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S.O. 29369

Report of Test Aldena (37.5°) Slant Yagi

For

Morgan Brook Christian Radio, Inc.

WJCI 89.5 MHz Baptist Village, MA

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a Aldena (37.5°) Slant Yagi to meet the needs of WJCI and to comply with the requirements of the FCC construction permit, file number BMPED-20110831ACM. 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-20110831ACM indicates that the Horizontal radiation component shall not exceed 0.0330 kW at any azimuth and is restricted to the following values at the azimuths specified:

340 Degrees T: 0.00105 Kw

From Figure 1A, the maximum radiation of the Horizontal component occurs at 119 Degrees T to 126 Degrees T. At the restricted azimuth of 340 Degrees T the Vertical component is 21.41 dB down from the maximum of 0.330 kW, or 0.00024.

The R.M.S. of the Horizontal component is 0.405. The total Horizontal power gain is 2.230. The R.M.S. of the Vertical component is 0.519. The total Vertical power gain is 2.186. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.608. The R.M.S. of the measured composite pattern is 0.519 Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.517. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the Aldena (37.5°) Slant Yagi was mounted on a tower of precise scale to the tower at the WJCI 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-20110831ACM, a single level of the Aldena (37.5°) Slant Yagi 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

All testing is carried out in strict accordance with approved procedures under our ISO9001:2008.

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 402.75 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:

Robert A. Surette
Director of Sales Engineering
S/O 29369
September 27, 2011

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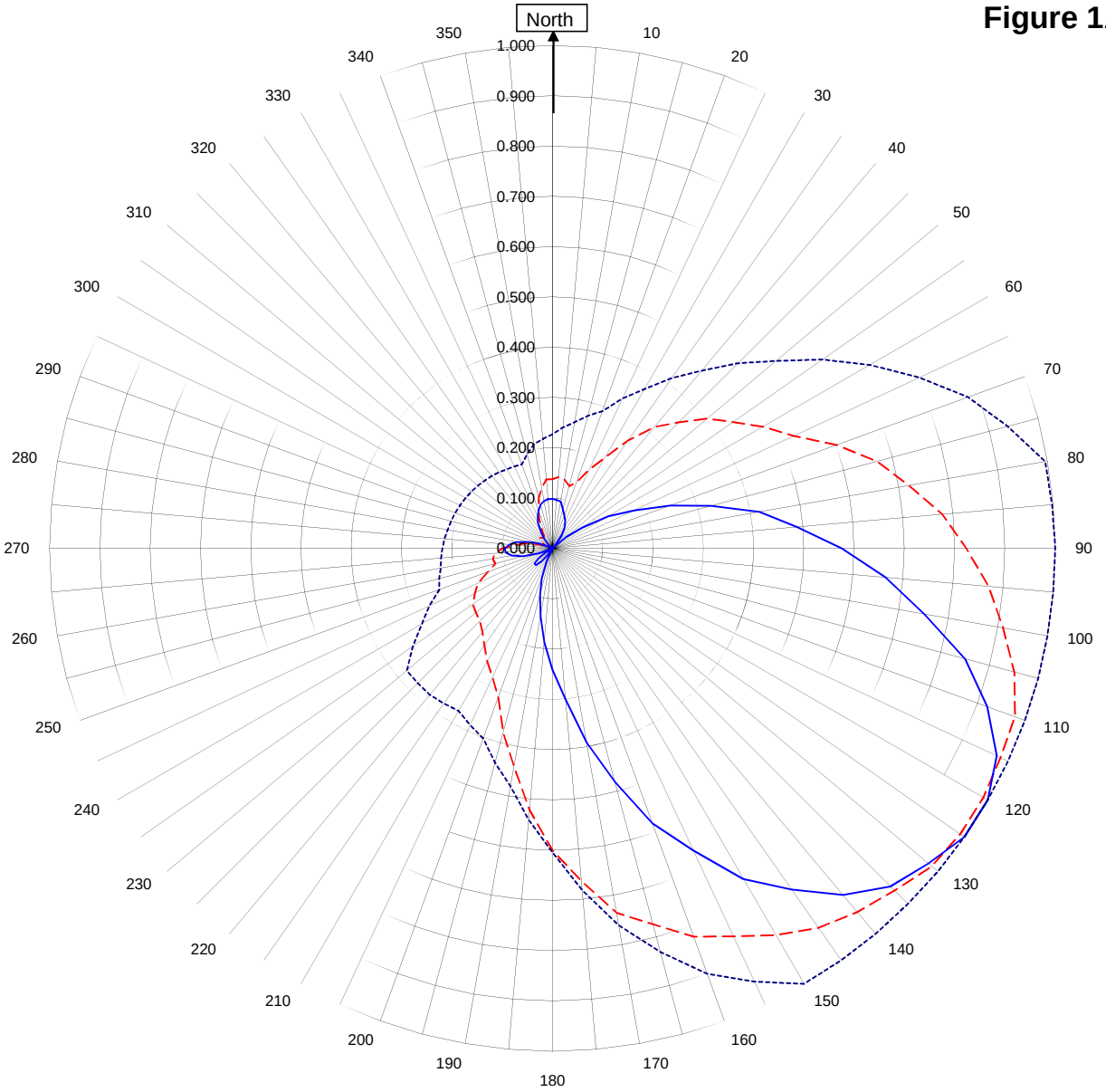
Figure 1A



WJCI Baptist Village, MA

29369

October 4, 2011

Horizontal RMS	0.407
Vertical RMS	0.519
H/V Composite RMS	0.519
FCC Composite RMS	0.608

Frequency	89.5 / 402.75 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	ALDENA Slant (37.5°) YAGI
Pattern Type	Directional Azimuth

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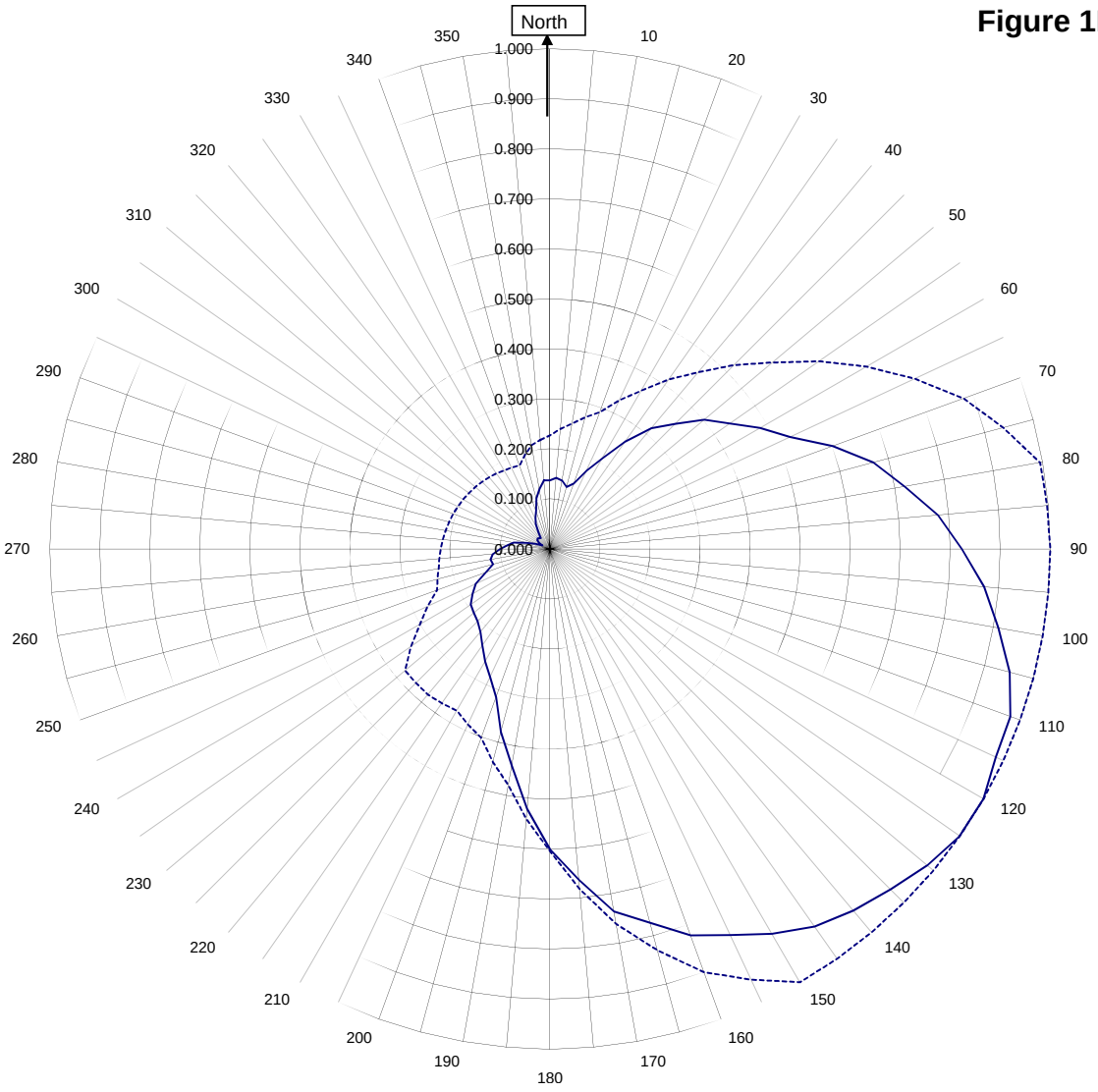
Figure 1B



WJCI Baptist Village, MA

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October 4, 2011

_____H/VComposite RMS	0.519
……FCC Composite RMS	0.608

Frequency	89.5 / 402.75 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	ALDENA Slant (37.5°) YAGI
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WJCI Baptist Village, MA

Azimuth	Rel Field	Azimuth	Rel Field
0	0.098	180	0.241
10	0.095	190	0.137
20	0.069	200	0.063
30	0.048	210	0.001
40	0.013	220	0.035
45	0.002	225	0.047
50	0.035	230	0.046
60	0.128	240	0.017
70	0.250	250	0.029
80	0.418	260	0.082
90	0.575	270	0.094
100	0.751	280	0.074
110	0.920	290	0.031
120	1.000	300	0.000
130	0.975	310	0.002
135	0.950	315	0.013
140	0.900	320	0.026
150	0.759	330	0.058
160	0.582	340	0.081
170	0.392	350	0.096

Figure 1D

Tabulation of Vertical Azimuth Pattern
WJCI Baptist Village, MA

Azimuth	Rel Field	Azimuth	Rel Field
0	0.138	180	0.600
10	0.139	190	0.440
20	0.140	200	0.316
30	0.209	210	0.260
40	0.315	220	0.217
45	0.355	225	0.205
50	0.402	230	0.199
60	0.484	240	0.178
70	0.601	250	0.138
80	0.720	260	0.121
90	0.824	270	0.100
100	0.910	280	0.056
110	0.979	290	0.017
120	0.990	300	0.025
130	0.984	310	0.032
135	0.962	315	0.031
140	0.944	320	0.028
150	0.888	330	0.041
160	0.822	340	0.082
170	0.736	350	0.123

Figure 1E

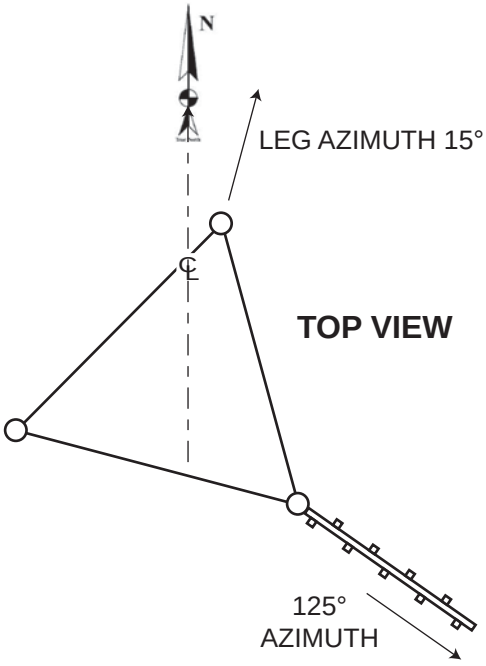
Tabulation of Composite Azimuth Pattern
WJCI Baptist Village, MA

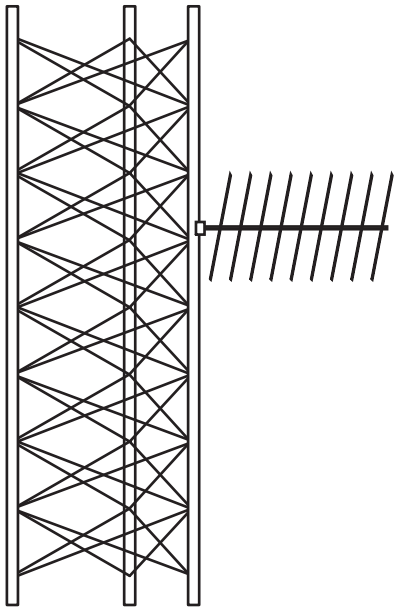
Azimuth	Rel Field	Azimuth	Rel Field
0	0.138	180	0.600
10	0.139	190	0.440
20	0.140	200	0.316
30	0.209	210	0.260
40	0.315	220	0.217
45	0.355	225	0.205
50	0.402	230	0.199
60	0.484	240	0.178
70	0.601	250	0.138
80	0.720	260	0.121
90	0.824	270	0.100
100	0.910	280	0.074
110	0.979	290	0.031
120	1.000	300	0.025
130	0.984	310	0.032
135	0.962	315	0.031
140	0.944	320	0.028
150	0.888	330	0.058
160	0.822	340	0.082
170	0.736	350	0.123

Figure 1F

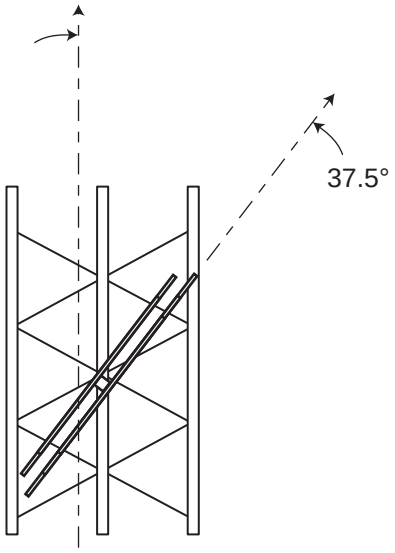
Tabulation of FCC Directional Composite
WJCI Baptist Village, MA

Azimuth	Rel Field	Azimuth	Rel Field
0	0.227	180	0.604
10	0.255	190	0.480
20	0.291	200	0.402
30	0.366	210	0.373
40	0.461	220	0.380
50	0.580	230	0.378
60	0.730	240	0.300
70	0.880	250	0.240
80	0.995	260	0.226
90	1.000	270	0.219
100	1.000	280	0.212
110	1.000	290	0.206
120	1.000	300	0.200
130	1.000	310	0.194
140	1.000	320	0.188
150	1.000	330	0.182
160	0.900	340	0.178
170	0.761	350	0.211





ELEVATION VIEW



PARTIAL FRONT VIEW

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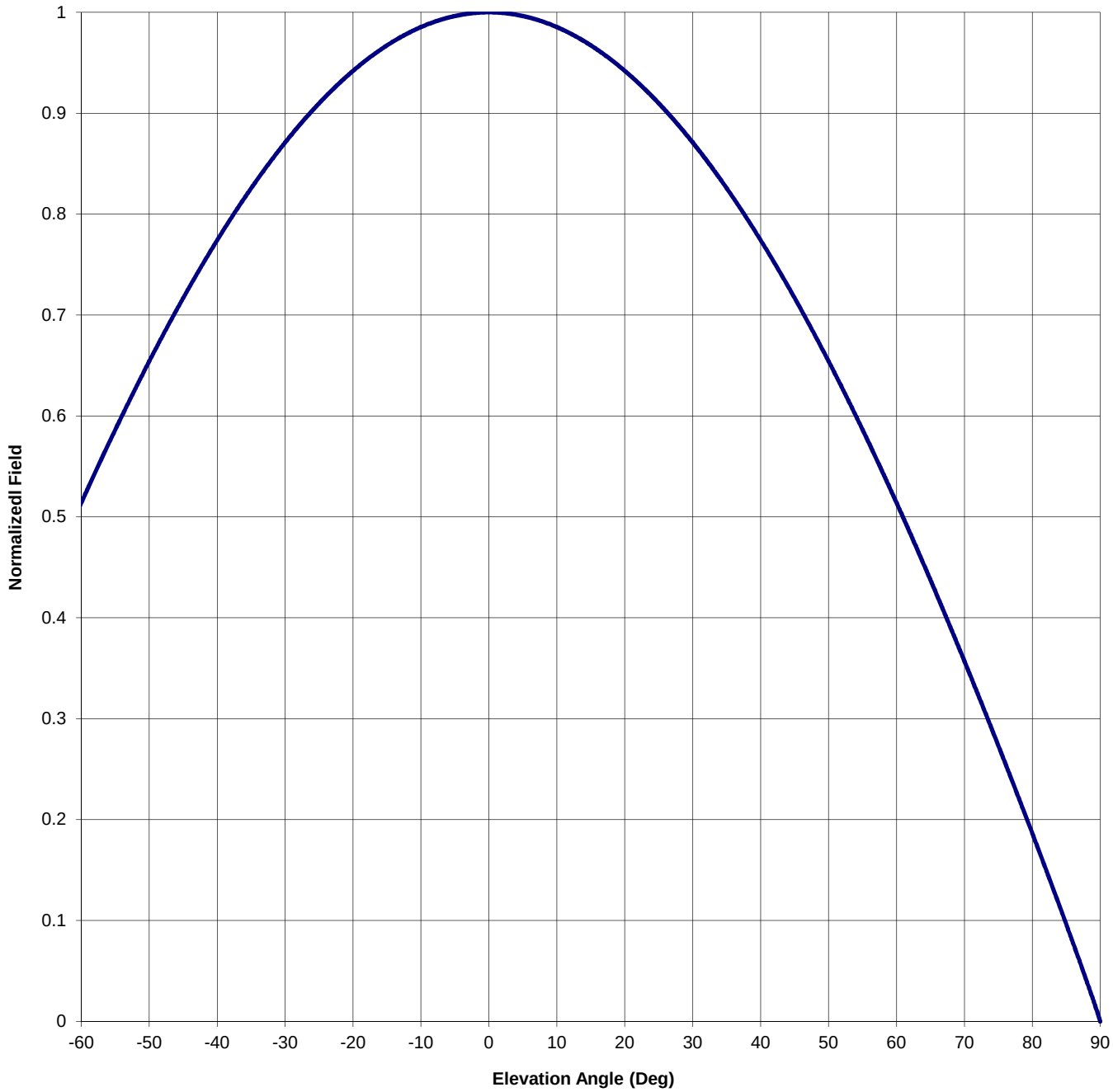
FIGURE 2, WJIC, 89.5 MHz
ALDENA SLANT (37.5°) YAGI ARRAY

SIZE	CODE IDENT. NO.	DRAWING NO.	REV
A	26750	AGF110926-001	—

SCALE		SHEET
NONE	S/O 29369	1 OF 1

Antenna Mfg.:	**Shively Labs**			**Date:**	**10/4/2011**
Antenna Type:	**Aldena (37.5°) Slant Yagi**				
Station:	**WJCI**	**Beam Tilt**	**0**		
Frequency:	**89.5**	**Gain (Max)**	**2.230**	**3.483**	**dB**
Channel #:	**208**	**Gain (Horizon)**	**2.230**	**3.483**	**dB**
Figure:	**Figure 3**				



Antenna Mfg.: Shively Labs **Date:** 10/4/2011

Antenna Type: Aldena (37.5°) Slant Yagi

Station: WJCI **Beam Tilt** 0

Frequency: 89.5 **Gain (Max)** 2.230 3.483 dB

Channel #: 208 **Gain (Horizon)** 2.230 3.483 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		

S.O. 29369 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WJCI	Baptist Village, MA
MODEL	ALDENA Slant (37.5°) YAGI

Elevation Gain of Antenna 0.471

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

H RMS 0.407 V RMS 0.519 H/V Ratio 0.785

Elevation Gain of Horizontal Component 0.370

Elevation Gain of Vertical Component 0.600

Horizontal Azimuth Gain equals $1/(RMS)^2$. 6.028

Vertical Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 3.644

Max. Vertical 0.990

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

Total Horizontal Power Gain = **2.230**

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

Total Vertical Power Gain = **2.186**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

0.033 kW ERP Divided by H Gain 2.230 equals 0.015 kW H Antenna Input Power

Antenna Input Power times Vertical Power Gain equals Vertical ERP

0.015 kW Times V Gain 2.186 equals 0.032 kW V ERP

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

(0.99)^2 Times 0.03 Equals 0.032 kW Vertical ERP

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