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. 29045

Report of Test Aldena Slant (45º) Yagi Array

Community Bible Church

WEGB 90.7 MHz Napeague, NY

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a Aldena Slant (45º) Yagi Array to meet the needs of WEGB and to comply with the requirements of the FCC construction permit, file number BMPED-20110308AAB. 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 BMPED-20110308AAB indicates that the Horizontal radiation component shall not exceed 4.6 kW at any azimuth and is restricted to the following values at the azimuths specified:

330 - 150 Degrees T: 0.145 kW

From Figure 1A, the maximum radiation of the Horizontal component occurs at 235 Degrees T to 237 Degrees T. At the restricted azimuth of 330 – 150 Degrees T the Vertical component is 19.49 dB down from the maximum of 4.6 kW, or 0.052 kW.

The R.M.S. of the Horizontal component is 0.371. The total Horizontal power gain is 4.018. The R.M.S. of the Vertical component is 0.369. The total Vertical power gain is 3.4. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.435. The R.M.S. of the measured composite pattern is 0.384. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.369. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the Aldena Slant (45º) Yagi Array was mounted on a tower of precise scale to the tower at the WEGB site. The spacing of the antenna to the tower was varied to achieve the horizontal and vertical patterns shown in Figure 1A. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BMPED-20110308AAB, a single level of the Aldena Slant (45º) Yagi Array 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 and 10th Editions 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 408.15 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. All testing is carried out in strict accordance with procedures approved under ISO 9001:2008.

Respectfully submitted by:

Robert A. Surette
Director of Sales Engineering
S/O 29045
May 2, 2011

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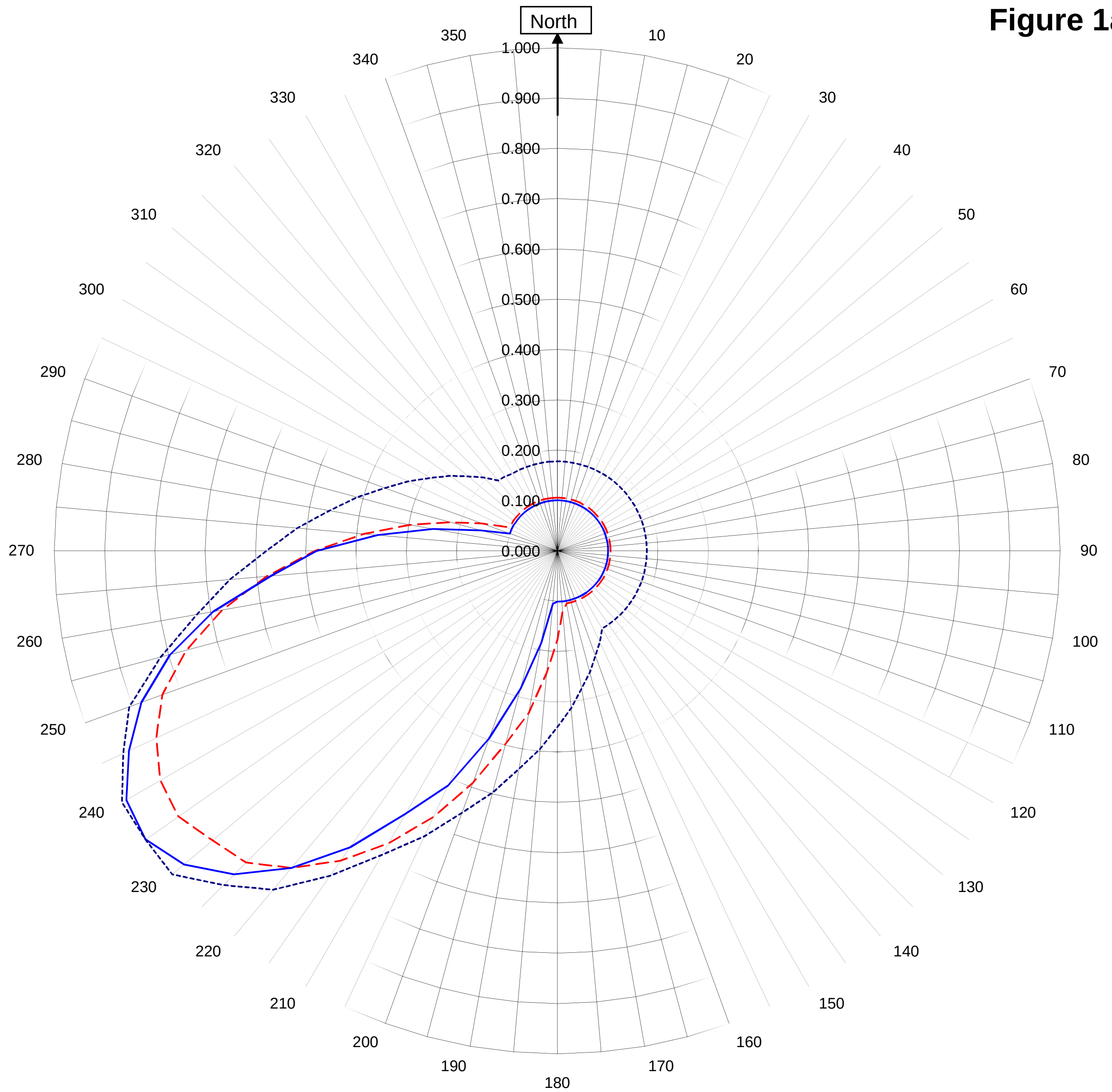
Figure 1a



WEGB Napeague, NY

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____________Horizontal RMS	0.371
_ _ _ _ _ _ _ _ _ Vertical RMS	0.369
H/V Composite RMS	0.384
……………FCC Composite RMS	0.435

Frequency	90.7 / 408.15 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	Aldena Slant (45º) Yagi Array
Pattern Type	Directional Azimuth

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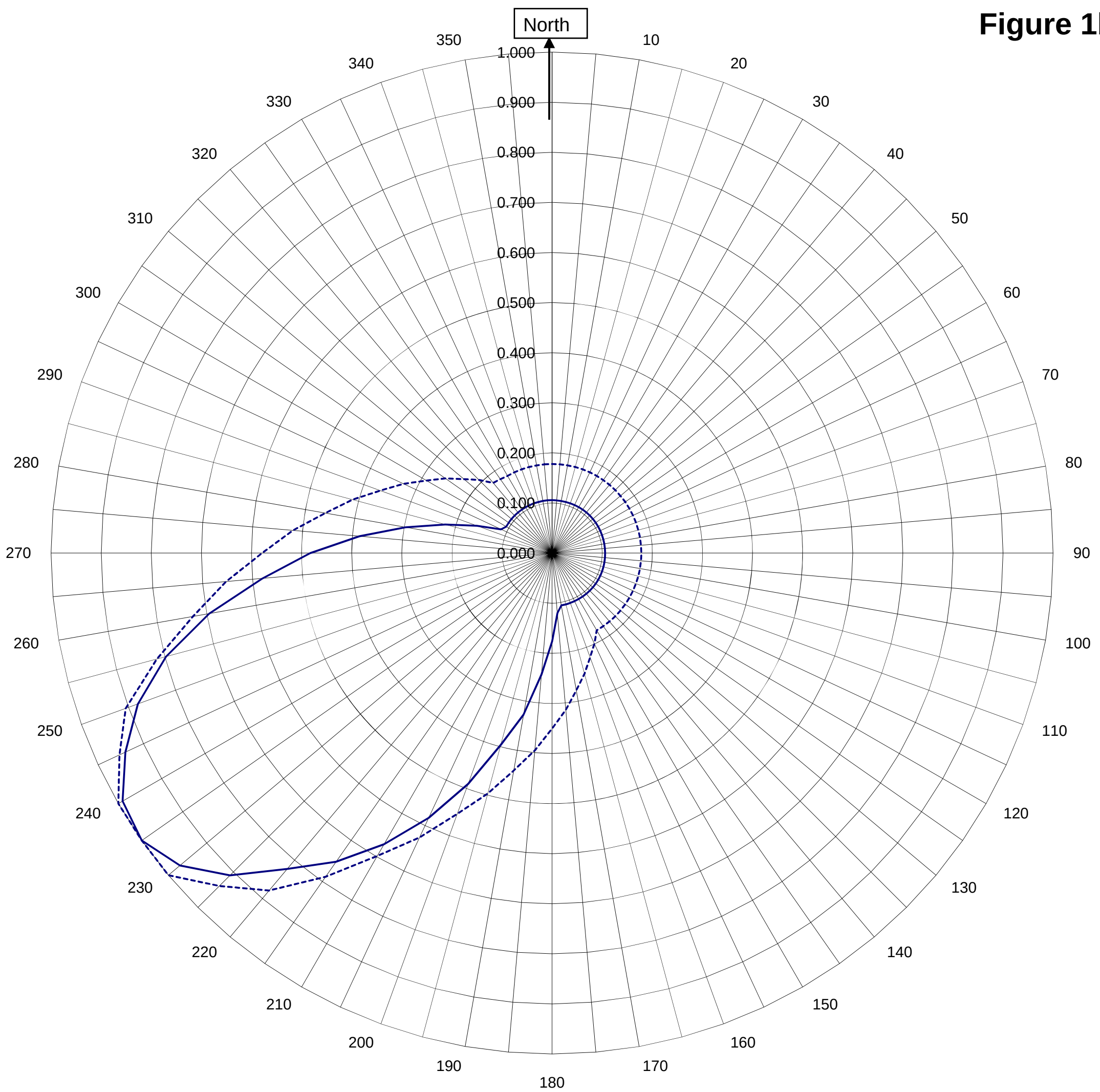
Figure 1b



WEGB Napeague, NY

29045

May 2, 2011

__________H/VComposite RMS	0.384
……………FCC Composite RMS	0.435

Frequency	90.7 / 408.15 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	Aldena Slant (45º) Yagi Array
Pattern Type	Directional H/V Composite

Figure 1c

Tabulation of Horizontal Azimuth Pattern
WEGB Napeague, NY

Azimuth	Rel Field	Azimuth	Rel Field
0	0.101	180	0.101
10	0.101	190	0.186
20	0.101	200	0.397
30	0.101	210	0.604
40	0.101	220	0.823
45	0.101	225	0.910
50	0.101	230	0.970
60	0.101	240	0.990
70	0.101	250	0.880
80	0.101	260	0.695
90	0.101	270	0.479
100	0.101	280	0.251
110	0.101	290	0.101
120	0.101	300	0.101
130	0.101	310	0.101
135	0.101	315	0.101
140	0.101	320	0.101
150	0.101	330	0.101
160	0.101	340	0.101
170	0.101	350	0.101

Figure 1d

Tabulation of Vertical Azimuth Pattern
WEGB Napeague, NY

Azimuth	Rel Field	Azimuth	Rel Field
0	0.106	180	0.176
10	0.106	190	0.327
20	0.106	200	0.490
30	0.106	210	0.671
40	0.106	220	0.823
45	0.106	225	0.876
50	0.106	230	0.895
60	0.106	240	0.912
70	0.106	250	0.836
80	0.106	260	0.677
90	0.106	270	0.483
100	0.106	280	0.298
110	0.106	290	0.160
120	0.106	300	0.106
130	0.106	310	0.106
135	0.106	315	0.106
140	0.106	320	0.106
150	0.106	330	0.106
160	0.106	340	0.106
170	0.106	350	0.106

Figure 1e

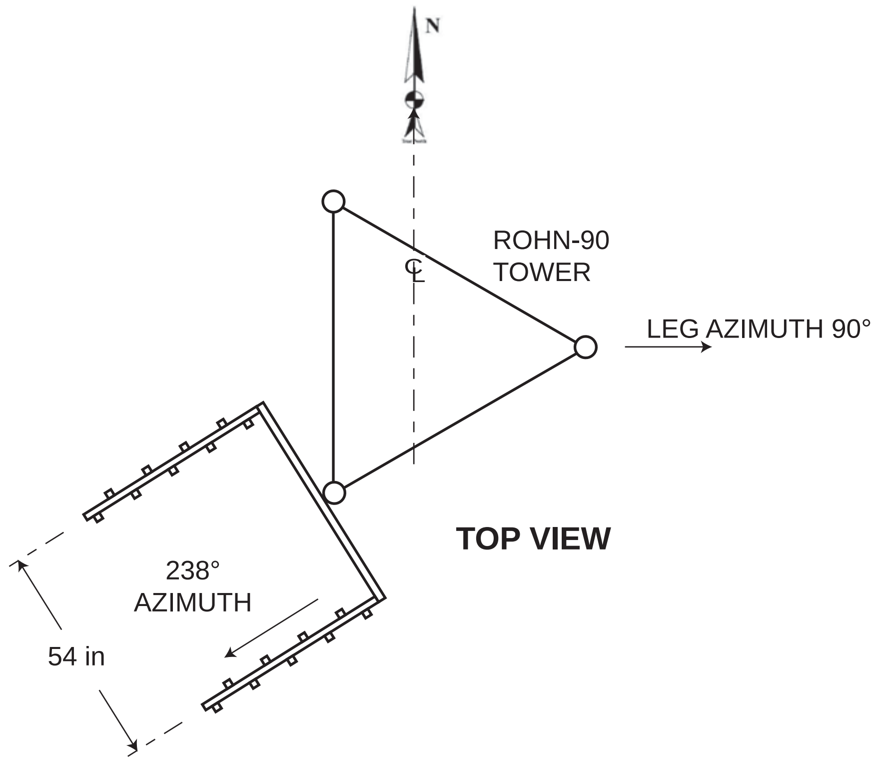
Tabulation of Composite Azimuth Pattern
WEGB Napeague, NY

Azimuth	Rel Field	Azimuth	Rel Field
0	0.106	180	0.176
10	0.106	190	0.327
20	0.106	200	0.490
30	0.106	210	0.671
40	0.106	220	0.823
45	0.106	225	0.910
50	0.106	230	0.970
60	0.106	240	0.990
70	0.106	250	0.880
80	0.106	260	0.695
90	0.106	270	0.483
100	0.106	280	0.298
110	0.106	290	0.160
120	0.106	300	0.106
130	0.106	310	0.106
135	0.106	315	0.106
140	0.106	320	0.106
150	0.106	330	0.106
160	0.106	340	0.106
170	0.106	350	0.106

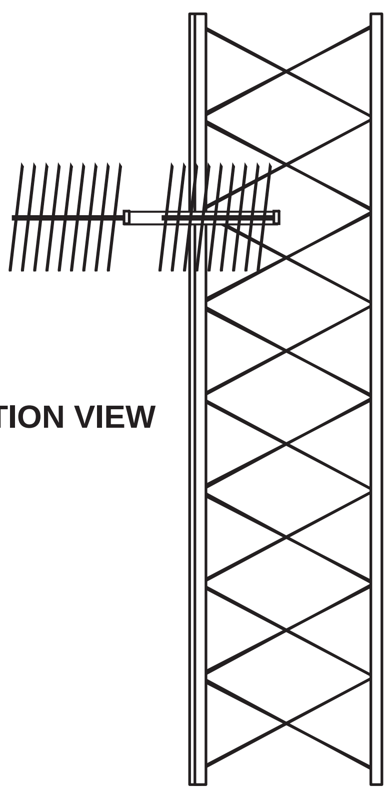
Figure 1f

Tabulation of FCC Directional Composite
WEGB Napeague, NY

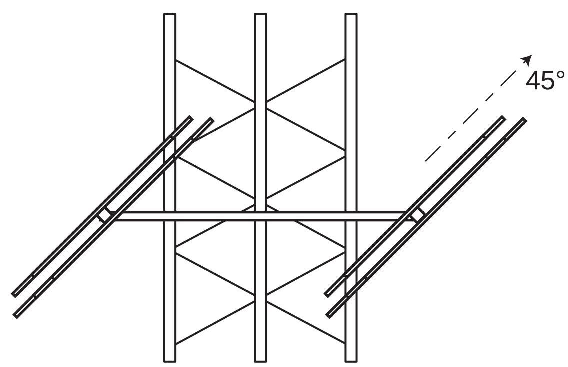
Azimuth	Rel Field	Azimuth	Rel Field
0	0.178	180	0.350
10	0.178	190	0.440
20	0.178	200	0.554
30	0.178	210	0.698
40	0.178	220	0.879
50	0.178	230	1.000
60	0.178	240	1.000
70	0.178	250	0.906
80	0.178	260	0.728
90	0.178	270	0.579
100	0.178	280	0.460
110	0.178	290	0.365
120	0.178	300	0.290
130	0.178	310	0.230
140	0.178	320	0.183
150	0.178	330	0.178
160	0.221	340	0.178
170	0.278	350	0.178



TOP VIEW



ELEVATION VIEW



PARTIAL FRONT VIEW

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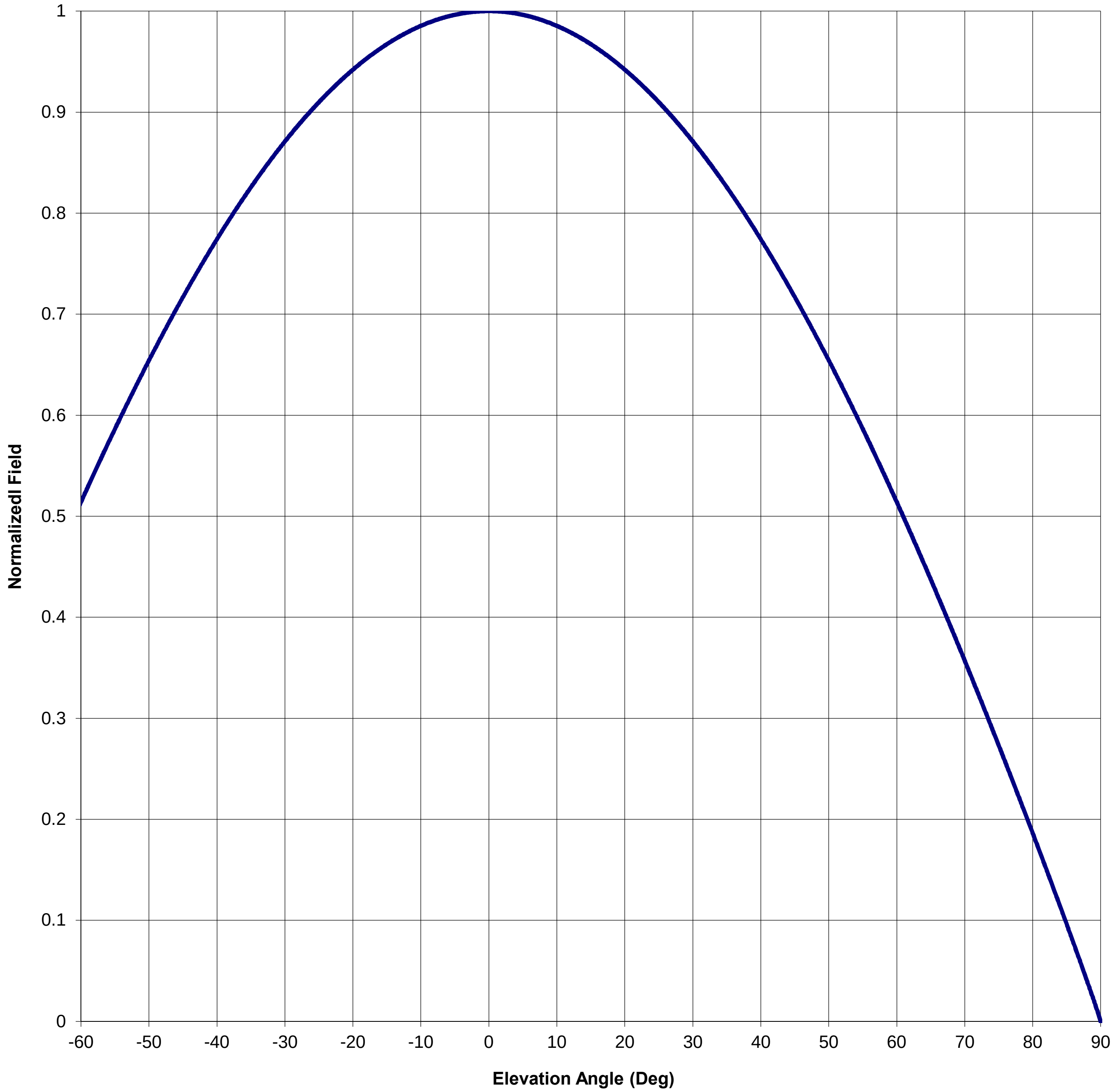
FIGURE 2, 90.7 MHz
ALDENA SLANT (45°) YAGI ARRAY

SIZE	CODE IDENT. NO.	DRAWING NO.	REV
A	26750	AGF110502-001	—
SCALE NONE	S/O 29045	SHEET 1 OF 1	

Antenna Mfg.:	**Shively Labs**			**Date: 4/28/2011**
Antenna Type:	**Aldena Slant (45º) Yagi Array**			
Station:	**WEGB**	**Beam Tilt**	**0**	
Frequency:	**90.7**	**Gain (Max)**	**4.018**	**6.040 dB**
Channel #:	**214**	**Gain (Horizon)**	**4.018**	**6.040 dB**
Figure:	**Figure 3**			



Antenna Mfg.: Shively Labs **Date:** 4/28/2011
Antenna Type: Aldena Slant (45º) Yagi Array
Station: WEGB **Beam Tilt** 0
Frequency: 90.7 **Gain (Max)** 4.018 6.040 dB
Channel #: 214 **Gain (Horizon)** 4.018 6.040 dB
Figure: 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		

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VALIDATION OF TOTAL POWER GAIN CALCULATION

WEGB 90.7 MHz Napeague, NY

Aldena Slant (45º) Yagi Array

Elevation Gain of Antenna 0.55

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

H RMS 0.371 V RMS 0.369 H/V Ratio 1.005

Elevation Gain of Horizontal Component 0.553

Elevation Gain of Vertical Component 0.547

Horizontal Azimuth Gain equals $1/(RMS)^2$. 7.265

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 6.216
Max. Vertical 0.92

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

Total Horizontal Power Gain = **4.018**

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

Total Vertical Power Gain = **3.400**

===

ERP divided by Horizontal Power Gain equals Antenna Input Power

4.6 kW ERP Divided by H Gain 4.018 equals 1.14 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

1.14 kW Times V Gain 3.400 equals 3.89 kW V ERP

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

(0.92)^2 Times 4.60 Equals 3.89 kW Vertical ERP

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