Shively Labs®
a division of Howell Laboratories, Inc.

P. O. Box 389, 188 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. 36099

Report of Test

6025-4-DA

for

Maine Public Broadcasting Corp.

WMEA 90.1 MHz Portland, ME.

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a 6025-4-DA to meet the needs of WMEA and to comply with the requirements of the FCC construction permit, file number BXPED-20180921AAF. This test characterizes only the radiation characteristics of the antenna when mounted on the tower as described. It does not represent or imply any guarantee of specific coverage which can be influenced by factors beyond the scope of this test.

RESULTS:

The following Figures are the results of the measurements from our pattern range:

Figure 1A - Measured Azimuth Pattern with the FCC Composite
Figure 1B - Measured Composite Azimuth Pattern with the FCC Composite
Figure 1C - Tabulation of the Horizontal Polarization for the Measured Azimuth Pattern
Figure 1D - Tabulation of the Vertical Polarization for the Measured Azimuth Pattern
Figure 1E - Tabulation of the Measured Composite Azimuth Pattern
Figure 1F - Tabulation of the FCC Composite

The calculated elevation pattern of the antenna is shown in Figure 3.

Construction permit file number BXPED-20180921AAF 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:

318 Degrees True: 0.42 kilowatts

From Figure 1A, the maximum radiation of the Horizontal component occurs at 58 Degrees True. At the restricted azimuth of 318 Degrees True, the Horizontal component is 22.80 dB down from the maximum of 100 kW, or 0.05 kW.

The R.M.S. of the Horizontal component is 0.40. The total Horizontal power gain is 14.21. The R.M.S. of the Vertical component is 0.40. The total Vertical power gain is 9.79. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.446. The R.M.S. of the measured composite pattern is 0.434. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.379. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the 6025-4-DA was mounted on a tower of precise scale to the Stainless G4 tower at the WMEA site. The spacing of the antenna to the tower was varied to achieve the vertical pattern shown in Figure 1A. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BXPED-20180921AAF, a single level of the 6025-4-DA was set up on the Shively Labs scale model antenna pattern measuring range. A scale of 4.5:1 was used.

EQUIPMENT:

The 4.5:1 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 4395-A Network Analyzer

PC Based Controller

Output Standard Printer or 'pdf'

All testing is carried out in strict accordance with approved procedures under our ISO9001.

TEST PROCEDURES:

The receiving antenna system is mounted so that the horizontal and vertical azimuth patterns are measured independently. The network analyzer was set to 405.45 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 1A.

Respectfully submitted by:

Angela Gillespie
Vice President, Shively Labs

S/O 36099
Date 3-1-19

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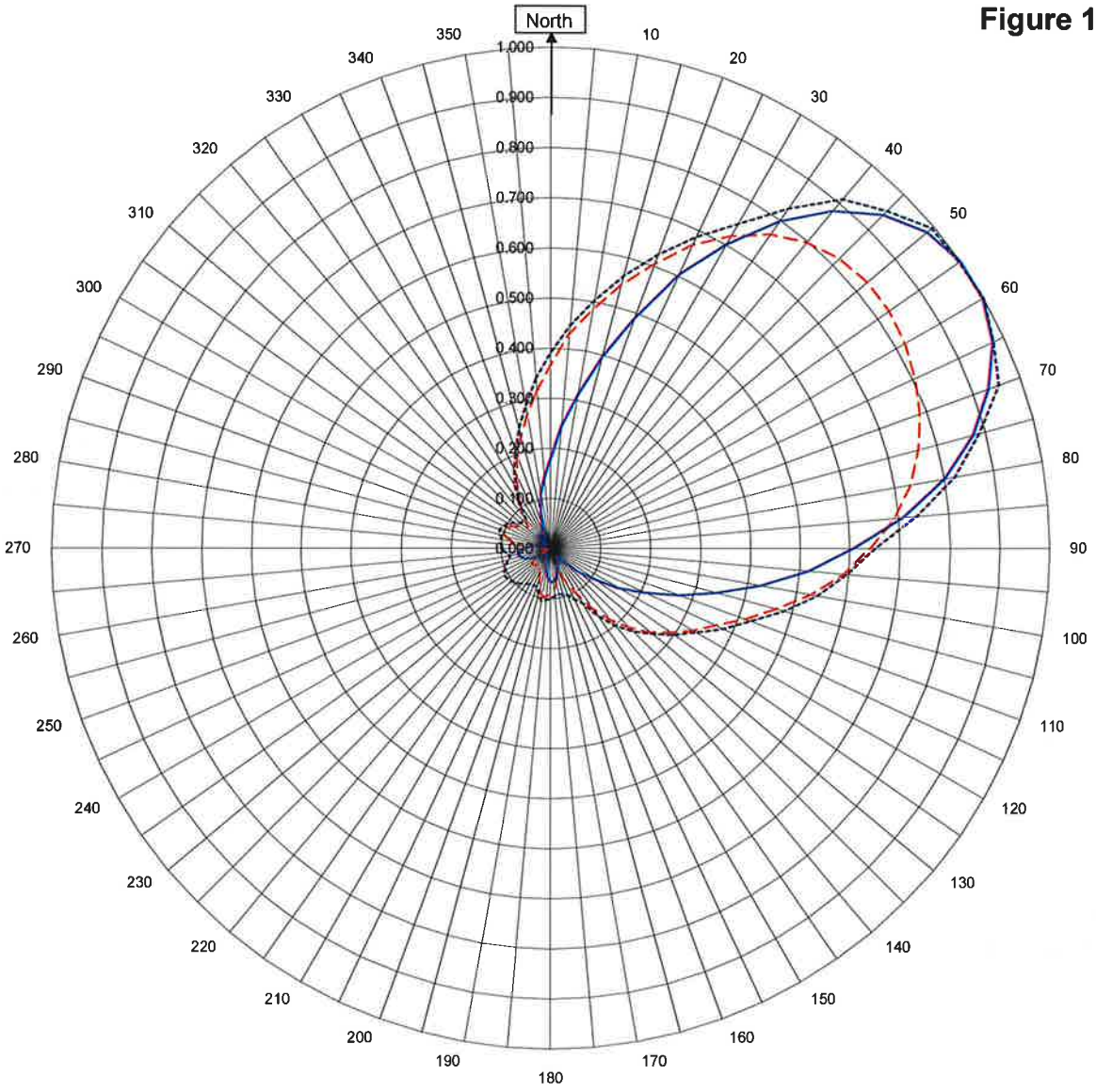
Figure 1A



WMEA Portland, ME

36099

December 13, 2018

Horizontal RMS	0.402
Vertical RMS	0.397
H/V Composite RMS	0.434
FCC Composite RMS	0.446

Frequency	90.1 / 405.45 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6025-4-DA
Pattern Type	Directional Azimuth

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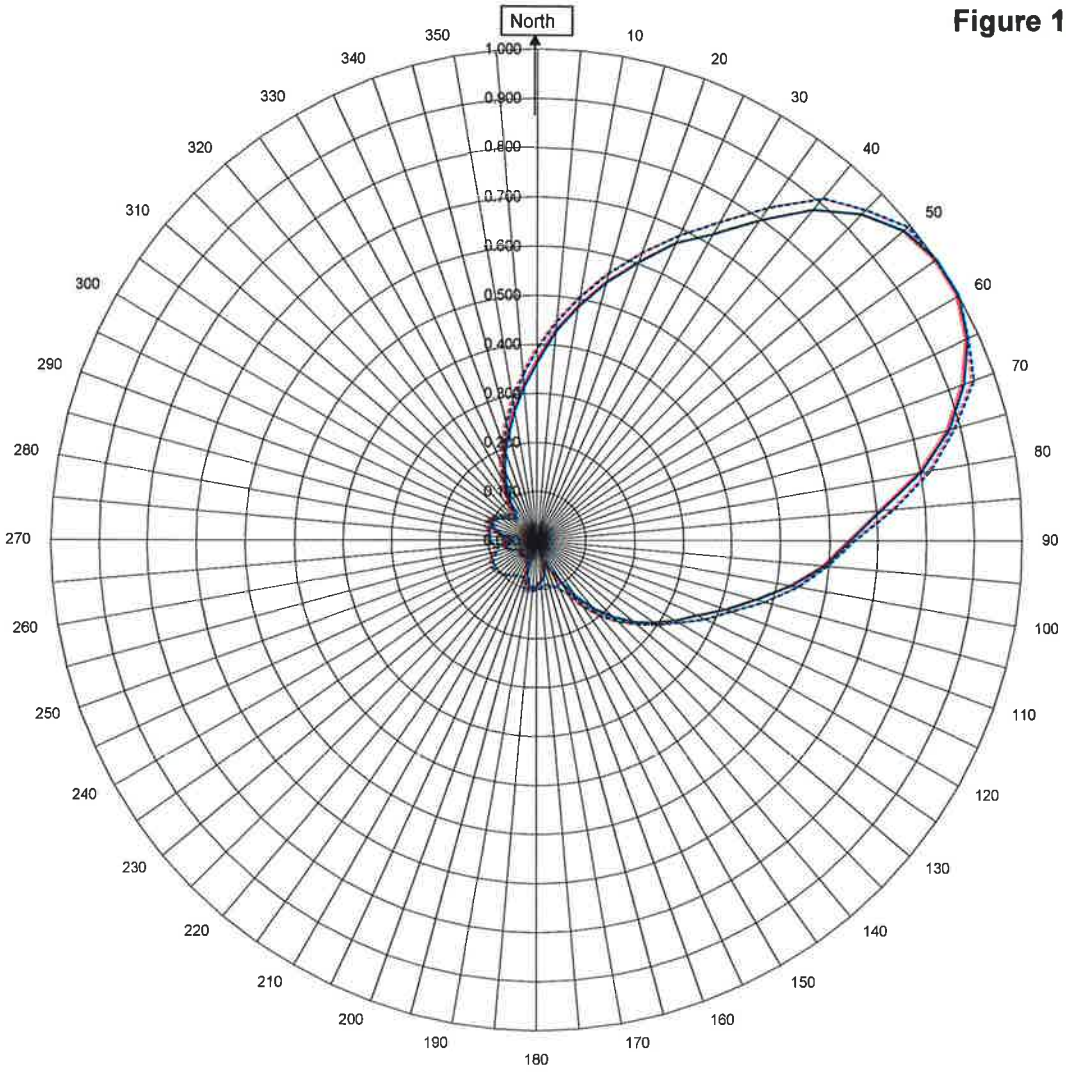
Figure 1B



WMEA Portland, ME

36099

December 13, 2018

H/VComposite RMS	0.434
FCC Composite RMS	0.446

Frequency	90.1 / 405.45 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	6025-4-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WMEA Portland, ME

Azimuth	Rel Field	Azimuth	Rel Field
0	0.181	180	0.067
10	0.310	190	0.047
20	0.489	200	0.023
30	0.700	210	0.017
40	0.879	220	0.012
45	0.941	225	0.013
50	0.982	230	0.019
60	0.999	240	0.037
70	0.933	250	0.057
80	0.800	260	0.067
90	0.607	270	0.056
100	0.426	280	0.029
110	0.273	290	0.016
120	0.157	300	0.014
130	0.073	310	0.015
135	0.042	315	0.028
140	0.021	320	0.035
150	0.031	330	0.022
160	0.043	340	0.048
170	0.061	350	0.111

Figure 1D

Tabulation of Vertical Azimuth Pattern
WMEA Portland, ME

Azimuth	Rel Field	Azimuth	Rel Field
0	0.365	180	0.092
10	0.484	190	0.094
20	0.604	200	0.060
30	0.720	210	0.037
40	0.798	220	0.043
45	0.819	225	0.045
50	0.829	230	0.046
60	0.821	240	0.023
70	0.788	250	0.006
80	0.733	260	0.007
90	0.642	270	0.032
100	0.529	280	0.076
110	0.413	290	0.100
120	0.327	300	0.089
130	0.259	310	0.068
135	0.221	315	0.061
140	0.182	320	0.072
150	0.100	330	0.129
160	0.047	340	0.193
170	0.075	350	0.270

Figure 1E

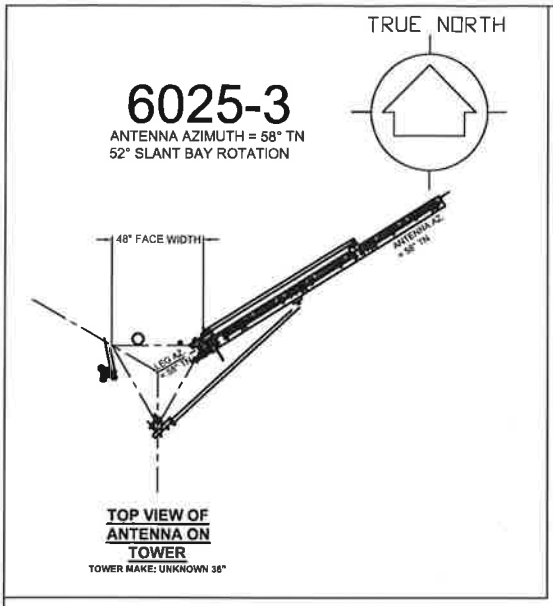
Tabulation of Composite Azimuth Pattern
WMEA Portland, ME

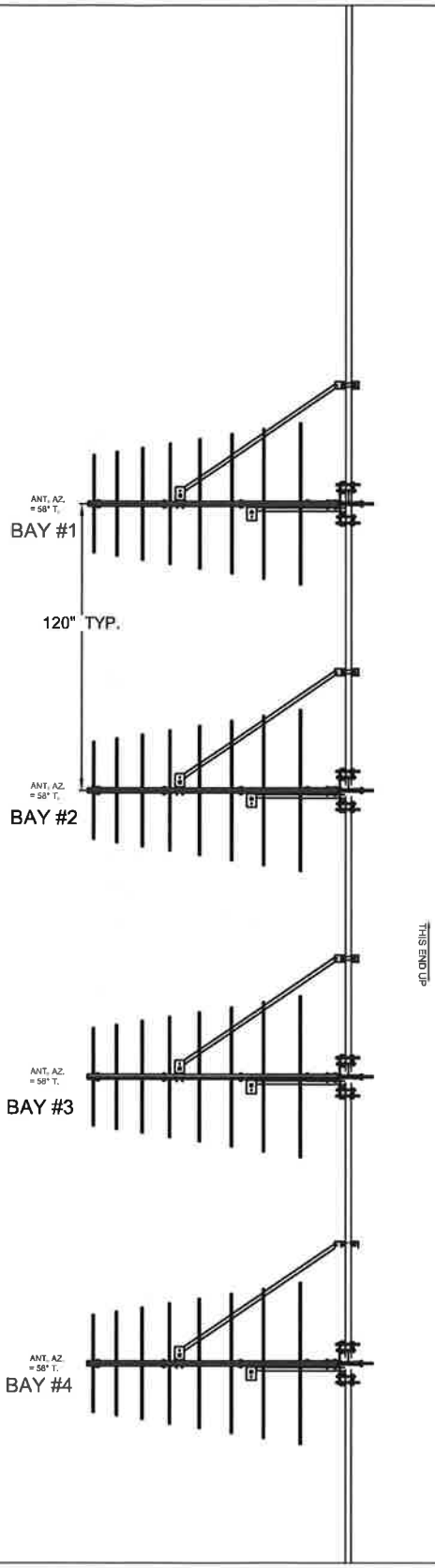
Azimuth	Rel Field	Azimuth	Rel Field
0	0.365	180	0.092
10	0.484	190	0.094
20	0.604	200	0.060
30	0.720	210	0.037
40	0.879	220	0.043
45	0.941	225	0.045
50	0.982	230	0.046
60	0.999	240	0.037
70	0.933	250	0.057
80	0.800	260	0.067
90	0.642	270	0.056
100	0.529	280	0.076
110	0.413	290	0.100
120	0.327	300	0.089
130	0.259	310	0.068
135	0.221	315	0.061
140	0.182	320	0.072
150	0.100	330	0.129
160	0.047	340	0.193
170	0.075	350	0.270

Figure 1F

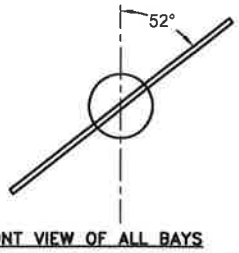
Tabulation of FCC Directional Composite
WMEA Portland, ME

Azimuth	Rel Field	Azimuth	Rel Field
0	0.392	180	0.100
10	0.504	190	0.107
20	0.624	200	0.080
30	0.748	210	0.082
40	0.910	220	0.092
50	0.995	230	0.102
60	1.000	240	0.108
70	0.955	250	0.096
80	0.820	260	0.082
90	0.650	270	0.100
100	0.543	280	0.100
110	0.424	290	0.110
120	0.335	300	0.100
130	0.265	310	0.078
140	0.200	320	0.078
150	0.124	330	0.142
160	0.098	340	0.206
170	0.091	350	0.290
115	1.000		





AZIMUTH	ATTENUATION	PHASE
58°	0 db	0°



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SHOP ORDER:	FREQUENCY:	SCALE:	DRAWN BY: ASP
36099	90.1	N.T.S.	APPROVED BY: —

TITLE:
FIGURE 2, WMEA, 90.1 MHz
MODEL 6025-4/1, SLANT ELEMENTS

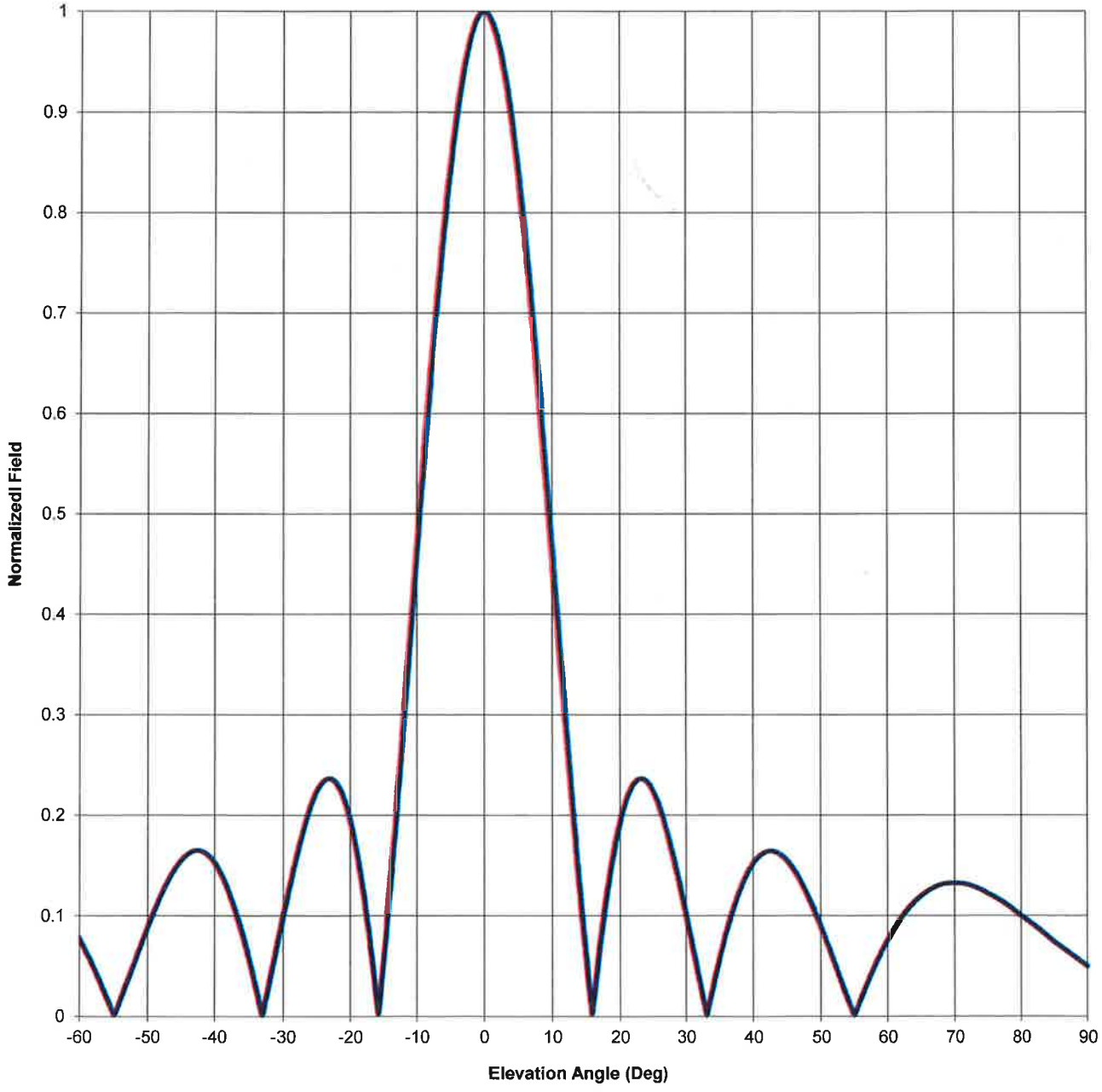
DATE: 1-10-19

FIGURE 2

Antenna Mfg.: Shively Labs
Antenna Type: 6025
Station: WMEA
Frequency: 90.1
Channel #: 211
Figure: Figure 3

Date: 1/15/2019

Beam Tilt	0	
Gain (Max)	2.276	3.571 dB
Gain (Horizon)	2.276	3.571 dB



Antenna Mfg.: Shively Labs
Antenna Type: 6025
Station: WMEA
Frequency: 90.1
Channel #: 211
Figure: Figure 3

Date: 1/15/2019

Beam Tilt	**0**		
Gain (Max)	**2.276**	**3.571**	**dB**
Gain (Horizon)	**2.276**	**3.571**	**dB**

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	0.050	-44	0.161	0	1.000	46	0.145
-89	0.055	-43	0.165	1	0.992	47	0.134
-88	0.060	-42	0.164	2	0.973	48	0.120
-87	0.064	-41	0.160	3	0.941	49	0.105
-86	0.069	-40	0.153	4	0.897	50	0.088
-85	0.074	-39	0.141	5	0.844	51	0.071
-84	0.079	-38	0.125	6	0.779	52	0.053
-83	0.085	-37	0.106	7	0.708	53	0.035
-82	0.090	-36	0.083	8	0.630	54	0.017
-81	0.095	-35	0.057	9	0.548	55	0.001
-80	0.100	-34	0.028	10	0.463	56	0.018
-79	0.105	-33	0.003	11	0.376	57	0.034
-78	0.110	-32	0.035	12	0.291	58	0.049
-77	0.115	-31	0.068	13	0.208	59	0.063
-76	0.119	-30	0.101	14	0.129	60	0.076
-75	0.122	-29	0.132	15	0.056	61	0.088
-74	0.126	-28	0.161	16	0.010	62	0.098
-73	0.129	-27	0.187	17	0.069	63	0.107
-72	0.131	-26	0.208	18	0.119	64	0.114
-71	0.132	-25	0.224	19	0.161	65	0.120
-70	0.132	-24	0.234	20	0.194	66	0.125
-69	0.132	-23	0.236	21	0.216	67	0.129
-68	0.131	-22	0.231	22	0.231	68	0.131
-67	0.129	-21	0.217	23	0.236	69	0.132
-66	0.125	-20	0.194	24	0.234	70	0.132
-65	0.120	-19	0.161	25	0.224	71	0.132
-64	0.114	-18	0.120	26	0.208	72	0.131
-63	0.107	-17	0.069	27	0.186	73	0.129
-62	0.098	-16	0.010	28	0.161	74	0.126
-61	0.088	-15	0.056	29	0.132	75	0.122
-60	0.076	-14	0.129	30	0.100	76	0.119
-59	0.063	-13	0.208	31	0.068	77	0.115
-58	0.049	-12	0.291	32	0.035	78	0.110
-57	0.034	-11	0.376	33	0.003	79	0.105
-56	0.018	-10	0.463	34	0.028	80	0.100
-55	0.001	-9	0.548	35	0.057	81	0.095
-54	0.017	-8	0.630	36	0.083	82	0.090
-53	0.035	-7	0.708	37	0.106	83	0.085
-52	0.053	-6	0.780	38	0.125	84	0.079
-51	0.071	-5	0.844	39	0.140	85	0.074
-50	0.089	-4	0.897	40	0.152	86	0.069
-49	0.105	-3	0.941	41	0.160	87	0.064
-48	0.121	-2	0.973	42	0.164	88	0.060
-47	0.134	-1	0.992	43	0.164	89	0.055
-46	0.146	0	1.000	44	0.161	90	0.050
-45	0.155			45	0.155		

S.O. 36099 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WMEA Portland, ME

MODEL 6025-4-DA

Elevation Gain of Antenna 2.276

Horizontal RMS value divided by the Vertical RMS value equals the Horiz. - Vert. Ratio

H RMS 0.401793 V RMS 0.397422 H/V Ratio 1.011

Elevation Gain of Horizontal Component 2.301

Elevation Gain of Vertical Component 2.251

Horizontal Azimuth Gain equals $1/(RMS)^2$. 6.194

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 4.362

Max. Vertical 0.83

***Total Horizontal Power Gain is the Elevation Gain Times the Azimuth Gain**

Total Horizontal Power Gain = **14.253**

***Total Vertical Power Gain is the Elevation Gain Times the Azimuth Gain**

Total Vertical Power Gain = **9.819**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

100 kW ERP Divided by H Gain 14.253 equals 7.016 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

7.016 kW Times V Gain 9.819 equals 68.890 kW V ERP

Maximum Value of the Vertical Component squared times the Maximum ERP equals the Vertical ERP

(0.83)^2 Times 100.00 Equals 68.890 kW Vertical ERP

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