ELECTRONICS RESEARCH, INC. ERI®

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

Directional Antenna System for KCLM, Santa Maria, California

April 26, 2013

Electronics Research Inc. is providing a custom fabricated antenna system that is specially designed to meet the FCC requirements and the general needs of radio station KCLM.

The antenna is the ERI model LP-3E-DA-HW configuration. The circular polarized system consists of 3 half-wavelength spaced bays using one driven circular polarized radiating element per bay and one horizontal parasitic element per bay. The antenna was mounted off the North 285 degrees East tower leg on a pipe with bracketry to provide an antenna orientation of North 298 degrees East. The antenna was tested on a self-support tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 89.7 megahertz, which is the center of the FM broadcast channel assigned to KCLM.

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
KCLM, Santa Maria, California

(Continued)

DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of two bay levels of the circular polarized system with the associated horizontal parasitic element. 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 a Self support 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.

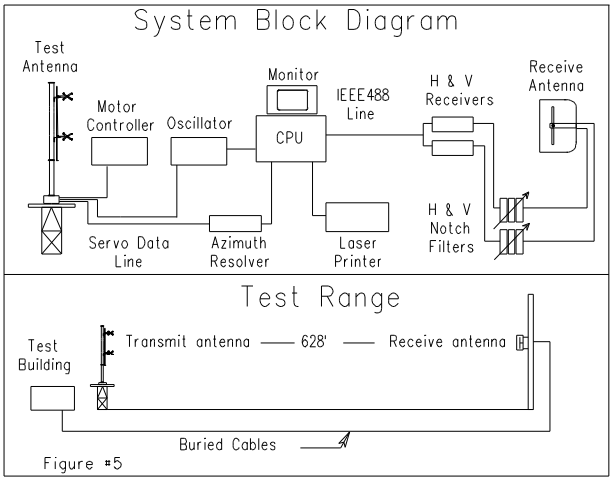


Figure #5

The antenna under test was operated in the transmitting mode and fed from a HP8657D signal generator. The frequency of the signal source was set at 89.7 MHz and was constantly monitored by a Rohde & Schwarz ESVD measuring receiver.

(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 Heliax 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 co-ordinated graph paper in a clockwise direction. Both horizontal and vertical components were recorded separately.

CONCLUSIONS

The circular polarized system consists of 3 half-wavelength spaced bays using one driven circular polarized radiating element per bay and one horizontal parasitic element 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-3E-DA-HW array is to be mounted off the North 285 degrees East tower leg on a pipe of the self-support tower at a bearing of North 298 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. A calculated vertical plane relative field pattern is shown on Figure #3 attached. The power in the maximum will reach 2.450 kilowatts (3.892 dBk).

(Continued)

The power at North 150 degrees East does not exceed 0.390 kilowatts (-4.089 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 that 85% of the filed composite pattern.

The clear vertical length of the structure required to support the antenna is 26 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.

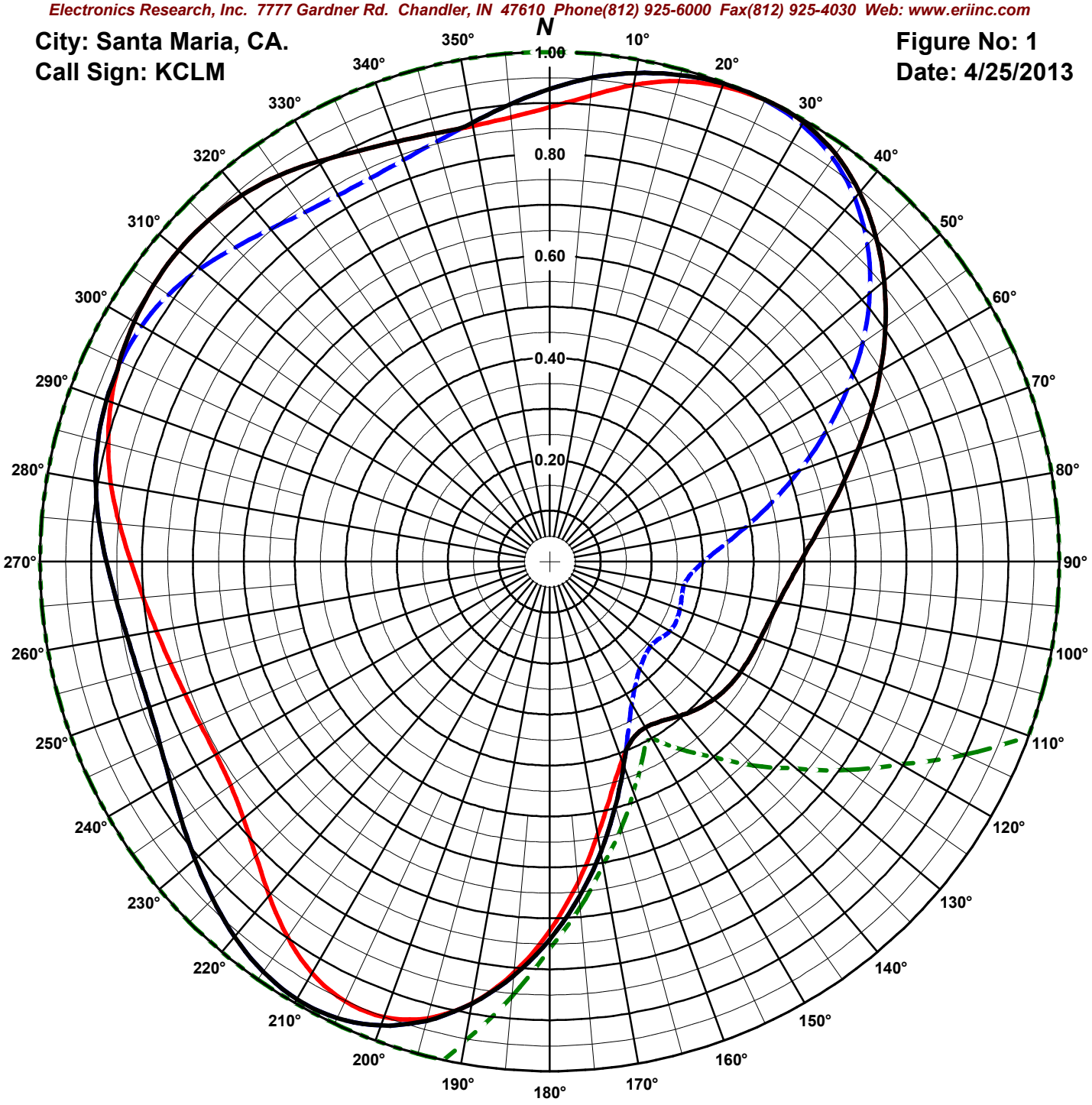
ELECTRONICS RESEARCH, INC.

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: Santa Maria, CA.
Call Sign: KCLM

Figure No: 1
Date: 4/25/2013



Antenna Orientation: 298° True

Frequency: 89.7 MHz
Antenna Type: LP-3E-DA-HW

Antenna Mounting: Custom
Tower Type: Rohn S.S. tower

HORIZONTAL	VERTICAL	COMPOSITE	FCC ENVELOPE
RMS: .779	RMS: .771	RMS: .802	RMS: .936
Maximum: 1 @ 26°	Maximum: 1 @ 23°	Maximum: 1 @ 23°	Maximum: 1 @ 0°
Minimum: .376 @ 150°	Minimum: .258 @ 130°	Minimum: .376 @ 150°	Minimum: .4 @ 150°

Measured patterns of the horizontal and vertical components. The composite pattern shows the maximum of either the H or V azimuth values. This patterns is greater than 85% of the FCC filed composite pattern BPED-20130124ACN.

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: 4/25/2013**
Station: KCLM **Antenna: LP-3E-DA-HW**
Location: Santa Maria, CA. **Antenna Orientation: 298° True**
Frequency: 89.7 MHz **Number of Bays: 3**

Azimuth	Envelope			Polarization	Azimuth	Envelope			Polarization
	Field	kW	dBk	Maximum		Field	kW	dBk	Maximum
0°	0.928	2.109	3.240	Vertical	180°	0.742	1.347	1.295	Vertical
5°	0.953	2.224	3.472	Vertical	185°	0.816	1.631	2.125	Vertical
10°	0.973	2.321	3.657	Vertical	190°	0.881	1.900	2.788	Vertical
15°	0.989	2.394	3.792	Vertical	195°	0.933	2.130	3.285	Vertical
20°	0.998	2.441	3.875	Vertical	200°	0.969	2.299	3.615	Vertical
25°	1.000	2.448	3.888	Horizontal	205°	0.988	2.393	3.789	Vertical
30°	0.996	2.428	3.853	Horizontal	210°	0.992	2.409	3.819	Vertical
35°	0.977	2.339	3.690	Horizontal	215°	0.981	2.360	3.728	Vertical
40°	0.946	2.192	3.408	Horizontal	220°	0.961	2.264	3.548	Vertical
45°	0.905	2.005	3.022	Horizontal	225°	0.936	2.144	3.313	Vertical
50°	0.857	1.798	2.548	Horizontal	230°	0.908	2.022	3.058	Vertical
55°	0.804	1.585	2.000	Horizontal	235°	0.883	1.908	2.806	Vertical
60°	0.750	1.378	1.392	Horizontal	240°	0.860	1.813	2.584	Vertical
65°	0.696	1.186	0.740	Horizontal	245°	0.844	1.746	2.420	Vertical
70°	0.644	1.016	0.067	Horizontal	250°	0.836	1.713	2.337	Vertical
75°	0.596	0.872	-0.597	Horizontal	255°	0.836	1.712	2.334	Vertical
80°	0.555	0.754	-1.226	Horizontal	260°	0.842	1.737	2.399	Vertical
85°	0.520	0.662	-1.790	Horizontal	265°	0.854	1.786	2.518	Vertical
90°	0.492	0.594	-2.265	Horizontal	270°	0.870	1.854	2.681	Vertical
95°	0.471	0.544	-2.641	Horizontal	275°	0.888	1.932	2.859	Vertical
100°	0.456	0.510	-2.923	Horizontal	280°	0.905	2.005	3.022	Vertical
105°	0.446	0.488	-3.118	Horizontal	285°	0.918	2.063	3.145	Vertical
110°	0.440	0.474	-3.239	Horizontal	290°	0.925	2.098	3.218	Vertical
115°	0.436	0.466	-3.314	Horizontal	295°	0.931	2.122	3.267	Horizontal
120°	0.433	0.459	-3.382	Horizontal	300°	0.941	2.170	3.365	Horizontal
125°	0.428	0.449	-3.479	Horizontal	305°	0.948	2.201	3.425	Horizontal
130°	0.420	0.433	-3.634	Horizontal	310°	0.950	2.212	3.448	Horizontal
135°	0.409	0.410	-3.868	Horizontal	315°	0.947	2.198	3.420	Horizontal
140°	0.395	0.383	-4.167	Horizontal	320°	0.939	2.159	3.343	Horizontal
145°	0.382	0.358	-4.463	Horizontal	325°	0.925	2.098	3.218	Horizontal
150°	0.376	0.346	-4.609	Horizontal	330°	0.907	2.015	3.042	Horizontal
155°	0.384	0.362	-4.412	Horizontal	335°	0.889	1.937	2.872	Horizontal
160°	0.425	0.442	-3.548	Vertical	340°	0.877	1.884	2.750	Horizontal
165°	0.498	0.607	-2.171	Vertical	345°	0.870	1.853	2.678	Horizontal
170°	0.578	0.819	-0.869	Vertical	350°	0.875	1.874	2.729	Vertical
175°	0.661	1.070	0.296	Vertical	355°	0.900	1.986	2.980	Vertical

Horizontal Polarization:
Maximum: 1.601 (2.043 dB)
Horizontal Plane: 1.601 (2.043 dB)
Maximum ERP: 2.450 kW

Vertical Polarization:
Maximum: 1.601 (2.043 dB)
Horizontal Plane: 1.601 (2.043 dB)
Maximum ERP: 2.450 kW

Total Input Power: 1.531 kW
Reference: KCLM2M.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: 4/25/2013**
Station: KCLM **Antenna: LP-3E-DA-HW**
Location: Santa Maria, CA. **Antenna Orientation: 298° True**
Frequency: 89.7 MHz **Number of Bays: 3**

Azimuth	Horizontal			Vertical			Azimuth	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.892	1.948	2.897	0.928	2.109	3.240	180°	0.725	1.286	1.094	0.742	1.347	1.295
5°	0.917	2.062	3.144	0.953	2.224	3.472	185°	0.810	1.608	2.063	0.816	1.631	2.125
10°	0.950	2.211	3.447	0.973	2.321	3.657	190°	0.880	1.897	2.782	0.881	1.900	2.788
15°	0.976	2.333	3.679	0.989	2.394	3.792	195°	0.928	2.109	3.240	0.933	2.130	3.285
20°	0.992	2.412	3.824	0.998	2.441	3.875	200°	0.951	2.216	3.455	0.969	2.299	3.615
25°	1.000	2.448	3.888	0.999	2.447	3.886	205°	0.951	2.217	3.458	0.988	2.393	3.789
30°	0.996	2.428	3.853	0.990	2.400	3.801	210°	0.932	2.130	3.283	0.992	2.409	3.819
35°	0.977	2.339	3.690	0.967	2.293	3.603	215°	0.898	1.976	2.957	0.981	2.360	3.728
40°	0.946	2.192	3.408	0.931	2.125	3.273	220°	0.856	1.794	2.538	0.961	2.264	3.548
45°	0.905	2.005	3.022	0.882	1.904	2.798	225°	0.815	1.629	2.118	0.936	2.144	3.313
50°	0.857	1.798	2.548	0.820	1.648	2.169	230°	0.784	1.506	1.778	0.908	2.022	3.058
55°	0.804	1.585	2.000	0.750	1.377	1.388	235°	0.765	1.432	1.560	0.883	1.908	2.806
60°	0.750	1.378	1.392	0.674	1.112	0.463	240°	0.756	1.401	1.466	0.860	1.813	2.584
65°	0.696	1.186	0.740	0.597	0.872	-0.595	245°	0.757	1.402	1.468	0.844	1.746	2.420
70°	0.644	1.016	0.067	0.521	0.666	-1.764	250°	0.761	1.421	1.524	0.836	1.713	2.337
75°	0.596	0.872	-0.597	0.452	0.500	-3.007	255°	0.770	1.454	1.626	0.836	1.712	2.334
80°	0.555	0.754	-1.226	0.390	0.374	-4.276	260°	0.784	1.504	1.773	0.842	1.737	2.399
85°	0.520	0.662	-1.790	0.340	0.283	-5.485	265°	0.801	1.571	1.961	0.854	1.786	2.518
90°	0.492	0.594	-2.265	0.302	0.223	-6.508	270°	0.822	1.655	2.189	0.870	1.854	2.681
95°	0.471	0.544	-2.641	0.278	0.190	-7.218	275°	0.847	1.759	2.453	0.888	1.932	2.859
100°	0.456	0.510	-2.923	0.267	0.174	-7.584	280°	0.874	1.872	2.723	0.905	2.005	3.022
105°	0.446	0.488	-3.118	0.268	0.176	-7.537	285°	0.897	1.971	2.948	0.918	2.063	3.145
110°	0.440	0.474	-3.239	0.272	0.181	-7.420	290°	0.916	2.055	3.128	0.925	2.098	3.218
115°	0.436	0.466	-3.314	0.274	0.184	-7.343	295°	0.931	2.122	3.267	0.928	2.110	3.242
120°	0.433	0.459	-3.382	0.273	0.182	-7.398	300°	0.941	2.170	3.365	0.924	2.094	3.209
125°	0.428	0.449	-3.479	0.263	0.170	-7.698	305°	0.948	2.201	3.425	0.913	2.044	3.104
130°	0.420	0.433	-3.634	0.258	0.163	-7.865	310°	0.950	2.212	3.448	0.895	1.961	2.925
135°	0.409	0.410	-3.868	0.263	0.170	-7.701	315°	0.947	2.198	3.420	0.872	1.864	2.705
140°	0.395	0.383	-4.167	0.275	0.185	-7.329	320°	0.939	2.159	3.343	0.852	1.778	2.500
145°	0.382	0.358	-4.463	0.294	0.212	-6.746	325°	0.925	2.098	3.218	0.837	1.717	2.348
150°	0.376	0.346	-4.609	0.322	0.254	-5.949	330°	0.907	2.015	3.042	0.830	1.688	2.273
155°	0.384	0.362	-4.412	0.365	0.326	-4.867	335°	0.889	1.937	2.872	0.831	1.691	2.280
160°	0.415	0.421	-3.755	0.425	0.442	-3.548	340°	0.877	1.884	2.750	0.839	1.724	2.365
165°	0.469	0.539	-2.687	0.498	0.607	-2.171	345°	0.870	1.853	2.678	0.854	1.786	2.518
170°	0.544	0.725	-1.395	0.578	0.819	-0.869	350°	0.868	1.846	2.661	0.875	1.874	2.729
175°	0.633	0.980	-0.086	0.661	1.070	0.296	355°	0.875	1.877	2.734	0.900	1.986	2.980

Horizontal Polarization:
Maximum: 1.601 (2.043 dB)
Horizontal Plane: 1.601 (2.043 dB)
Maximum ERP: 2.450 kW

Vertical Polarization:
Maximum: 1.601 (2.043 dB)
Horizontal Plane: 1.601 (2.043 dB)
Maximum ERP: 2.450 kW

Total Input Power: 1.531 kW
Reference: KCLM2M.FIG

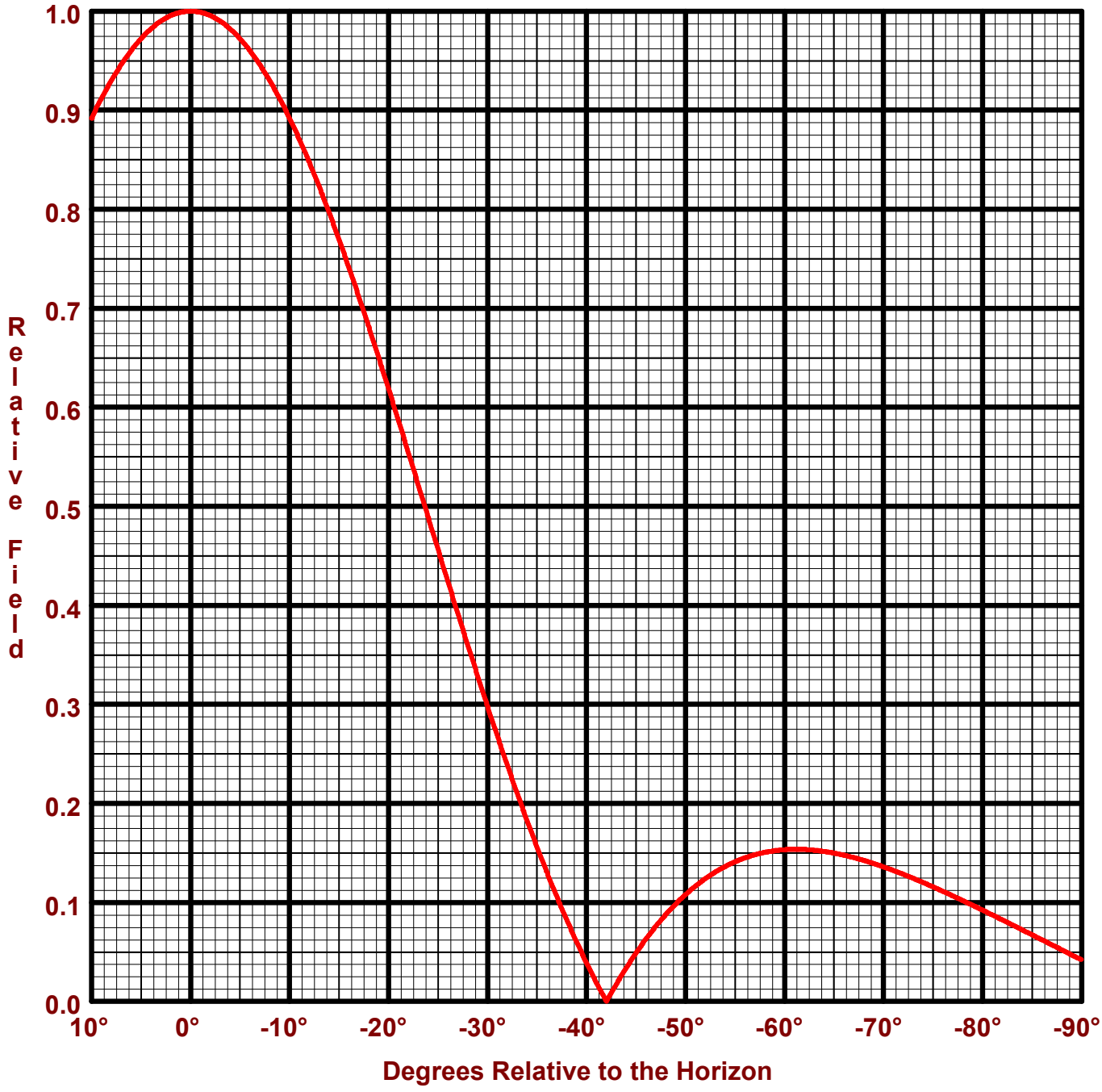
This list shows the azimuth values for the horizontal and vertical components.

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: KCLM
Location: Santa Maria, CA.
Frequency: 89.7 MHz
3 bay LP-3E-DA-HW antenna

Date: 4/25/2013
H/V Power Ratio: 1
.5 Wave-length Spacing
0° Beam Tilt
0% First Null Fill



Horizontal Polarization:
Maximum: 1.601 (2.043 dB)
Horizontal Plane: 1.601 (2.043 dB)
Maximum ERP: 2.450 kW

Vertical Polarization:
Maximum: 1.601 (2.043 dB)
Horizontal Plane: 1.601 (2.043 dB)
Maximum ERP: 2.450 kW

Directional Antenna System
for
KCLM, Santa Maria, California

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	LP-3E-DA-HW
Frequency:	89.7 MHz
Number of Bays:	Three

MECHANICAL SPECIFICATIONS

Mounting:	Custom
System length:	19 ft 9 in
Aperture length required:	30 ft 11 in
Orientation:	298° true

Input flange to the antenna 1 5/8” female.

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	2.450 kW (3.892 dBk)
Horizontal maximum power gain:	1.601 (2.043 dB)
Maximum vertical ERP:	2.450 kW (3.892 dBk)
Vertical maximum power gain:	1.601 (2.043 dB)
Total input power:	1.531 kW (1.850 dBk)