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S.O. 30898

Report of Test Aldena ALP.08.02.712-1-Slant 30°-DA

for

Horizon Christian Fellowship of Indianapolis, INC.

WWQI 91.3 MHz Morristown

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of a Aldena ALP.08.02.712-1-Slant 30°-DA to meet the needs of WWQI and to comply with the requirements of the FCC construction permit, file number BNPED-20071017ABZ. 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 BNPED-20071017ABZ indicates that the Horizontal radiation component shall not exceed 5.0 kW and 14.5 kW Vertical at any azimuth and is restricted to the following values at the azimuths specified:

280 – 290 Degrees True: 0.45 kilowatt

From Figure 1A, the maximum radiation of the Horizontal component occurs at 84 Degrees True to 86 Degrees True. At the restricted azimuth of 280 - 290 Degrees True the Vertical component is 17.856 dB down from the maximum of 14.5 kW, or 0.24 kW.

The R.M.S. of the Horizontal component is 0.270. The total Horizontal power gain is 0.947. The R.M.S. of the Vertical component is 0.538. The total Vertical power gain is 2.748. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.580. The R.M.S. of the measured composite pattern is 0.539. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.493. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the Aldena ALP.08.02.712-1-Slant 30°-DA was mounted on a tower of precise scale to the Sabre S3TL tower at the WWQI 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 BNPED-20071017ABZ, a single level of the Aldena ALP.08.02.712-1-Slant 30°-DA was set up on the Shively Labs 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 410.85 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 30898
June 4, 2014

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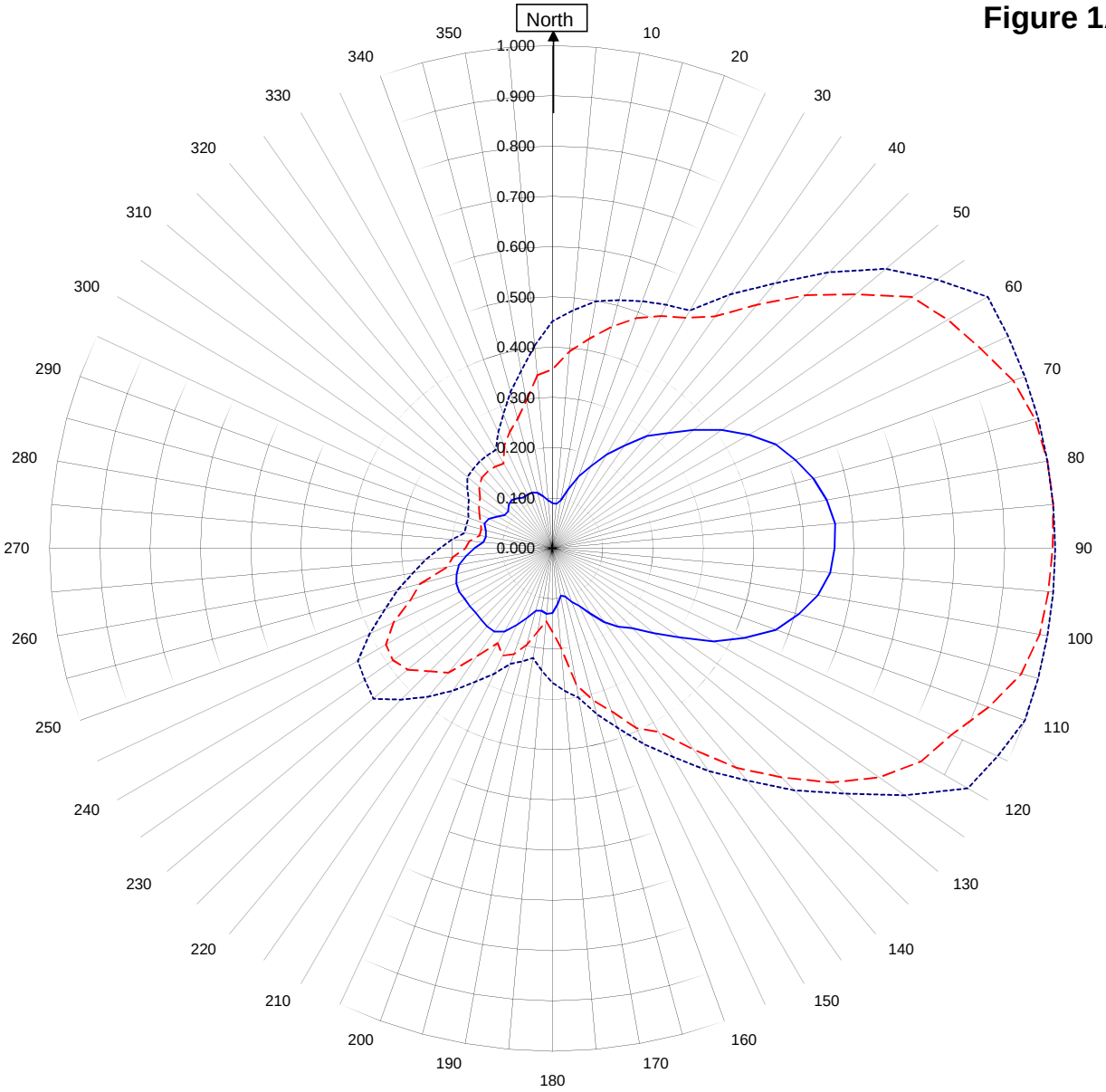
Figure 1A



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31746

June 4, 2014

Horizontal RMS	0.270
Vertical RMS	0.538
H/V Composite RMS	0.539
FCC Composite RMS	0.580

Frequency	91.3 / 410.85 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	ALP.08.02.712-1-Slant 30°-DA
Pattern Type	Directional Azimuth

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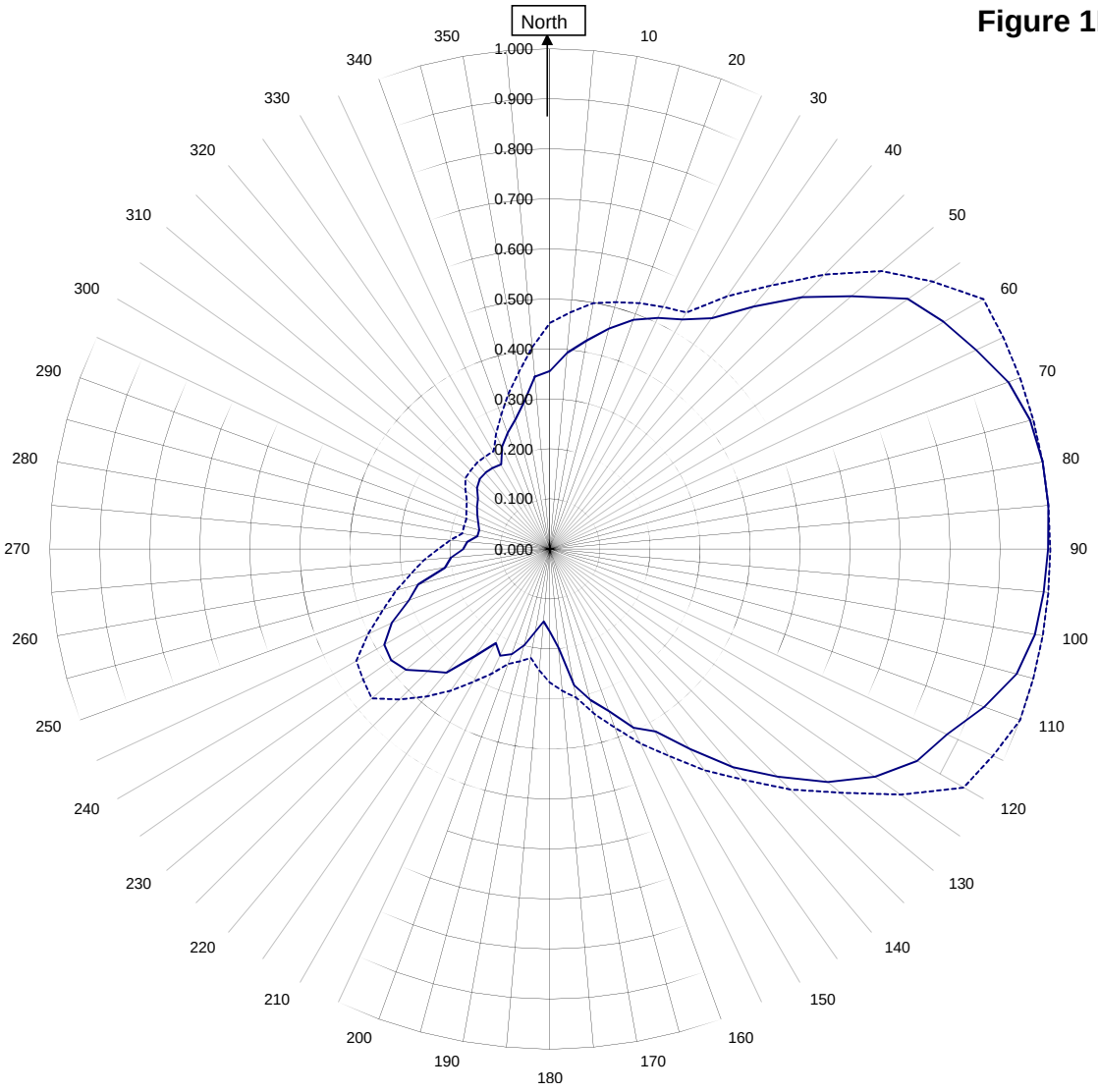
Figure 1B



WWQI MORRISTOWN, IN.

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June 4, 2014

_____H/VComposite RMS	0.539
……FCC Composite RMS	0.580

Frequency	91.3 / 410.85 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	ALP.08.02.712-1-Slant 30°-DA
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
WWQI MORRISTOWN, IN.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.090	180	0.128
10	0.098	190	0.126
20	0.153	200	0.147
30	0.215	210	0.191
40	0.292	220	0.202
45	0.325	225	0.200
50	0.366	230	0.199
60	0.452	240	0.201
70	0.514	250	0.203
80	0.554	260	0.189
90	0.561	270	0.155
100	0.536	280	0.134
110	0.474	290	0.144
120	0.370	300	0.127
130	0.262	310	0.115
135	0.224	315	0.123
140	0.203	320	0.125
150	0.149	330	0.117
160	0.113	340	0.118
170	0.095	350	0.106

Figure 1D

Tabulation of Vertical Azimuth Pattern
WWQI MORRISTOWN, IN.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.356	180	0.166
10	0.424	190	0.167
20	0.488	200	0.224
30	0.530	210	0.217
40	0.633	220	0.322
45	0.713	225	0.345
50	0.786	230	0.376
60	0.909	240	0.382
70	0.975	250	0.300
80	1.000	260	0.214
90	0.995	270	0.174
100	0.984	280	0.148
110	0.924	290	0.152
120	0.847	300	0.169
130	0.724	310	0.190
135	0.644	315	0.199
140	0.569	320	0.200
150	0.421	330	0.195
160	0.345	340	0.248
170	0.276	350	0.299

Figure 1E

Tabulation of Composite Azimuth Pattern
WWQI MORRISTOWN, IN.

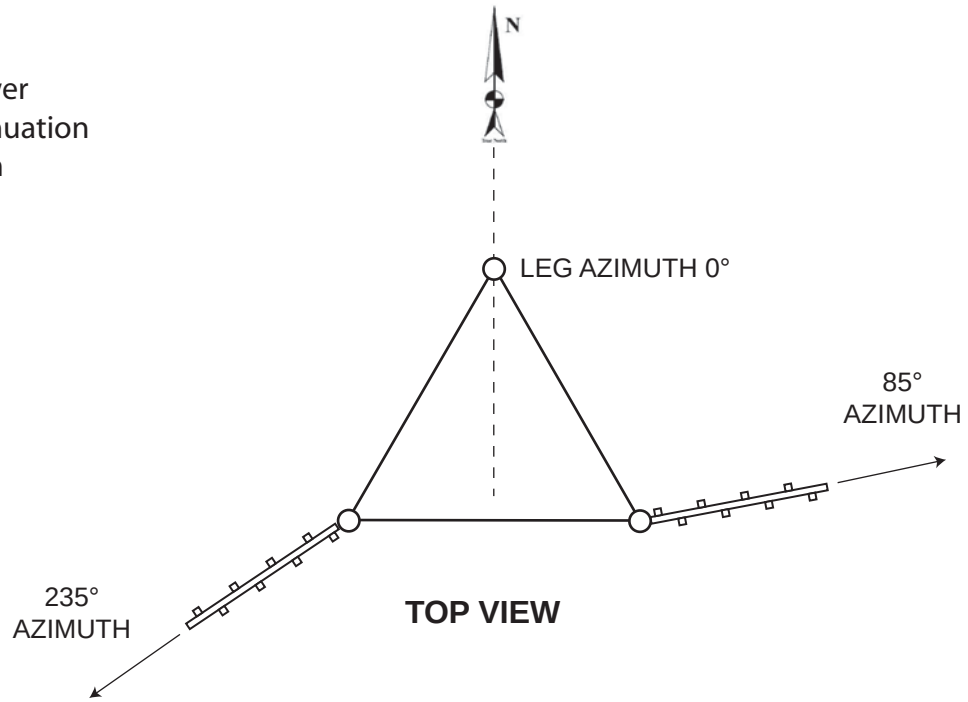
Azimuth	Rel Field	Azimuth	Rel Field
0	0.356	180	0.166
10	0.424	190	0.167
20	0.488	200	0.224
30	0.530	210	0.217
40	0.633	220	0.322
45	0.713	225	0.345
50	0.786	230	0.376
60	0.909	240	0.382
70	0.975	250	0.300
80	1.000	260	0.214
90	0.995	270	0.174
100	0.984	280	0.148
110	0.924	290	0.152
120	0.847	300	0.169
130	0.724	310	0.190
135	0.644	315	0.199
140	0.569	320	0.200
150	0.421	330	0.195
160	0.345	340	0.248
170	0.276	350	0.299

Figure 1F

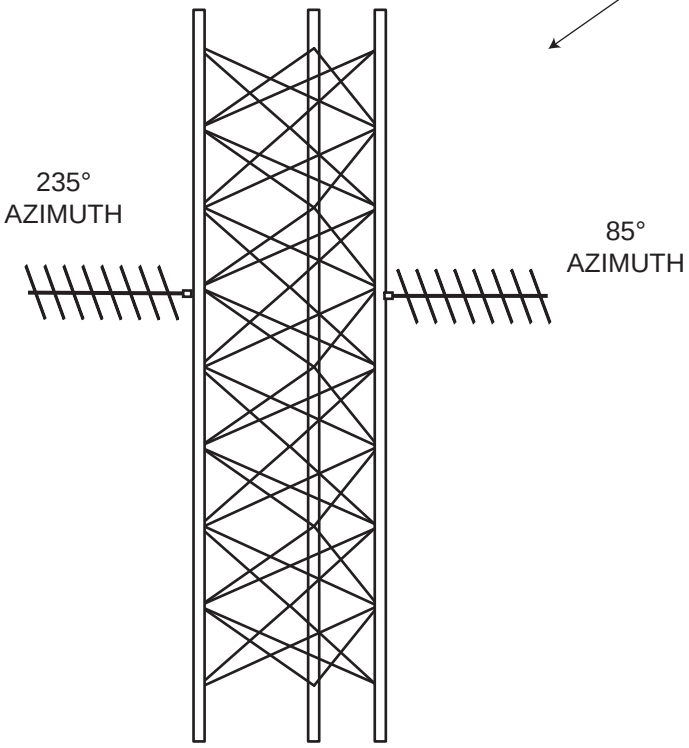
Tabulation of FCC Directional Composite
WWQI MORRISTOWN, IN.

Azimuth	Rel Field	Azimuth	Rel Field
0	0.452	180	0.267
10	0.499	190	0.221
20	0.523	200	0.244
30	0.546	210	0.306
40	0.688	220	0.385
50	0.865	230	0.465
60	1.000	240	0.447
70	1.000	250	0.355
80	1.000	260	0.282
90	1.000	270	0.224
100	1.000	280	0.178
110	1.000	290	0.178
120	0.954	300	0.192
130	0.758	310	0.221
140	0.602	320	0.226
150	0.478	330	0.226
160	0.380	340	0.285
170	0.302	350	0.359

Feed System
85° Antenna Full Power
235° Antenna 10 dB Attenuation
Equal Phase to both

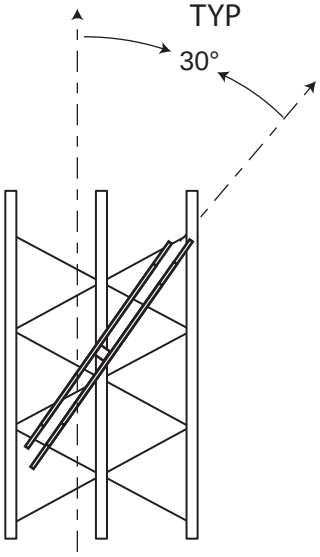


TOP VIEW



Sabre S3TL Tower

ELEVATION VIEW



PARTIAL FRONT VIEW

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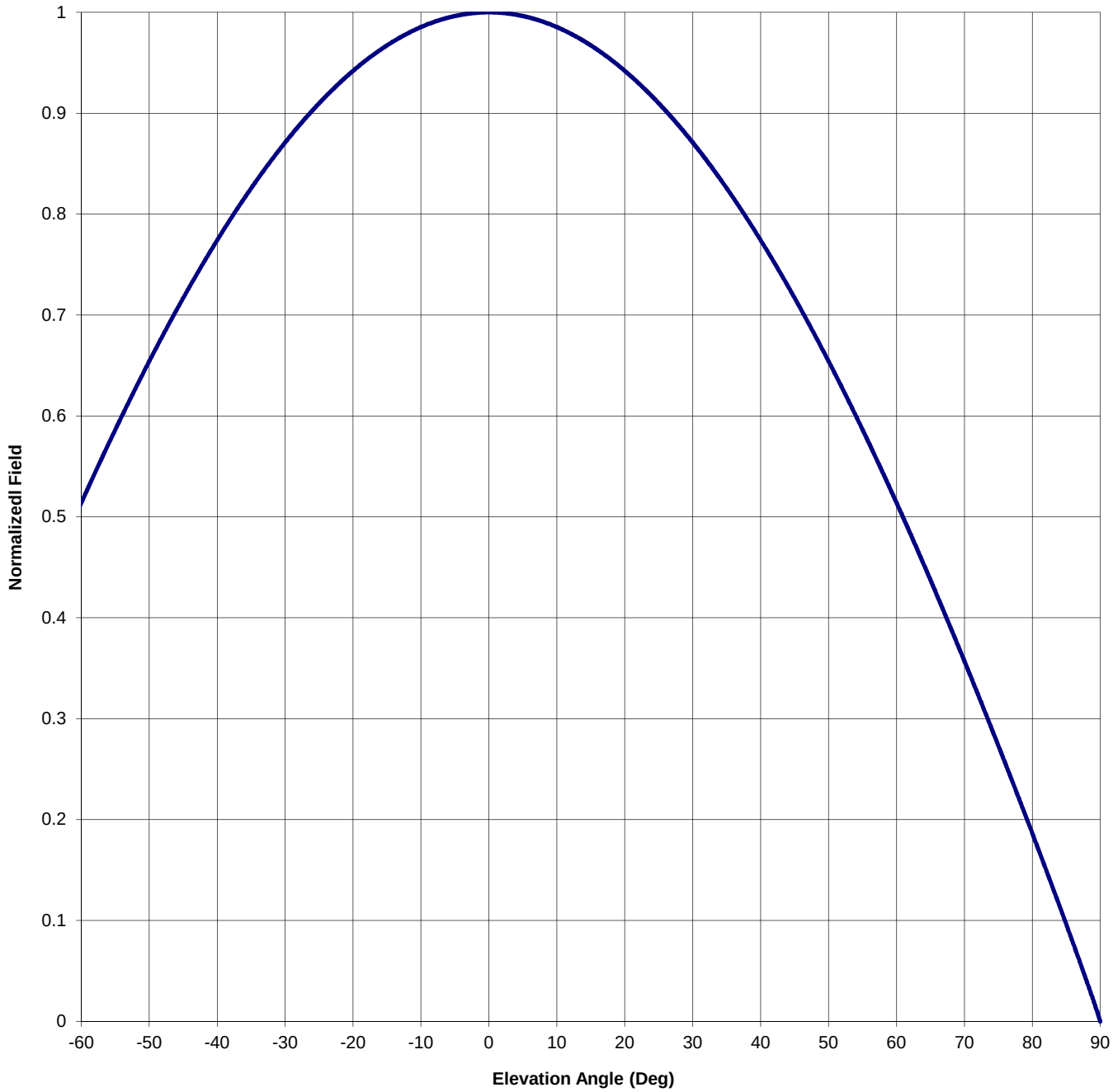
FIGURE 2, 91.3 MHz
WWQI Morristown, IN
Aldena ALP.08.02.712-1-Slant 30°-DA

SIZE	CODE IDENT. NO.	DRAWING NO.	REV
A	26750	RAS0632014	A

SCALE		SHEET
NONE	S/O 31746	1 OF 1

Antenna Mfg.:	**Shively Labs**			**Date:**	**6/4/2014**
Antenna Type:	**Alp.08.02.712-1-Slant(30°)-DA**				
Station:	**WWQI**	**Beam Tilt**	**0**		
Frequency:	**91.3**	**Gain (Max)**	**2.748**	**4.391**	**dB**
Channel #:	**217**	**Gain (Horizon)**	**2.748**	**4.391**	**dB**
Figure:	**Figure 3**				



Antenna Mfg.: Shively Labs **Date:** 6/4/2014

Antenna Type: Alp.08.02.712-1-Slant(30°)-DA

Station: WWQI **Beam Tilt** 0

Frequency: 91.3 **Gain (Max)** 2.748 4.391 dB

Channel #: 217 **Gain (Horizon)** 2.748 4.391 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. 31746 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WWQI MORRISTOWN, IN.

MODEL ALP.08.02.712-1-Slant 30°-DA

Elevation Gain of Antenna 0.4

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

H RMS 0.538369 V RMS 0.270332 H/V Ratio 1.992

Elevation Gain of Vertical Component 0.797

Elevation Gain of Horizontal Component 0.201

Vertical Azimuth Gain equals $1/(RMS)^2$. 3.450

Horizontal Azimuth Gain equals $1/(RMS/Max\ Vert)^2$. 4.715

Max. Vertical 0.587

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

Total Vertical Power Gain = **2.748**

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

Total Horizontal Power Gain = **0.947**

==========

ERP divided by Horizontal Power Gain equals Antenna Input Power

14.5 kW ERP Divided by V Gain 2.748 equals 5.276 kW V Antenna Input Power

Antenna Input Power times Horizontal Power Gain equals Horizontal ERP

5.276 kW Times H Gain 0.947 equals 4.996 kW H ERP

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

(0.587)^2 Times 14.50 Equals 4.996 kW Horizontal ERP

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