

Directional Antenna System for KLRD, Yucaipa, California

July 14, 2011

Electronics Research Inc. is providing modifications to an existing antenna system that is specially designed to meet the FCC requirements and the general needs of radio station KLRD.

The antenna is the ERI model LP-5C-DA-HW-SP configuration. The circular polarized system consists of 5 half-wavelength spaced bays using one driven circular polarized radiating element per bay, two horizontal parasitic elements per bay and two vertical parasitic elements per bay. The antenna was mounted on the North 312.25 degrees East tower face with bracketry to provide an antenna orientation of North 312.25 degrees East. The antenna was tested on an 18" ***ERI***[®] ***λ MOUNTING SYSTEM***, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 90.1 megahertz, which is the center of the FM broadcast channel assigned to KLRD.

Pattern measurements were made on a sixty-acre antenna pattern range that is owned and operated by Electronics Research, Inc. The tests were performed under the direction of Thomas B. Silliman, president of Electronics Research, Inc. Mr. Silliman has the Bachelor of Electrical Engineering and the Master of Electrical Engineering degrees from Cornell University and is a registered professional engineer in the states of Indiana, Maryland and Minnesota.



Directional Antenna System For KLRD, Yucaipa, California

(Continued)

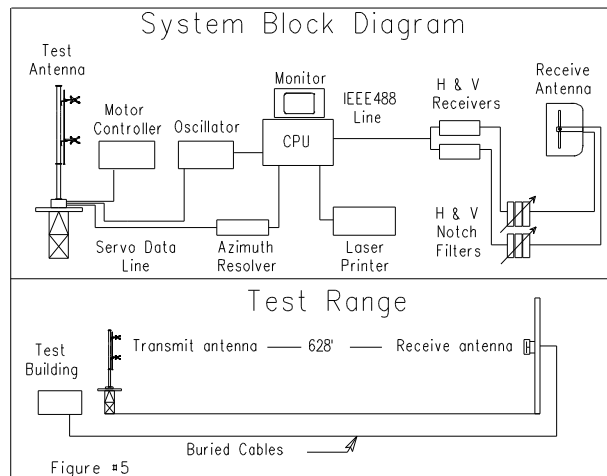
DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of two bay levels of the circular polarized system with the associated horizontal and vertical parasitic elements. The elements and brackets that were used in this test are electrically equivalent to those that will be supplied with the antenna. A section of 1 5/8 inch o.d. rigid coaxial line was used to feed the test antenna, and a section of 1 5/8 inch o.d. rigid outer conductor only was attached above the test antenna. The lines were properly grounded during all tests.

The power distribution and phase relationship to the antenna elements was adjusted in order to achieve the directional radiation patterns for both horizontal and vertical polarization components.

The proof-of-performance was accomplished using an 18" **ERI**® **λ** **MOUNTING SYSTEM**, face tower with identical dimension and configuration including all braces, ladders, conduits, coaxial lines and other appurtenances that are included in the actual aperture at which the antenna will be installed. The structure was erected vertically on a turntable mounted on a non-metallic building with the antenna centered vertically on the structure, making the center of radiation of the test approximately 30 feet above ground. The turntable is equipped with a motor drive and a US Digital angle position indicator. The resolution of this angle position indicator is one-hundredth of a degree.

The antenna under test was operated in the transmitting mode and fed from an HP8657D signal generator. The frequency of the signal source was set at 90.1 MHz and was constantly monitored by a Rohde & Schwarz ESVD measuring receiver.



Directional Antenna System For KLRD, Yucaipa, California

(Continued)

A broadband horizontal and vertical dipole system, located approximately 628 feet from the test antenna, was used to receive the emitted test signals. The dipole system was mounted at the same height above terrain as the center of the antenna under test. The signals received by the dipole system were fed to the test building by way of two buried Heliac cables to a Rohde & Schwarz measuring receiver. This data was interfaced to a laser jet printer by means of a computer system. Relative field strength was plotted as a function of azimuth.

The measurements were performed by rotating the test antenna in a counter-clockwise direction and plotting the received signal on polar coordinated graph paper in a clockwise direction. Both horizontal and vertical components were recorded separately.

CONCLUSIONS

The circular polarized system consists of 5 half-wavelength spaced bays using one driven circular polarized radiating element per bay, two horizontal parasitic elements per bay and two vertical parasitic elements per bay. The power distribution and phase relationship will be fixed when antenna is manufactured. Proper maintenance of the elements should be all that is required to maintain the pattern in adjustment.

The LP-5C-DA-HW-SP array is to be mounted on the North 312.25 degrees East tower face of the 18" **ERI[®] λ MOUNTING SYSTEM**, face tower at a bearing of North 312.25 degrees East. Blue prints provided with the antenna will show the proper antenna orientation alignment. The antenna alignment procedure should be directed by a licensed surveyor as prescribed by the FCC.

Figure #1 represents the measured individual horizontal and vertical components, the composite maximum of either the horizontal or vertical component at any azimuth and the FCC filed envelope pattern. The horizontal plane relative field list for the composite pattern and the individual H & V components are shown as Figure #1 & 1A respectively. The actual measured pattern does not exceed the authorized FCC composite pattern at any azimuth.

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For
KLRD, Yucaipa, California

(Continued)

A calculated vertical plane relative field pattern is shown on Figure #3 attached. The power in the maximum will reach 0.600 kilowatts (-2.218 dBk).

The power at North 130 degrees East does not exceed 0.063 kilowatts (-12.007 dBk).

The power at North 180-190 degrees East does not exceed 0.294 kilowatts (-5.317 dBk).

The RMS of the vertically polarized horizontal plane component does not exceed the RMS of the horizontally polarized horizontal plane component.

The composite horizontal and vertical maximum relative field pattern obtained from the measured data as shown on Figure #1 has an RMS that is greater than 85% of the filed composite pattern.

The clear vertical length of the structure required to support the antenna is 37 feet if the antenna is to be top mounted.

The directional antenna should not be mounted on the top of an antenna tower that includes a top-mounted platform larger than the cross-sectional area of the tower in the horizontal plane. No obstructions other than those that are specified by the blue prints supplied with the antenna are to be mounted within 75 ft. horizontally of the system. The vertical distance to the nearest obstruction should be a minimum of 10 ft. from the directional antenna. Metallic guy wires should be a minimum distance of forty feet horizontally from the antenna.

ELECTRONICS RESEARCH, INC.



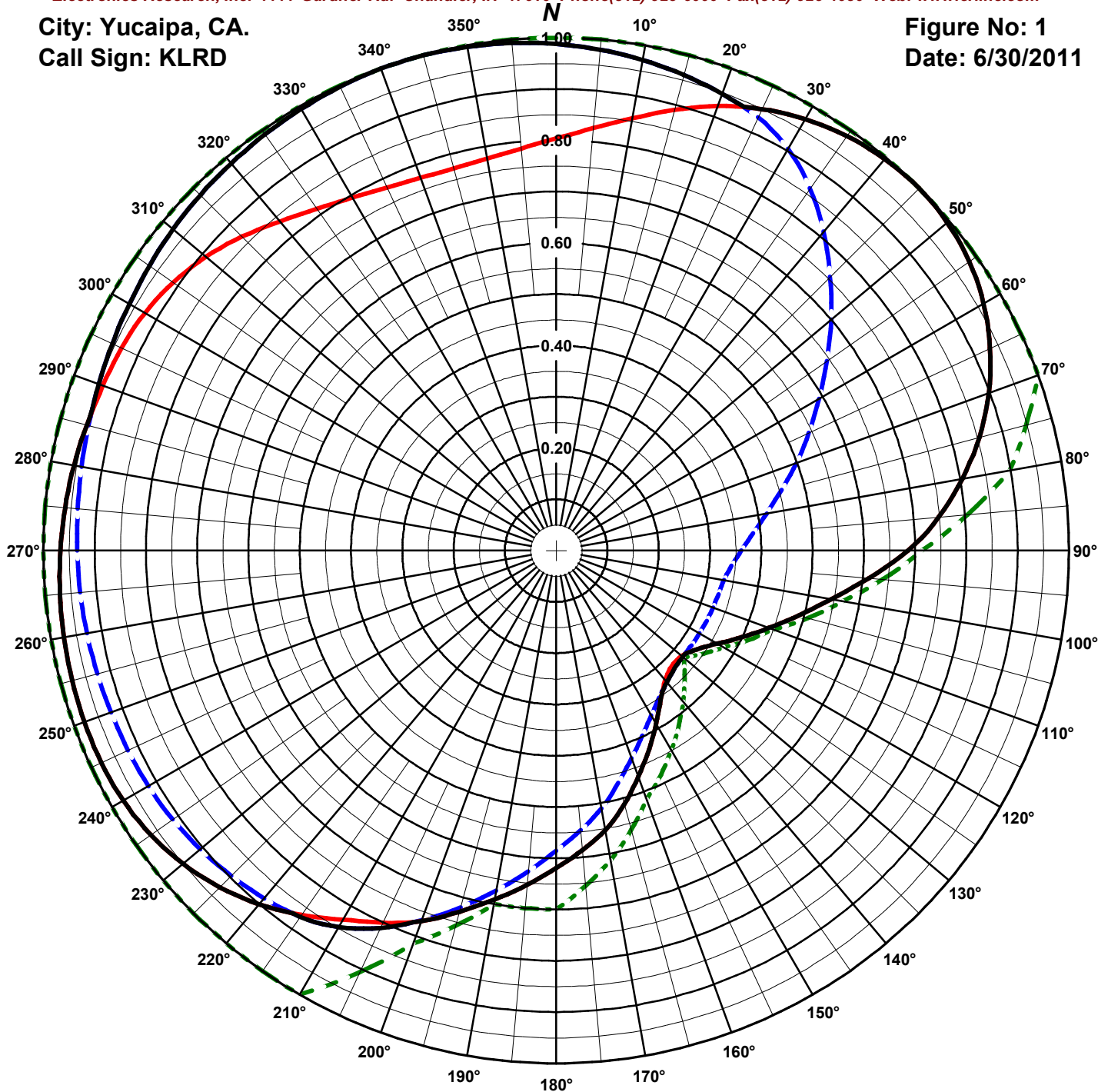
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ERI® Horizontal Plane Relative Field Pattern

Electronics Research, Inc. 7777 Gardner Rd. Chandler, IN 47610 Phone(812) 925-6000 Fax(812) 925-4030 Web: www.eriinc.com

City: Yucaipa, CA.
Call Sign: KLRD

Figure No: 1
Date: 6/30/2011



Antenna Orientation: 312.25° True

Frequency: 90.1 MHz

Antenna Type: LP-5C-DA-HW-SP

Antenna Mounting: Standard

Tower Type: 18" Lambda

HORIZONTAL

RMS: .802

Maximum: 1 @ 45°

Minimum: .317 @ 133°

VERTICAL

RMS: .774

Maximum: 1 @ 342°

Minimum: .322 @ 128°

COMPOSITE

RMS: .84

Maximum: 1 @ 45°

Minimum: .322 @ 129°

FCC ENVELOPE

RMS: .877

Maximum: 1 @ 0°

Minimum: .324 @ 130°

Measured patterns of the horizontal and vertical components, with the composite maximum of either the H or V components and the filed FCC envelope pattern BPED-20041124AGK.

ERI[®] Horizontal Plane Relative Field Pattern

Electronics Research, Inc. 7777 Gardner Rd. Chandler, IN 47610 Phone(812) 925-6000 Fax(812) 925-4030 Web: www.eriinc.com

Figure# 1

Date: 6/30/2011

Station: KLRD

Antenna: LP-5C-DA-HW-SP

Location: Yucaipa, CA.

Antenna Orientation: 312.25° True

Frequency: 90.1 MHz

Number of Bays: 5

Azimuth	Envelope			Polarization	Azimuth	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.988	0.586	-2.324	Vertical	180°	0.619	0.230	-6.379	Horizontal
5°	0.980	0.577	-2.390	Vertical	185°	0.654	0.257	-5.901	Horizontal
10°	0.971	0.566	-2.472	Vertical	190°	0.691	0.286	-5.435	Horizontal
15°	0.960	0.553	-2.571	Vertical	195°	0.729	0.319	-4.965	Horizontal
20°	0.947	0.539	-2.688	Vertical	200°	0.769	0.355	-4.503	Horizontal
25°	0.950	0.541	-2.666	Horizontal	205°	0.812	0.395	-4.030	Vertical
30°	0.971	0.566	-2.470	Horizontal	210°	0.848	0.431	-3.653	Vertical
35°	0.987	0.585	-2.332	Horizontal	215°	0.871	0.456	-3.415	Vertical
40°	0.997	0.596	-2.247	Horizontal	220°	0.901	0.487	-3.128	Horizontal
45°	1.000	0.600	-2.218	Horizontal	225°	0.928	0.517	-2.866	Horizontal
50°	0.996	0.595	-2.257	Horizontal	230°	0.950	0.541	-2.666	Horizontal
55°	0.983	0.580	-2.365	Horizontal	235°	0.965	0.559	-2.525	Horizontal
60°	0.963	0.556	-2.550	Horizontal	240°	0.975	0.570	-2.439	Horizontal
65°	0.934	0.523	-2.814	Horizontal	245°	0.979	0.575	-2.406	Horizontal
70°	0.898	0.484	-3.155	Horizontal	250°	0.979	0.575	-2.406	Horizontal
75°	0.854	0.438	-3.586	Horizontal	255°	0.977	0.573	-2.419	Horizontal
80°	0.804	0.388	-4.113	Horizontal	260°	0.975	0.570	-2.442	Horizontal
85°	0.749	0.337	-4.728	Horizontal	265°	0.971	0.566	-2.473	Horizontal
90°	0.686	0.283	-5.488	Horizontal	270°	0.967	0.561	-2.513	Horizontal
95°	0.613	0.225	-6.471	Horizontal	275°	0.961	0.554	-2.562	Horizontal
100°	0.545	0.178	-7.489	Horizontal	280°	0.955	0.547	-2.620	Horizontal
105°	0.489	0.144	-8.424	Horizontal	285°	0.947	0.539	-2.688	Horizontal
110°	0.442	0.117	-9.320	Horizontal	290°	0.949	0.541	-2.671	Vertical
115°	0.400	0.096	-10.183	Horizontal	295°	0.955	0.547	-2.619	Vertical
120°	0.363	0.079	-11.020	Horizontal	300°	0.961	0.554	-2.563	Vertical
125°	0.335	0.067	-11.709	Horizontal	305°	0.968	0.562	-2.499	Vertical
130°	0.322	0.062	-12.055	Vertical	310°	0.975	0.571	-2.436	Vertical
135°	0.326	0.064	-11.954	Vertical	315°	0.981	0.577	-2.385	Vertical
140°	0.335	0.067	-11.709	Vertical	320°	0.986	0.583	-2.343	Vertical
145°	0.355	0.076	-11.204	Horizontal	325°	0.990	0.588	-2.304	Vertical
150°	0.390	0.091	-10.394	Horizontal	330°	0.994	0.593	-2.268	Vertical
155°	0.428	0.110	-9.589	Horizontal	335°	0.998	0.597	-2.238	Vertical
160°	0.469	0.132	-8.793	Horizontal	340°	1.000	0.600	-2.220	Vertical
165°	0.512	0.158	-8.026	Horizontal	345°	1.000	0.600	-2.222	Vertical
170°	0.553	0.184	-7.359	Horizontal	350°	0.998	0.597	-2.240	Vertical
175°	0.587	0.207	-6.850	Horizontal	355°	0.994	0.592	-2.274	Vertical

Horizontal Polarization:

Maximum: 2.507 (3.992 dB)

Horizontal Plane: 2.440 (3.874 dB)

Maximum ERP: 0.600 kW

Vertical Polarization:

Maximum: 2.507 (3.992 dB)

Horizontal Plane: 2.440 (3.874 dB)

Maximum ERP: 0.600 kW

Total Input Power: 0.239 kW

Reference: KLRD1M.FIG

This list shows the the maximum azimuth values of either the horizontal or vertical components.

ERI[®] Horizontal Plane Relative Field Pattern

Electronics Research, Inc. 7777 Gardner Rd. Chandler, IN 47610 Phone(812) 925-6000 Fax(812) 925-4030 Web: www.eriinc.com

Figure# 1A

Date: 6/30/2011

Station: KLRD

Antenna: LP-5C-DA-HW-SP

Location: Yucaipa, CA.

Antenna Orientation: 312.25° True

Frequency: 90.1 MHz

Number of Bays: 5

Azimuth	Horizontal			Vertical			Azimuth	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.804	0.388	-4.116	0.988	0.586	-2.324	180°	0.619	0.230	-6.379	0.585	0.206	-6.870
5°	0.827	0.410	-3.872	0.980	0.577	-2.390	185°	0.654	0.257	-5.901	0.628	0.236	-6.262
10°	0.856	0.439	-3.573	0.971	0.566	-2.472	190°	0.691	0.286	-5.435	0.673	0.272	-5.655
15°	0.889	0.475	-3.236	0.960	0.553	-2.571	195°	0.729	0.319	-4.965	0.720	0.311	-5.073
20°	0.922	0.510	-2.922	0.947	0.539	-2.688	200°	0.769	0.355	-4.503	0.767	0.353	-4.517
25°	0.950	0.541	-2.666	0.932	0.522	-2.827	205°	0.801	0.385	-4.149	0.812	0.395	-4.030
30°	0.971	0.566	-2.470	0.905	0.491	-3.089	210°	0.831	0.415	-3.822	0.848	0.431	-3.653
35°	0.987	0.585	-2.332	0.863	0.446	-3.503	215°	0.867	0.451	-3.454	0.871	0.456	-3.415
40°	0.997	0.596	-2.247	0.812	0.395	-4.031	220°	0.901	0.487	-3.128	0.886	0.470	-3.275
45°	1.000	0.600	-2.218	0.755	0.342	-4.655	225°	0.928	0.517	-2.866	0.897	0.482	-3.165
50°	0.996	0.595	-2.257	0.700	0.294	-5.317	230°	0.950	0.541	-2.666	0.906	0.492	-3.077
55°	0.983	0.580	-2.365	0.644	0.249	-6.039	235°	0.965	0.559	-2.525	0.913	0.500	-3.009
60°	0.963	0.556	-2.550	0.592	0.210	-6.775	240°	0.975	0.570	-2.439	0.918	0.506	-2.960
65°	0.934	0.523	-2.814	0.544	0.177	-7.512	245°	0.979	0.575	-2.406	0.921	0.509	-2.930
70°	0.898	0.484	-3.155	0.498	0.149	-8.266	250°	0.979	0.575	-2.406	0.923	0.512	-2.911
75°	0.854	0.438	-3.586	0.455	0.124	-9.063	255°	0.977	0.573	-2.419	0.926	0.515	-2.882
80°	0.804	0.388	-4.113	0.417	0.104	-9.821	260°	0.975	0.570	-2.442	0.929	0.518	-2.856
85°	0.749	0.337	-4.728	0.385	0.089	-10.499	265°	0.971	0.566	-2.473	0.932	0.521	-2.834
90°	0.686	0.283	-5.488	0.361	0.078	-11.070	270°	0.967	0.561	-2.513	0.934	0.523	-2.813
95°	0.613	0.225	-6.471	0.343	0.071	-11.507	275°	0.961	0.554	-2.562	0.936	0.526	-2.790
100°	0.545	0.178	-7.489	0.332	0.066	-11.787	280°	0.955	0.547	-2.620	0.940	0.530	-2.759
105°	0.489	0.144	-8.424	0.328	0.064	-11.909	285°	0.947	0.539	-2.688	0.944	0.535	-2.719
110°	0.442	0.117	-9.320	0.326	0.064	-11.967	290°	0.941	0.531	-2.751	0.949	0.541	-2.671
115°	0.400	0.096	-10.183	0.324	0.063	-12.009	295°	0.935	0.525	-2.801	0.955	0.547	-2.619
120°	0.363	0.079	-11.020	0.323	0.063	-12.039	300°	0.926	0.514	-2.886	0.961	0.554	-2.563
125°	0.335	0.067	-11.709	0.322	0.062	-12.057	305°	0.911	0.498	-3.024	0.968	0.562	-2.499
130°	0.320	0.061	-12.117	0.322	0.062	-12.055	310°	0.891	0.477	-3.218	0.975	0.571	-2.436
135°	0.318	0.061	-12.157	0.326	0.064	-11.954	315°	0.866	0.450	-3.471	0.981	0.577	-2.385
140°	0.331	0.066	-11.831	0.335	0.067	-11.709	320°	0.838	0.421	-3.755	0.986	0.583	-2.343
145°	0.355	0.076	-11.204	0.350	0.074	-11.327	325°	0.814	0.397	-4.011	0.990	0.588	-2.304
150°	0.390	0.091	-10.394	0.371	0.083	-10.823	330°	0.795	0.379	-4.216	0.994	0.593	-2.268
155°	0.428	0.110	-9.589	0.398	0.095	-10.220	335°	0.781	0.366	-4.364	0.998	0.597	-2.238
160°	0.469	0.132	-8.793	0.431	0.111	-9.538	340°	0.773	0.359	-4.451	1.000	0.600	-2.220
165°	0.512	0.158	-8.026	0.469	0.132	-8.797	345°	0.772	0.357	-4.471	1.000	0.600	-2.222
170°	0.553	0.184	-7.359	0.510	0.156	-8.060	350°	0.776	0.362	-4.419	0.998	0.597	-2.240
175°	0.587	0.207	-6.850	0.547	0.180	-7.453	355°	0.787	0.372	-4.299	0.994	0.592	-2.274

Horizontal Polarization:

Maximum: 2.507 (3.992 dB)

Horizontal Plane: 2.440 (3.874 dB)

Maximum ERP: 0.600 kW

Vertical Polarization:

Maximum: 2.507 (3.992 dB)

Horizontal Plane: 2.440 (3.874 dB)

Maximum ERP: 0.600 kW

Total Input Power: 0.239 kW

Reference: KLRD1M.FIG

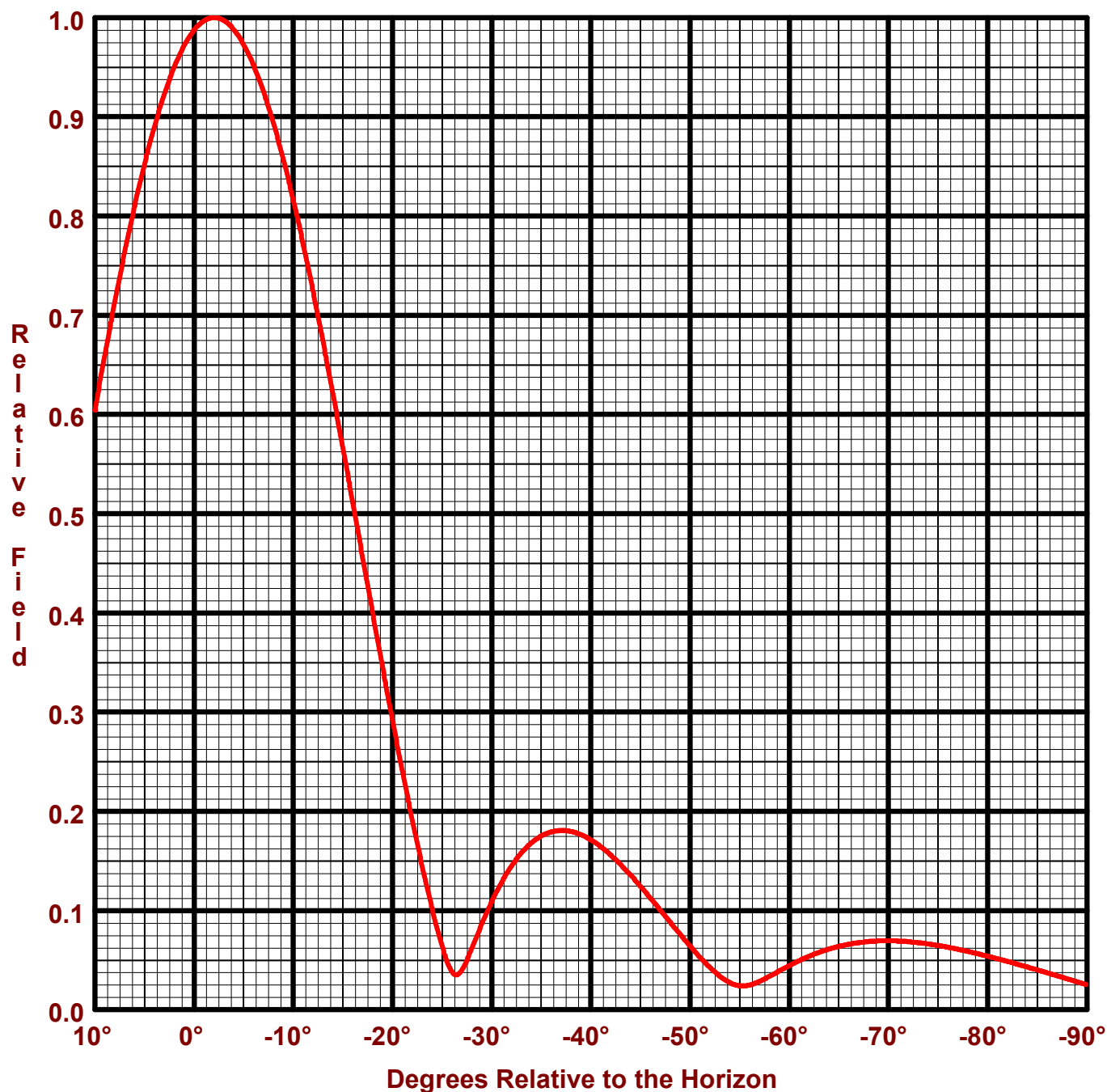
This list shows the azimuth values for the horizontal and vertical components.

ERI[®] Vertical Plane Relative Field Pattern

Electronics Research, Inc. 7777 Gardner Rd. Chandler, IN 47610 Phone(812) 925-6000 Fax(812) 925-4030 Web: www.eriinc.com

Figure No: 3
Call Sign: KLRD
Location: Yucaipa, CA.
Frequency: 90.1 MHz
5 bay LP-5C-DA-HW antenna

Date: 6/30/2011
H/V Power Ratio: 1
.5 Wave-length Spacing
-2° Beam Tilt
0% First Null Fill



Horizontal Polarization:
Maximum: 2.507 (3.992 dB)
Horizontal Plane: 2.440 (3.874 dB)
Maximum ERP: 0.600 kW

Vertical Polarization:
Maximum: 2.507 (3.992 dB)
Horizontal Plane: 2.440 (3.874 dB)
Maximum ERP: 0.600 kW

Directional Antenna System for KLRD, Yucaipa, California

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	LP-5C-DA-HW-SP
Frequency:	90.1 MHz
Number of Bays:	Five

MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	26 ft 6 in
Aperture length required:	41 ft 6 in ft.
Orientation:	312.25° true
Input flange to the antenna 1 5/8" female.	

ELECTRICAL SPECIFICATIONS (For directional use)

Maximum horizontal ERP:	0.600 kW (-2.218 dBk)
Horizontal maximum power gain:	2.507 (3.992 dB)
H pol horizontal plane power gain:	2.440 (3.874 dB)
Maximum vertical ERP:	0.600 kW (-2.218 dBk)
Vertical maximum power gain:	2.507 (3.992 dB)
V pol horizontal plane power gain:	2.440 (3.874 dB)
Total input power:	0.239 kW (-6.211 dBk)

