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S.O. 26858

Report of Test Aldena Model 0802712
for
HORIZON CHRISTIAN FELLOWSHIP
WTNP 91.9 MHz Richland, MI

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of an Aldena Model 0802712 to meet the needs of WTNP and to comply with the requirements of the FCC construction permit, file number BMPED-20080721AAH.

RESULTS:

The measured azimuth pattern for the Aldena Model 0802712 is shown in Figure 1. Figure 1A shows the Tabulation of the Vertical Polarization. Figure 1B shows the Tabulation of the FCC Composite Pattern. The calculated elevation patterns of the antenna are shown in Figures 3a and 3b. Construction permit file number BMPED-20080721AAH indicates that the Vertical radiation component shall not exceed 6.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

000 Degrees T: 1.05 kW
090 Degrees T: 2.65 kW
180 - 190 Degrees T: 0.30 kW

From Figure 1, the maximum radiation of the Vertical component occurs at 279 Degrees T to 293 Degrees T. At the restricted azimuth of 000 Degrees T the Vertical component is 7.89 dB down from the maximum of 6.0 kW, or 0.97 kW. At the restricted azimuth of 090 Degrees T the Vertical component is 3.60 dB down from the maximum of 6.0 kW, or 2.62 kW. At the restricted azimuth of 180 - 190 Degrees T the Vertical component is 15.92 dB down from the maximum of 6.0 kW, or 0.15 kW.

The R.M.S. of the Vertical component is 0.609. The total Vertical power gain is 4.892. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.716. The R.M.S. of the measured composite pattern is 0.609. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.609. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

Three bays of the Aldena Model 0802712 were mounted on a tower of precise scale to the 36.5 face width tower at the WTNP site. An equal power split and vertical bay to bay spacing was used 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-20080721AAH, a complete array of the Aldena Model 0802712 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 413.55 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.

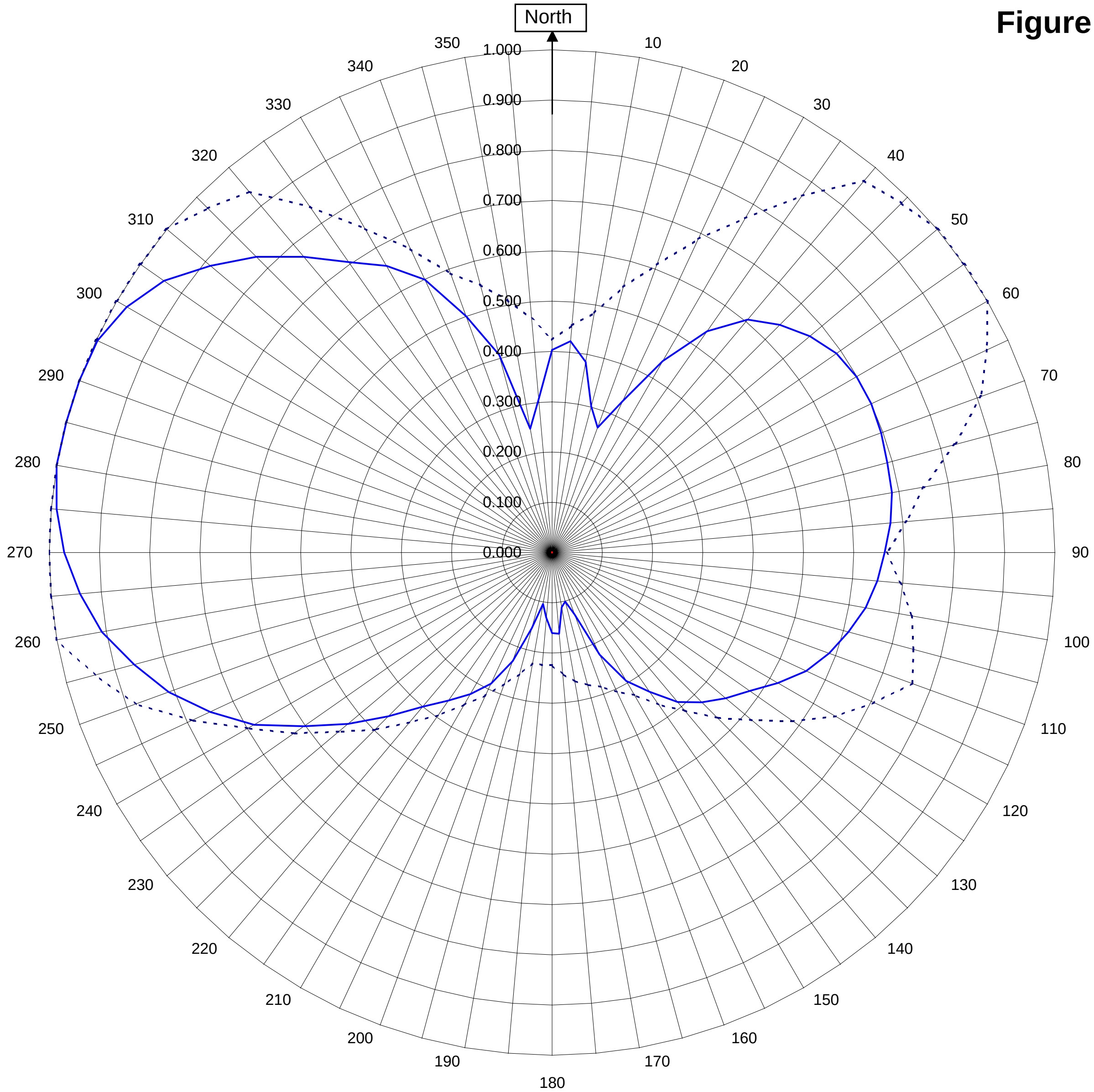
Respectfully submitted by:

Robert A. Surette
Director of Sales Engineering
S/O 26858
August 8, 2008

Shively Labs

Shively Labs, a division of Howell Laboratories, Inc. Bridgton, ME (207)647-3327

Figure 1



WTNP Richland, MI

26858

August 8, 2008

____________Vertical RMS	0.609
H/V Composite RMS	0.609
...............FCC Composite RMS	0.716

Frequency	91.9 / 413.55 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	Aldena 0802712 Pattern 25CC
Pattern Type	Directional Azimuth

Figure 1a

Tabulation of Vertical Azimuth Pattern
WTNP Richland, MI

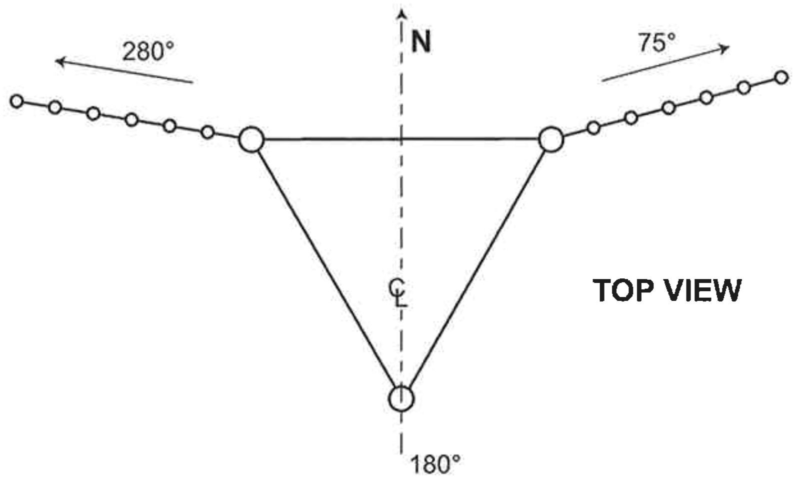
Azimuth	Rel Field	Azimuth	Rel Field
0	0.403	180	0.160
10	0.385	190	0.104
20	0.264	200	0.230
30	0.440	210	0.325
40	0.605	220	0.400
45	0.640	225	0.461
50	0.669	230	0.530
60	0.699	240	0.684
70	0.696	250	0.811
80	0.686	260	0.909
90	0.661	270	0.970
100	0.633	280	1.000
110	0.586	290	1.000
120	0.518	300	0.976
130	0.451	310	0.887
135	0.421	315	0.831
140	0.388	320	0.767
150	0.295	330	0.658
160	0.131	340	0.500
170	0.110	350	0.250

Figure 1b

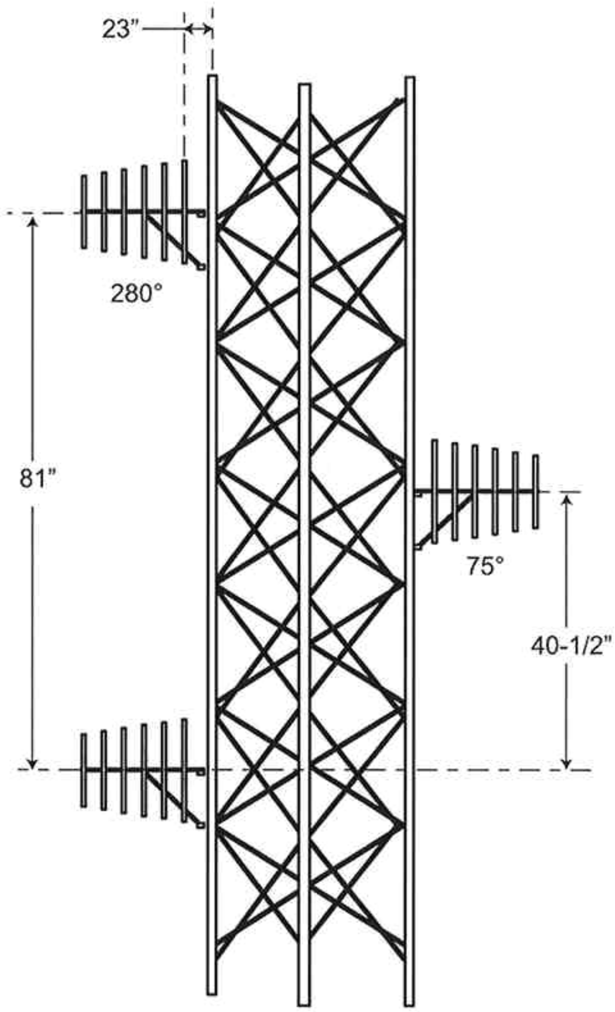
Tabulation of FCC Directional Composite
WTNP Richland, MI

Azimuth	Rel Field	Azimuth	Rel Field
0	0.423	180	0.224
10	0.484	190	0.224
20	0.609	200	0.278
30	0.767	210	0.350
40	0.965	220	0.441
50	1.000	230	0.555
60	1.000	240	0.699
70	0.907	250	0.880
80	0.750	260	1.000
90	0.665	270	1.000
100	0.726	280	1.000
110	0.762	290	1.000
120	0.651	300	1.000
130	0.518	310	1.000
140	0.411	320	0.936
150	0.327	330	0.743
160	0.284	340	0.590
170	0.260	350	0.510

REV NO	REVISION	DATE	APP'D



TOP VIEW



ELEVATION VIEW

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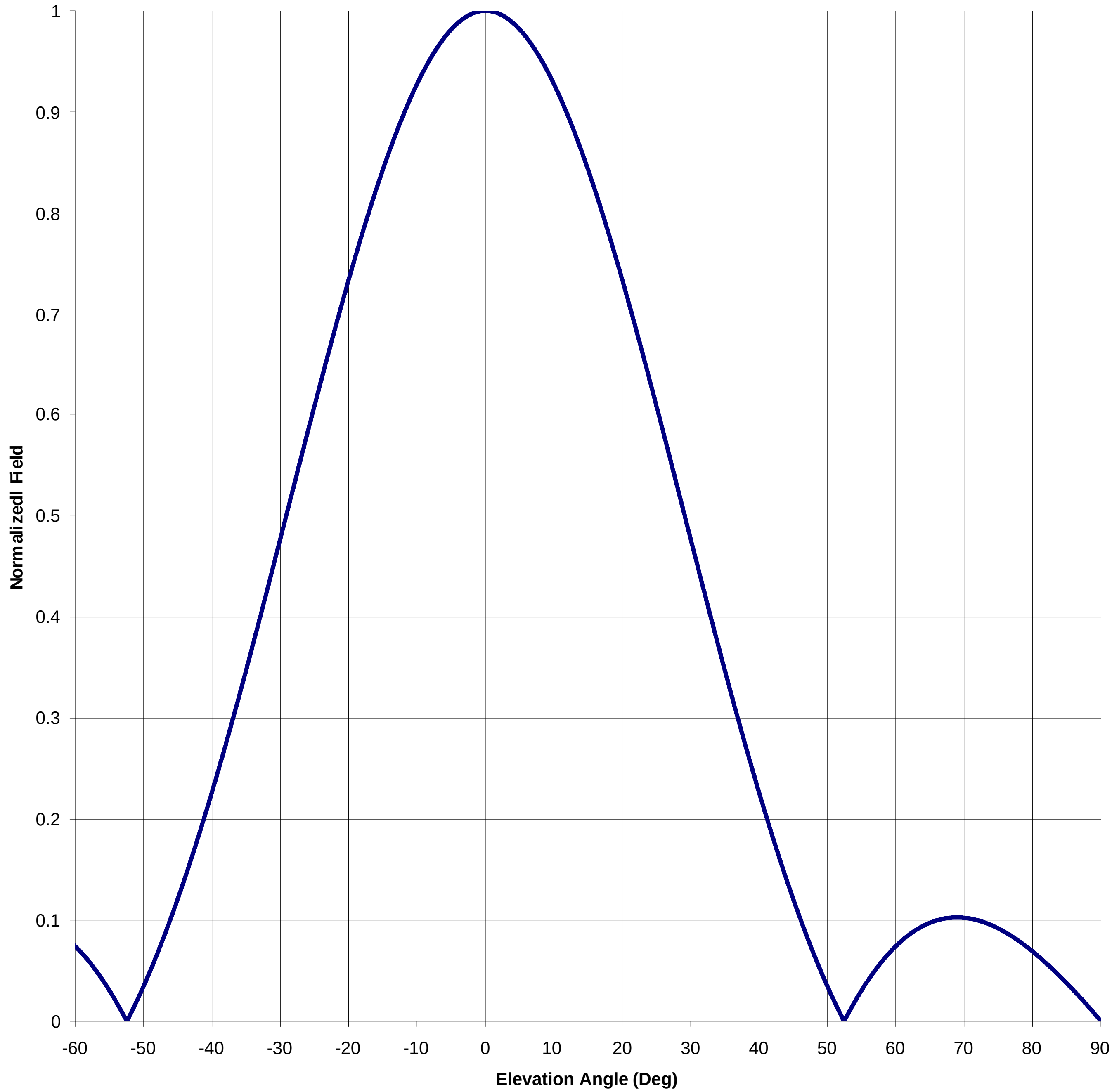
Figure 2, WTNP 91.9 MHz, Richland, MI
Aldena Log Periodic Array

SIZE	CODE IDENT NO.	DRAWING NO.	REV
A	22501	AGF080506-001	--

SCALE	NONE	S/O 26858	SHEET 1 of 1

Antenna Mfg.:	**Shively Labs**				**Date: 8/8/2008**
Antenna Type:	**Aldena Log Periodic**				
Station:	**WTNP**	**Beam Tilt**	**0**		
Frequency:	**91.9**	**Gain (Max)**	**1.972**	**2.950 dB**	
Channel #:	**220**	**Gain (Horizon)**	**1.972**	**2.950 dB**	
Figure:	**3a Main Lobe**				



Antenna Mfg.: **Shively Labs** | **Date:** **8/8/2008**

Antenna Type: **Aldena Log Periodic**

Station: **WTNP** | **Beam Tilt** **0**

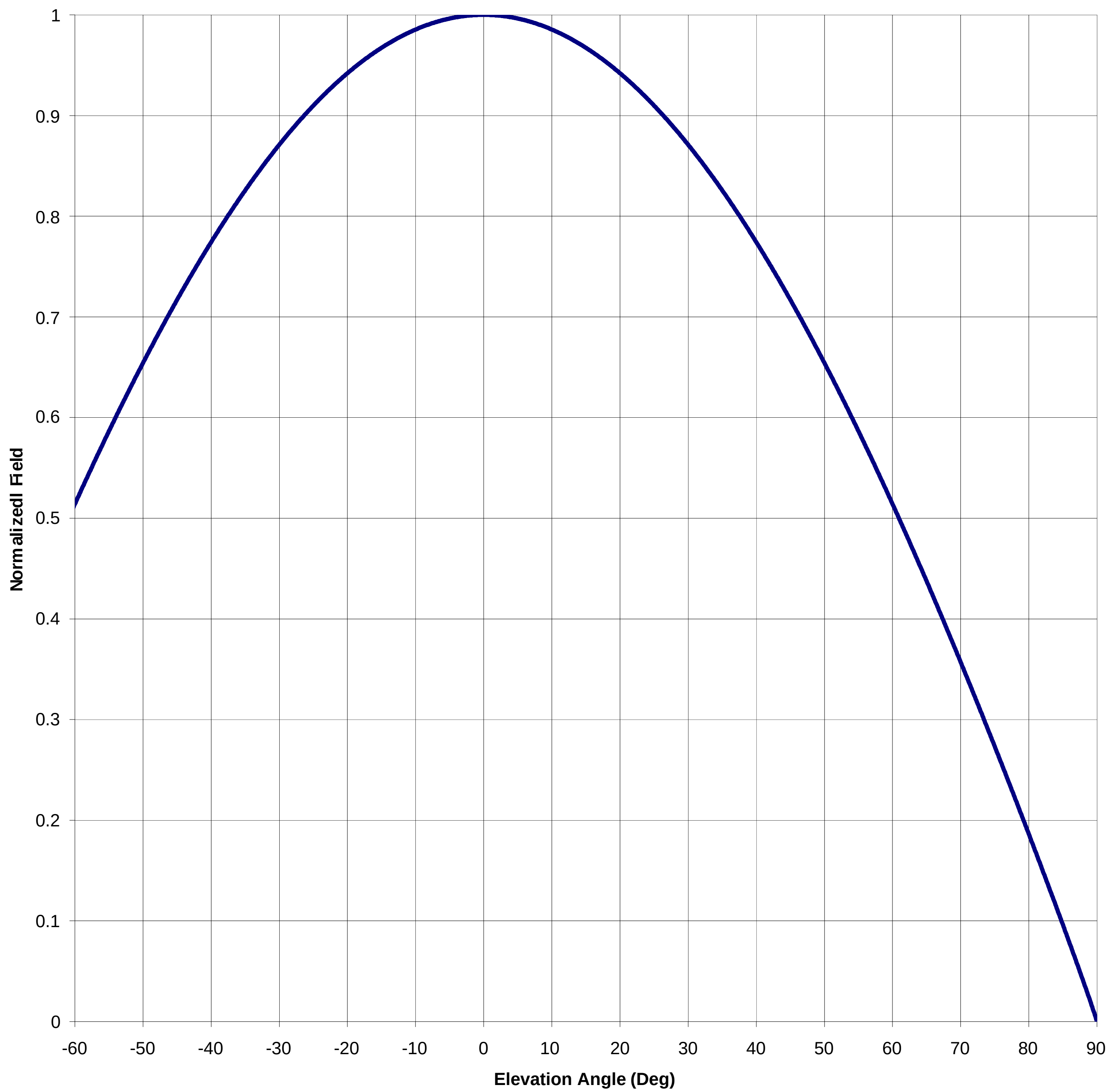
Frequency: **91.9** | **Gain (Max)** **1.972** **2.950 dB**

Channel #: **220** | **Gain (Horizon)** **1.972** **2.950 dB**

Figure: **3a Main Lobe**

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	0.141	0	1.000	46	0.102
-89	0.008	-43	0.161	1	0.999	47	0.084
-88	0.016	-42	0.182	2	0.997	48	0.067
-87	0.023	-41	0.204	3	0.993	49	0.050
-86	0.031	-40	0.227	4	0.988	50	0.035
-85	0.038	-39	0.250	5	0.982	51	0.020
-84	0.045	-38	0.274	6	0.973	52	0.006
-83	0.051	-37	0.298	7	0.964	53	0.007
-82	0.057	-36	0.322	8	0.953	54	0.019
-81	0.063	-35	0.347	9	0.941	55	0.031
-80	0.069	-34	0.373	10	0.928	56	0.041
-79	0.075	-33	0.399	11	0.913	57	0.051
-78	0.079	-32	0.425	12	0.897	58	0.059
-77	0.084	-31	0.451	13	0.880	59	0.067
-76	0.088	-30	0.477	14	0.862	60	0.074
-75	0.092	-29	0.504	15	0.843	61	0.081
-74	0.095	-28	0.530	16	0.823	62	0.086
-73	0.098	-27	0.557	17	0.802	63	0.091
-72	0.100	-26	0.583	18	0.780	64	0.094
-71	0.101	-25	0.609	19	0.757	65	0.098
-70	0.102	-24	0.635	20	0.734	66	0.100
-69	0.103	-23	0.660	21	0.710	67	0.102
-68	0.103	-22	0.685	22	0.685	68	0.103
-67	0.102	-21	0.710	23	0.660	69	0.103
-66	0.100	-20	0.734	24	0.635	70	0.102
-65	0.098	-19	0.757	25	0.609	71	0.101
-64	0.094	-18	0.780	26	0.583	72	0.100
-63	0.091	-17	0.802	27	0.557	73	0.098
-62	0.086	-16	0.823	28	0.530	74	0.095
-61	0.081	-15	0.843	29	0.504	75	0.092
-60	0.074	-14	0.862	30	0.477	76	0.088
-59	0.067	-13	0.880	31	0.451	77	0.084
-58	0.059	-12	0.897	32	0.425	78	0.079
-57	0.051	-11	0.913	33	0.399	79	0.075
-56	0.041	-10	0.928	34	0.373	80	0.069
-55	0.031	-9	0.941	35	0.347	81	0.063
-54	0.019	-8	0.953	36	0.322	82	0.057
-53	0.007	-7	0.964	37	0.298	83	0.051
-52	0.006	-6	0.973	38	0.274	84	0.045
-51	0.020	-5	0.982	39	0.250	85	0.038
-50	0.035	-4	0.988	40	0.227	86	0.031
-49	0.050	-3	0.993	41	0.204	87	0.023
-48	0.067	-2	0.997	42	0.182	88	0.016
-47	0.084	-1	0.999	43	0.161	89	0.008
-46	0.102	0	1.000	44	0.141	90	0.000
-45	0.121			45	0.121		

Antenna Mfg.:	**Shively Labs**				**Date:**	**8/8/2008**
Antenna Type:	**Aldena Log Periodic**					
Station:	**WTNP**	**Beam Tilt**	**0**			
Frequency:	**91.9**	**Gain (Max)**	**0.964**	**-0.160**	**dB**	
Channel #:	**220**	**Gain (Horizon)**	**0.964**	**-0.160**	**dB**	
Figure:	**3b Minor Lobe**					



Antenna Mfg.: **Shively Labs** **Date:** **8/8/2008**
Antenna Type: **Aldena Log Periodic**
Station: **WTNP** **Beam Tilt** **0**
Frequency: **91.9** **Gain (Max)** **0.964** **-0.160 dB**
Channel #: **220** **Gain (Horizon)** **0.964** **-0.160 dB**
Figure: **3b Minor Lobe**

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. 26858 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

WTNP 91.9 Richland, MI

Model: Aldena 0802712

Main Lobe:
Elevation Gain of Antenna in Main Lobe 1.972

V RMS 0.609

Vertical Azimuth Gain equals $1/(RMS)^2$ 2.696

Power Splitter and Feed System Efficiency 92.00%

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

Total Vertical Power Gain **4.892**

==

ERP divided by Vertical Power Gain equals Antenna Input Power

6 kW ERP Divided by V Gain 4.892 Equals **1.227** kW Antenna Input Power

==

Minor Lobe:
Elevation Gain of Antenna in Minor Lobe 0.964

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

Total Vertical Power Gain in Minor Lobe **2.391**

Antenna Input Power Times Minor Lobe Gain Equals **2.933** kW ERP in Minor Lobe

Maximum Field Value of the Minor Lobe Component squared times the Maximum ERP equals the Maximum ERP in the Minor Lobe

Maximum Field in the Minor Lobe 0.699

0.699^2 Times 6 kW Equals **2.932** kW

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