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S.O. 28265

Report of Test Aldena Log Periodic Array

for

REGENTS OF THE UNIVERSITY OF NEW MEXICO

KRRT 90.9 MHz Arroyo Seco, NM

OBJECTIVE:

The objective of this test was to demonstrate the directional characteristics of an Aldena Log Periodic Array to meet the needs of KRRT and to comply with the requirements of the FCC construction permit, file number BPED-20100413AAK.

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 Measured Composite Azimuth Pattern
Figure 1E - Tabulation of the FCC Composite

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

Construction permit file number BPED-20100413AAK indicates that the Horizontal radiation component shall not exceed 4.0 kW at any azimuth and is restricted to the following values at the azimuths specified:

90 – 150 Degrees T: 0.125 kW

From Figure 1A, the maximum radiation of the Horizontal component occurs at 358 Degrees T to 02 Degrees T. At the restricted azimuth of 90 - 150 Degrees T the Horizontal component is 19.17 dB down from the maximum of 4.0 kW, or 0.048 kW.

The R.M.S. of the Horizontal component is 0.440. The total Horizontal power gain is 5.682. See Figure 4 for calculations. The R.M.S. of the FCC composite pattern is 0.477. The R.M.S. of the measured composite pattern is 0.440. Eighty-five percent (85%) of the original authorized FCC composite pattern is 0.405. Therefore this pattern complies with the FCC requirement of 73.316(c)(2)(ix)(A).

METHOD OF DIRECTIONALIZATION:

One bay of the Aldena Log Periodic Array was mounted on a tower of precise scale to the Rohn SSV 8N tower at the KRRT site. Attenuation was applied and orientation of the antenna to the tower was varied to achieve the horizontal pattern shown in Figure 1A. See Figure 2 for mechanical details.

METHOD OF MEASUREMENT:

As allowed by the construction permit, file number BPED-20100413AAK, a single level of the Aldena Log Periodic 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 409.05 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 28265
June 10, 2010

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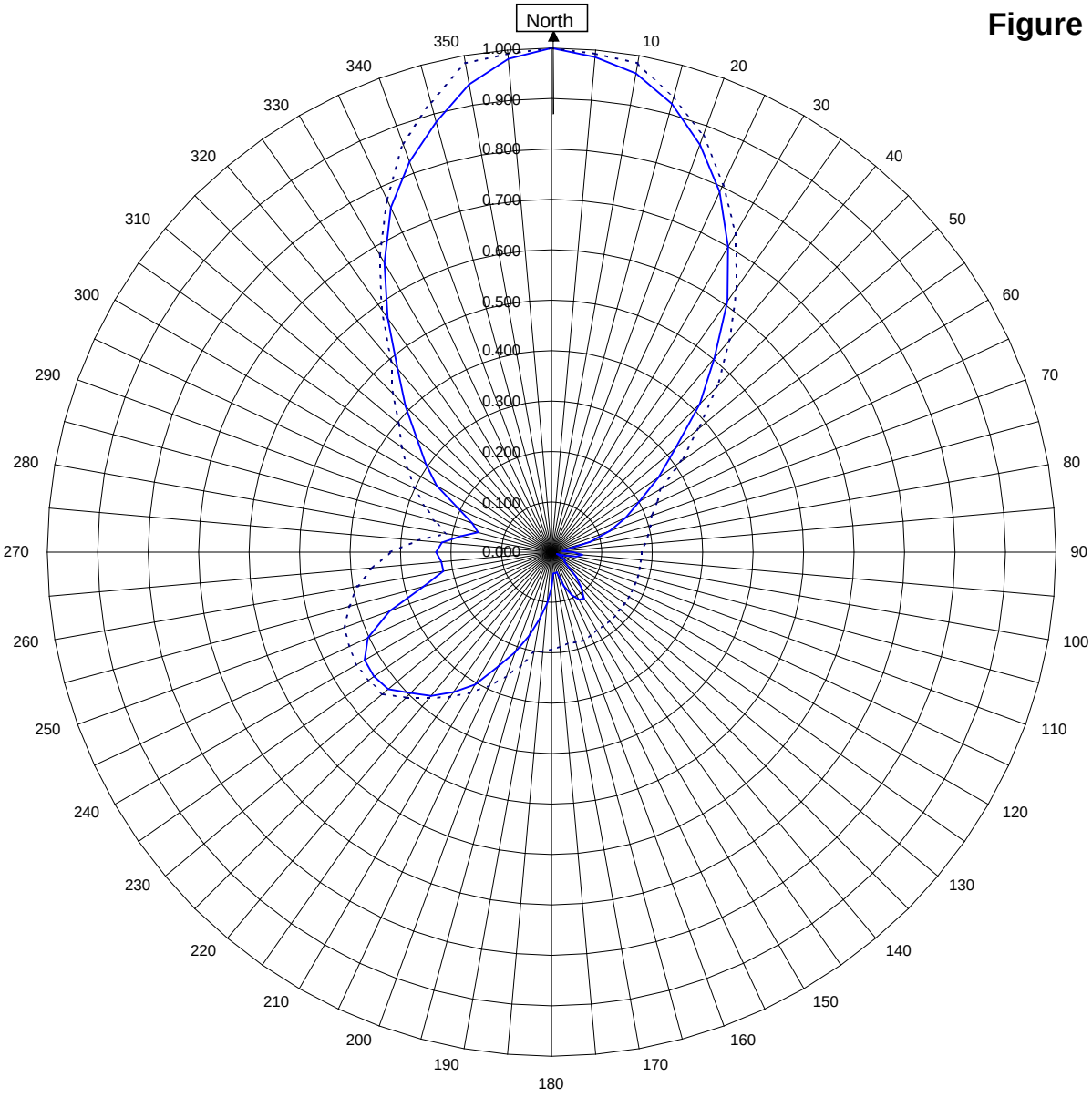
Figure 1A



KRRT Arroyo Seco, NM

28265

June 10, 2010

Horizontal RMS	0.440
Vertical RMS	0.000
H/V Composite RMS	0.440
FCC Composite RMS	0.477

Frequency	90.9 / 409.05 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	Aldena Log Periodic Array
Pattern Type	Directional Azimuth

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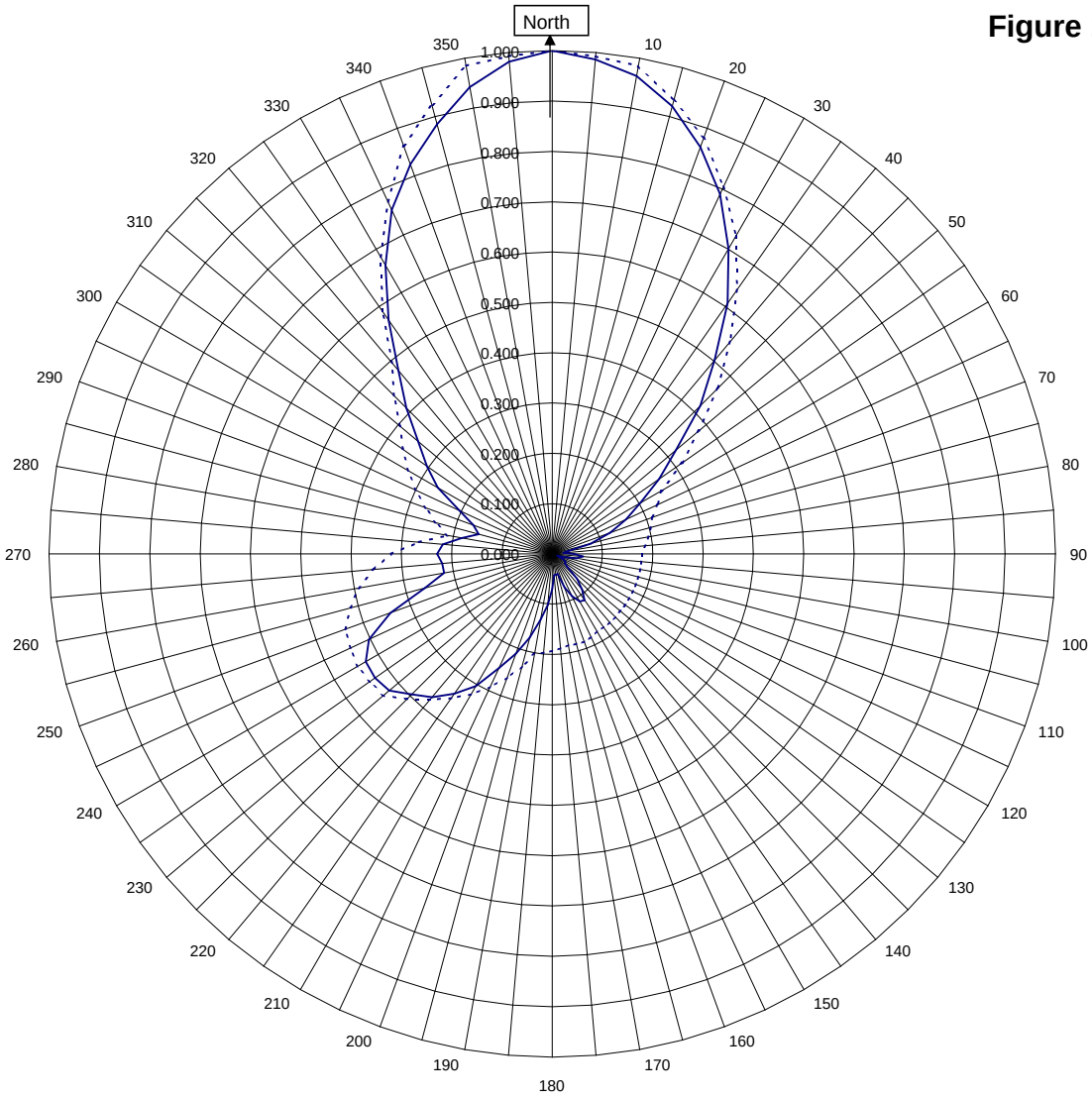
Figure 1B



KRRT Arroyo Seco, NM

28265

June 10, 2010

_____H/VComposite RMS	0.440
……FCC Composite RMS	0.477

Frequency	90.9 / 409.05 mHz
Plot	Relative Field
Scale	4.5 : 1
	See Figure 2 for Mechanical Details

Antenna Model	Aldena Log Periodic Array
Pattern Type	Directional H/V Composite

Figure 1C

Tabulation of Horizontal Azimuth Pattern
KRRT Arroyo Seco, NM

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.070
10	0.964	190	0.133
20	0.860	200	0.211
30	0.700	210	0.303
40	0.502	220	0.372
45	0.416	225	0.395
50	0.321	230	0.423
60	0.202	240	0.428
70	0.123	250	0.342
80	0.030	260	0.218
90	0.043	270	0.229
100	0.049	280	0.182
110	0.011	290	0.167
120	0.031	300	0.263
130	0.038	310	0.348
135	0.069	315	0.410
140	0.092	320	0.475
150	0.109	330	0.662
160	0.071	340	0.824
170	0.042	350	0.942

Figure 1D

Tabulation of Composite Azimuth Pattern
KRRT Arroyo Seco, NM

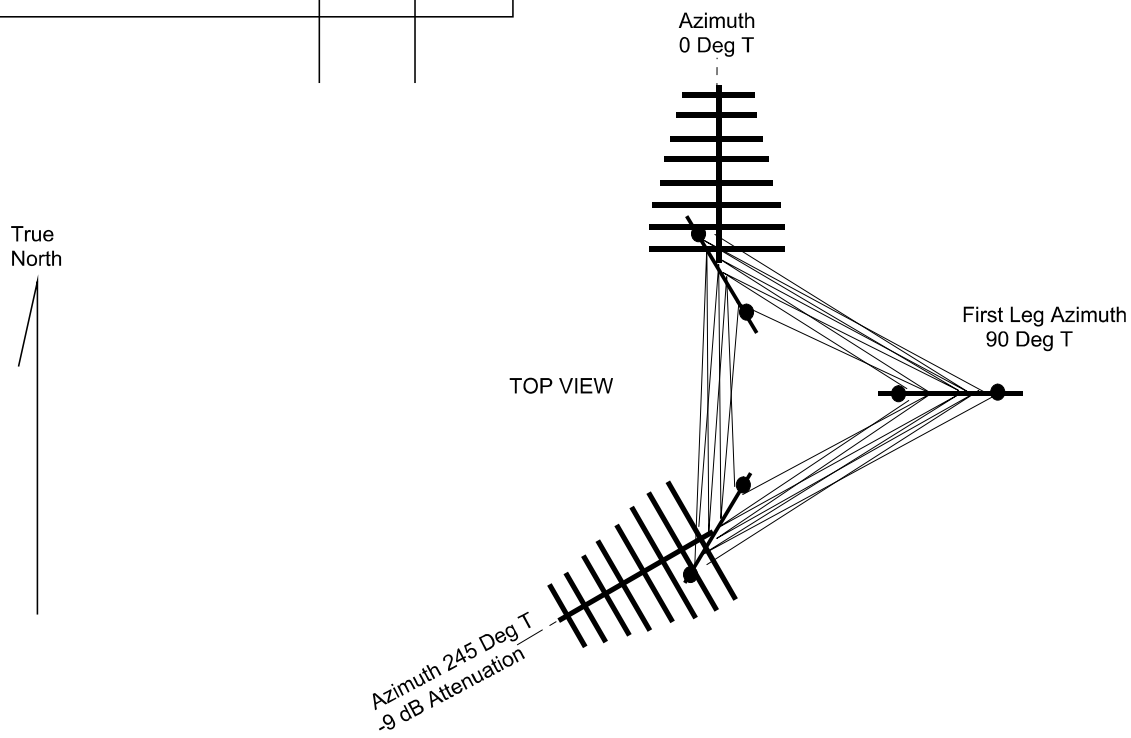
Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.070
10	0.964	190	0.133
20	0.860	200	0.211
30	0.700	210	0.303
40	0.502	220	0.372
45	0.416	225	0.395
50	0.321	230	0.423
60	0.202	240	0.428
70	0.123	250	0.342
80	0.030	260	0.218
90	0.043	270	0.229
100	0.049	280	0.182
110	0.011	290	0.167
120	0.031	300	0.263
130	0.038	310	0.348
135	0.069	315	0.410
140	0.092	320	0.475
150	0.109	330	0.662
160	0.071	340	0.824
170	0.042	350	0.942

Figure 1E

Tabulation of FCC Directional Composite
KRRT Arroyo Seco, NM

Azimuth	Rel Field	Azimuth	Rel Field
0	1.000	180	0.193
10	0.985	190	0.202
20	0.880	200	0.262
30	0.730	210	0.322
40	0.550	220	0.378
50	0.380	230	0.438
60	0.250	240	0.447
70	0.211	250	0.438
80	0.195	260	0.391
90	0.178	270	0.320
100	0.178	280	0.212
110	0.178	290	0.268
120	0.178	300	0.330
130	0.178	310	0.395
140	0.178	320	0.495
150	0.178	330	0.681
160	0.186	340	0.863
170	0.184	350	0.985

REV NO	REVISON	DATE	APP'D



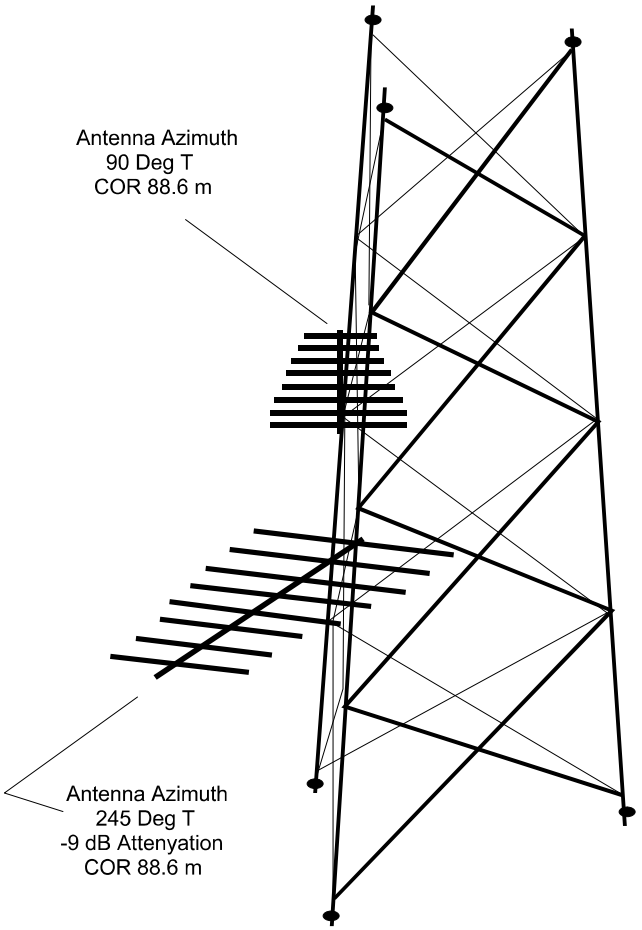


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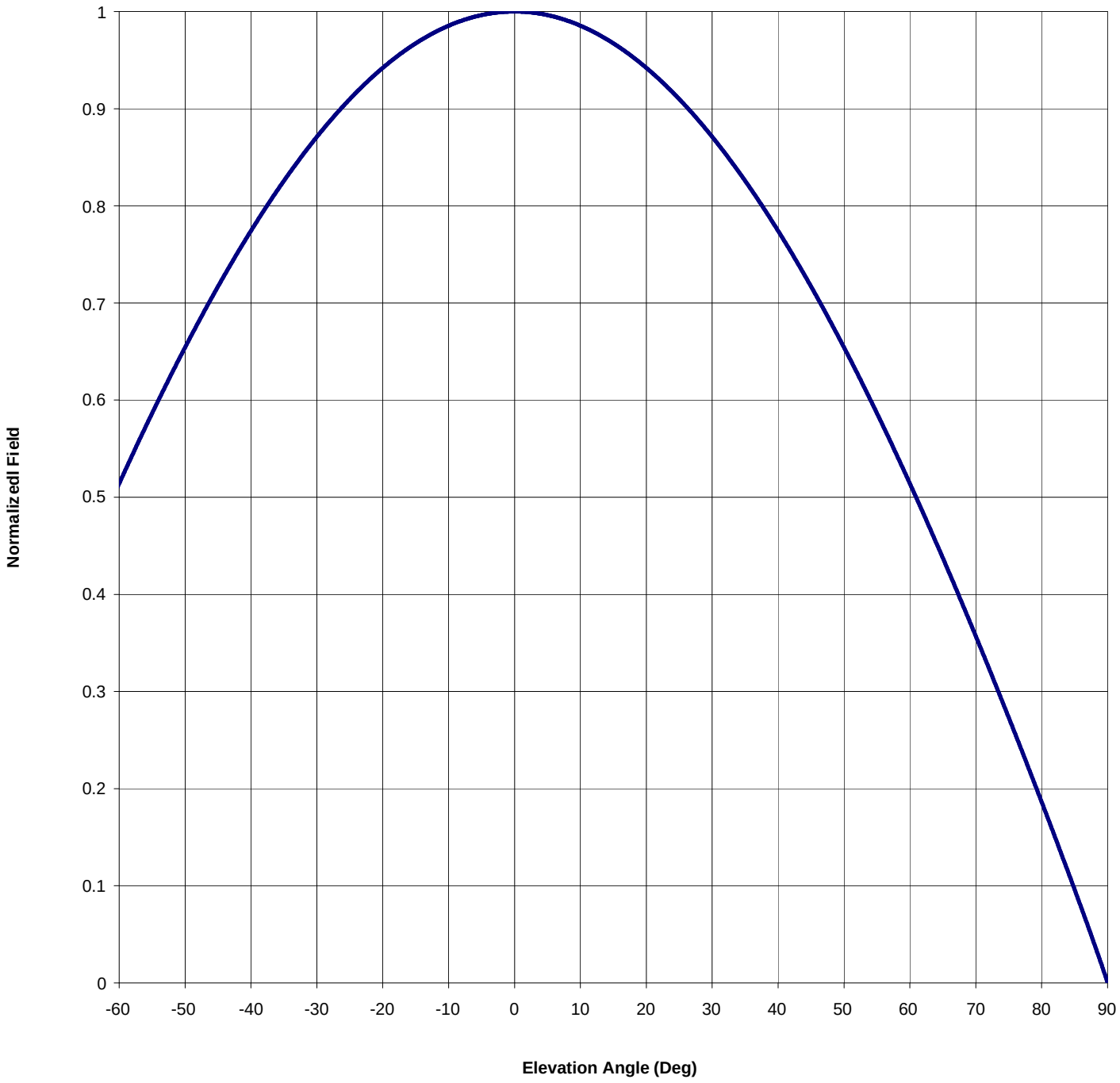
Figure 2 - KRRT Arroyo Seco, NM
Aldena Yagi Array

SIZE	CODE IDENT NO	DRAWING NO	REV
A		061010-BJR	--

SCALE		SHEET
NONE	SO 28265	1 of 1

Antenna Mfg.:	**Shively Labs**			**Date: 6/10/2010**
Antenna Type:	**Aldena Log Periodic Array**			
Station:	**KRRT**	**Beam Tilt**	**0**	
Frequency:	**90.9**	**Gain (Max)**	**5.682**	**7.545 dB**
Channel #:	**215**	**Gain (Horizon)**	**5.682**	**7.545 dB**
Figure:	**3**			



Antenna Mfg.: Shively Labs **Date:** 6/10/2010

Antenna Type: Aldena Log Periodic Array

Station: KRRT **Beam Tilt** 0

Frequency: 90.9 **Gain (Max)** 5.682 7.545 dB

Channel #: 215 **Gain (Horizon)** 5.682 7.545 dB

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. 28265 Figure 4

VALIDATION OF TOTAL POWER GAIN CALCULATION

KRRT 90.9 MHz Arroyo Seco, NM

Aldena Log Periodic Array

Elevation Gain of Antenna 1.1

H RMS 0.44

Horizontal Azimuth Gain equals $1/(RMS)^2$ 5.165

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

Total Horizontal Power Gain **5.682**

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ERP divided by Horizontal Power Gain equals Antenna Input Power

4 kW ERP Divided by H Gain 5.682 Equals **0.704** kW Antenna Input Power