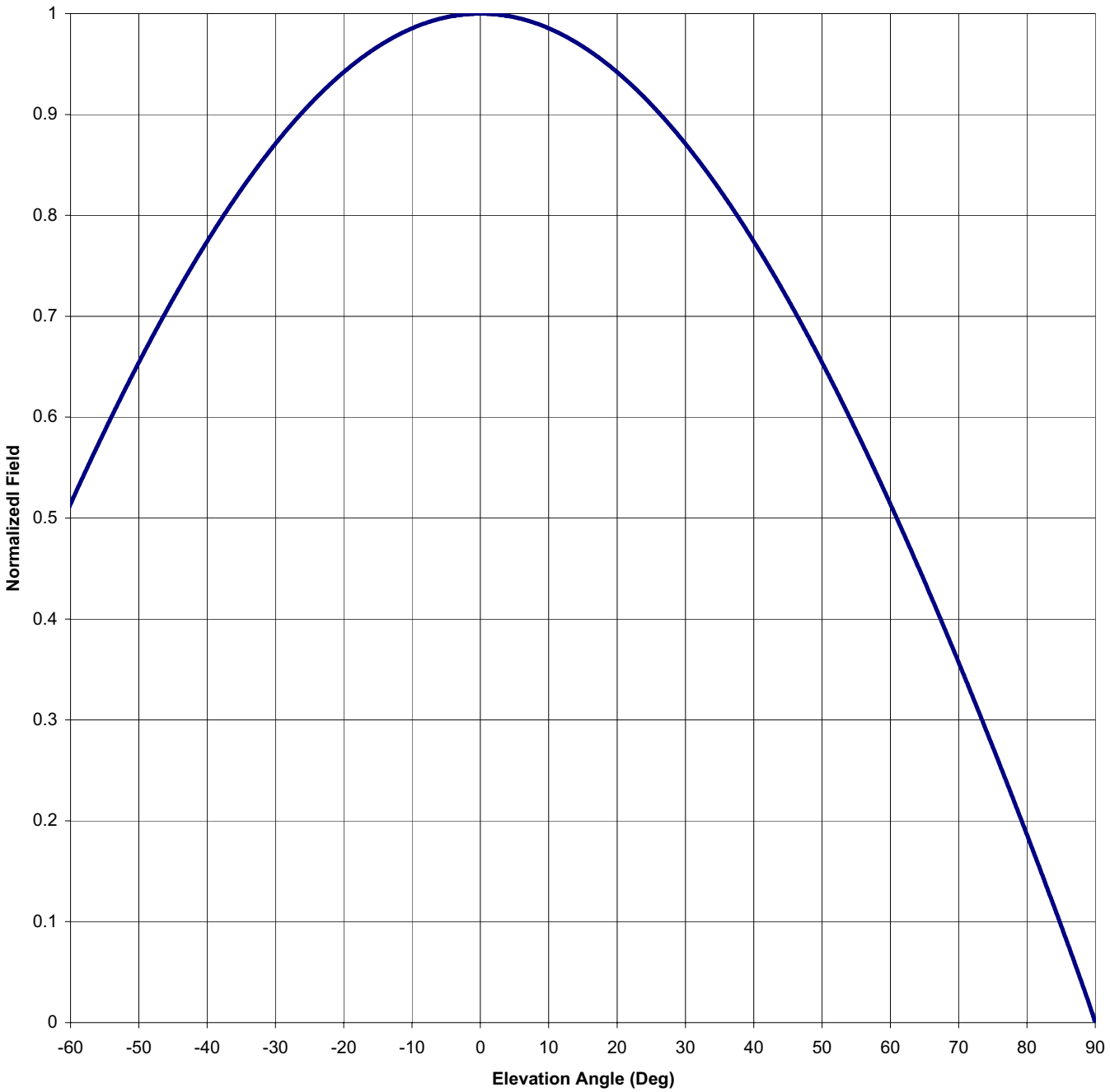
SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY:
24437	90.5	N.T.S.	ASP
			APPROVED BY:

TITLE:

MODEL–SCALA–DIRECTIONAL ANTENNA

DATE:	
1/18/06	FIGURE 2

Antenna Mfg.:	**Shively Labs**			**Date: 1/19/2006**
Antenna Type:	**Scala FMV/50N**			
Station:	**WWFP**	**Beam Tilt**	**0**	
Frequency:	**90.5**	**Gain (Max)**	**2.464**	**3.916 dB**
Channel #:	**213**	**Gain (Horizon)**	**2.464**	**3.916 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs **Date:** 1/19/2006

Antenna Type: Scala FMV/50N

Station: WWFP **Beam Tilt** 0

Frequency: 90.5 **Gain (Max)** 2.464 3.916 dB

Channel #: 213 **Gain (Horizon)** 2.464 3.916 dB

Figure: 3

Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field	Angle of Depression (Deg)	Relative Field
-90	0.000	-44	0.729	0	1.000	46	0.705
-89	0.021	-43	0.741	1	1.000	47	0.693
-88	0.040	-42	0.752	2	0.999	48	0.680
-87	0.059	-41	0.763	3	0.999	49	0.667
-86	0.078	-40	0.774	4	0.998	50	0.654
-85	0.096	-39	0.785	5	0.996	51	0.641
-84	0.114	-38	0.796	6	0.995	52	0.628
-83	0.133	-37	0.806	7	0.993	53	0.614
-82	0.151	-36	0.816	8	0.991	54	0.600
-81	0.168	-35	0.826	9	0.988	55	0.586
-80	0.186	-34	0.835	10	0.985	56	0.572
-79	0.204	-33	0.845	11	0.982	57	0.558
-78	0.221	-32	0.854	12	0.979	58	0.544
-77	0.239	-31	0.862	13	0.975	59	0.529
-76	0.256	-30	0.871	14	0.971	60	0.514
-75	0.273	-29	0.879	15	0.967	61	0.499
-74	0.290	-28	0.887	16	0.963	62	0.484
-73	0.307	-27	0.895	17	0.958	63	0.469
-72	0.324	-26	0.903	18	0.953	64	0.453
-71	0.341	-25	0.910	19	0.948	65	0.437
-70	0.357	-24	0.917	20	0.942	66	0.422
-69	0.373	-23	0.924	21	0.936	67	0.406
-68	0.390	-22	0.930	22	0.930	68	0.390
-67	0.406	-21	0.936	23	0.924	69	0.373
-66	0.422	-20	0.942	24	0.917	70	0.357
-65	0.437	-19	0.948	25	0.910	71	0.341
-64	0.453	-18	0.953	26	0.903	72	0.324
-63	0.469	-17	0.958	27	0.895	73	0.307
-62	0.484	-16	0.963	28	0.887	74	0.290
-61	0.499	-15	0.967	29	0.879	75	0.273
-60	0.514	-14	0.971	30	0.871	76	0.256
-59	0.529	-13	0.975	31	0.862	77	0.239
-58	0.544	-12	0.979	32	0.854	78	0.221
-57	0.558	-11	0.982	33	0.845	79	0.204
-56	0.572	-10	0.985	34	0.835	80	0.186
-55	0.586	-9	0.988	35	0.826	81	0.168
-54	0.600	-8	0.991	36	0.816	82	0.151
-53	0.614	-7	0.993	37	0.806	83	0.133
-52	0.628	-6	0.995	38	0.796	84	0.114
-51	0.641	-5	0.996	39	0.785	85	0.096
-50	0.654	-4	0.998	40	0.774	86	0.078
-49	0.667	-3	0.999	41	0.763	87	0.059
-48	0.680	-2	0.999	42	0.752	88	0.040
-47	0.693	-1	1.000	43	0.741	89	0.021
-46	0.705	0	1.000	44	0.729	90	0.000
-45	0.717			45	0.717		

FIGURE 4

S.O. 24437

VALIDATION OF GAIN CALCULATION

WWFP 90.5 MHz BRIGANTINE, NJ

SCALA FMV/50N

Elevation Gain of Scala FMV/50N equals 0.908

Vertical Azimuth Gain equals $1/(RMS)^2$
$1/(.607)^2 = 2.714$

*** Total Vertical Gain is Elevation Gain times Azimuth Gain**
0.908 x 2.7147 = 2.464

ERP divided by Vertical Gain equals Antenna Input Power
0.077 kW ÷ 2.464 = 0.031 kW