

***Directional Antenna System
for
KLRS, Lodi, California***

November 4, 2008

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 KLRS.

The antenna is the ERI model 1093-1CP-DA configuration. The circular polarized system consists of one level using three driven circular polarized radiating elements with two horizontal parasitic elements placed one-quarter wave above and below the bay and two vertical parasites at bay level. The antenna was mounted on triangular tower to provide an antenna orientation of North 44 degrees East. The antenna was tested on a 10' face tower, which is the structure the station plans to use to support the array. All tests will be performed on a frequency of 89.7 megahertz, which is the center of the FM broadcast channel assigned to KLRS.

Pattern measurements will be made on a sixty-acre antenna pattern range that is owned and operated by Electronics Research, Inc. The tests will be 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 Proposed For KLRS, Lodi, California

(Continued)

DESCRIPTION OF THE TEST PROCEDURE

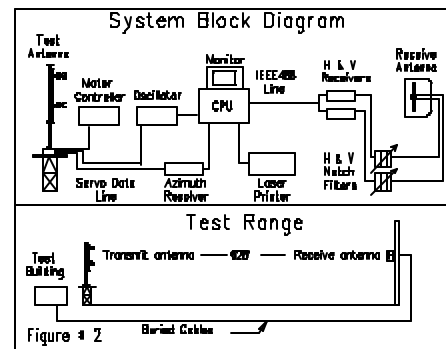
The test antenna will consist of a full-scale model of the complete circular polarized system with the associated horizontal and vertical parasitic elements.

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

The proof-of-performance will be accomplished using a 10' 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 will be 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 will be operated in the transmitting mode and fed from a HP8657D signal generator. The frequency of the signal source will be set at 89.7 MHz and will be constantly monitored by a Rohde & Schwarz ESVD measuring receiver.

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



Directional Antenna System

Proposed For

KLRS, Lodi, California

(Continued)

The measurements will be 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 will be recorded separately.

CONCLUSIONS

The circular polarized system consists of one level using three driven circular polarized radiating elements with two horizontal parasitic elements placed one-quarter wave above and below the bay and two vertical parasites at bay level. 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 1093-1CP-DA array is to be mounted on the North 44 degrees East tower of the 10' face tower at a bearing of North 44 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 maximum value of either the horizontal or vertical component at any azimuth. The attached horizontal plane relative field pattern shown on Figure #1 represents the maximum achievable radiation at any azimuth. The actual pattern when measured will not exceed that of Figure #1 at any azimuth. The composite horizontal and vertical maximum relative field envelope pattern obtained from the measured data will have an R.M.S. that is equal to, or no less than 85% of the R.M.S. of the pattern shown on Figure #1. A calculated vertical plane relative field pattern is shown on Figure #3 attached. The power in the maximum will reach 2.500 kilowatts (3.979 dBk).

The power at North 210 degrees East does not exceed 0.265 kilowatts (-5.768 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.

Directional Antenna System
Proposed For
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(Continued)

The clear vertical length of the structure required to support the antenna is 20 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.

A handwritten signature in black ink, appearing to read "Tom Scharf". The signature is written in a cursive, flowing style with a large initial "T" and a long, sweeping underline.

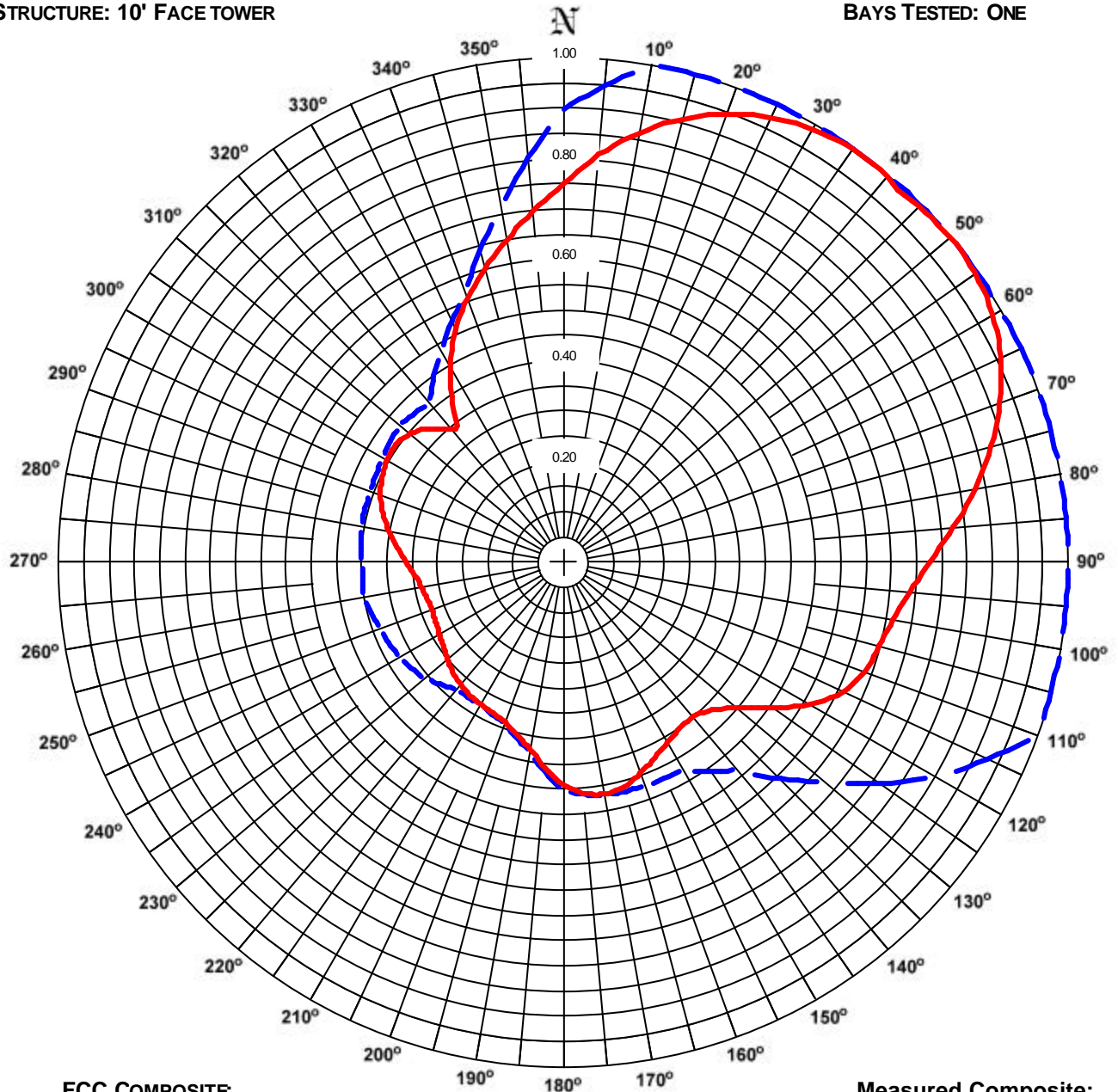
The Microsoft Word document on file electronically at Electronic Research, Inc. governs the specifications, scope, and configuration of the product described. All other representations whether verbal, printed, or electronic are subordinate to the master copy of this document on file at ERI.

ERI® *Horizontal Plane Relative Field Pattern*

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

FIGURE NO: 1
STATION: KLRS
LOCATION: LODI, CA
ANTENNA: 1093-1CP-DA
STRUCTURE: 10' FACE TOWER

DATE: 11/4/08
FREQUENCY: 89.7 MHz
ORIENTATION: 44° TRUE
MOUNTING: CUSTOM
BAYS TESTED: ONE



FCC COMPOSITE
RMS: 0.692
MAXIMUM: 1.000 @ 10° TRUE
MINIMUM: 0.327 @ 210° TRUE

Measured Composite:
RMS: 0.602
Maximum: 1.000 @ 37° True
Minimum: 0.278 @ 250° True

COMMENTS: COMPOSITE PATTERN: THIS PATTERN SHOWS THE MAXIMUM OF EITHER THE H OR V AZIMUTH VALUES. THIS PATTERN IS GREATER THAN 85% OF THE FCC FILED COMPOSITE PATTERN BMPED-20070827AEH.

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Station: KLRS
Location: Lodi, CA
Frequency: 89.7 MHz

Antenna: 1093-1CP-DA
Orientation: 44° True
Tower: 10' Face Tower

Figure: 1
Date: 11/4/08
Reference: KLRS2M.fig

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.749	1.40	1.47	Vertical	180°	0.442	0.49	-3.11	Vertical
5°	0.810	1.64	2.14	Vertical	185°	0.411	0.42	-3.74	Vertical
10°	0.863	1.86	2.70	Vertical	190°	0.378	0.36	-4.48	Horizontal
15°	0.908	2.06	3.14	Vertical	195°	0.355	0.31	-5.02	Horizontal
20°	0.944	2.23	3.48	Vertical	200°	0.339	0.29	-5.42	Horizontal
25°	0.971	2.36	3.73	Vertical	205°	0.331	0.27	-5.63	Horizontal
30°	0.989	2.45	3.89	Vertical	210°	0.327	0.27	-5.73	Horizontal
35°	0.999	2.50	3.97	Vertical	215°	0.323	0.26	-5.83	Horizontal
40°	0.997	2.48	3.95	Vertical	220°	0.318	0.25	-5.98	Horizontal
45°	0.996	2.48	3.94	Horizontal	225°	0.310	0.24	-6.20	Horizontal
50°	1.000	2.50	3.98	Horizontal	230°	0.300	0.23	-6.48	Horizontal
55°	0.996	2.48	3.95	Horizontal	235°	0.291	0.21	-6.74	Horizontal
60°	0.982	2.41	3.82	Horizontal	240°	0.284	0.20	-6.95	Horizontal
65°	0.956	2.29	3.59	Horizontal	245°	0.280	0.20	-7.09	Horizontal
70°	0.920	2.12	3.26	Horizontal	250°	0.278	0.19	-7.14	Horizontal
75°	0.878	1.93	2.85	Horizontal	255°	0.280	0.20	-7.08	Horizontal
80°	0.828	1.72	2.34	Horizontal	260°	0.286	0.20	-6.90	Horizontal
85°	0.775	1.50	1.77	Horizontal	265°	0.296	0.22	-6.59	Horizontal
90°	0.727	1.32	1.21	Horizontal	270°	0.311	0.24	-6.16	Horizontal
95°	0.690	1.19	0.75	Horizontal	275°	0.330	0.27	-5.65	Horizontal
100°	0.664	1.10	0.42	Horizontal	280°	0.351	0.31	-5.11	Horizontal
105°	0.649	1.05	0.22	Horizontal	285°	0.370	0.34	-4.65	Horizontal
110°	0.636	1.01	0.05	Horizontal	290°	0.386	0.37	-4.29	Horizontal
115°	0.610	0.93	-0.31	Horizontal	295°	0.397	0.39	-4.04	Horizontal
120°	0.565	0.80	-0.98	Horizontal	300°	0.404	0.41	-3.89	Horizontal
125°	0.506	0.64	-1.94	Horizontal	305°	0.405	0.41	-3.88	Horizontal
130°	0.452	0.51	-2.92	Horizontal	310°	0.395	0.39	-4.08	Horizontal
135°	0.416	0.43	-3.63	Horizontal	315°	0.373	0.35	-4.59	Horizontal
140°	0.402	0.40	-3.94	Horizontal	320°	0.343	0.29	-5.32	Horizontal
145°	0.403	0.41	-3.92	Horizontal	325°	0.382	0.37	-4.38	Vertical
150°	0.413	0.43	-3.69	Horizontal	330°	0.448	0.50	-2.99	Vertical
155°	0.429	0.46	-3.37	Horizontal	335°	0.507	0.64	-1.92	Vertical
160°	0.445	0.49	-3.06	Vertical	340°	0.556	0.77	-1.11	Vertical
165°	0.462	0.53	-2.73	Vertical	345°	0.601	0.90	-0.44	Vertical
170°	0.468	0.55	-2.62	Vertical	350°	0.648	1.05	0.21	Vertical
175°	0.461	0.53	-2.74	Vertical	355°	0.697	1.21	0.84	Vertical

Polarization:	Envelope
Maximum Field:	1.000 @ 37° True
Minimum Field:	0.278 @ 250° True
RMS:	0.602
Maximum ERP:	2.500 kW
Maximum Power Gain:	1.365 (1.350 dB)

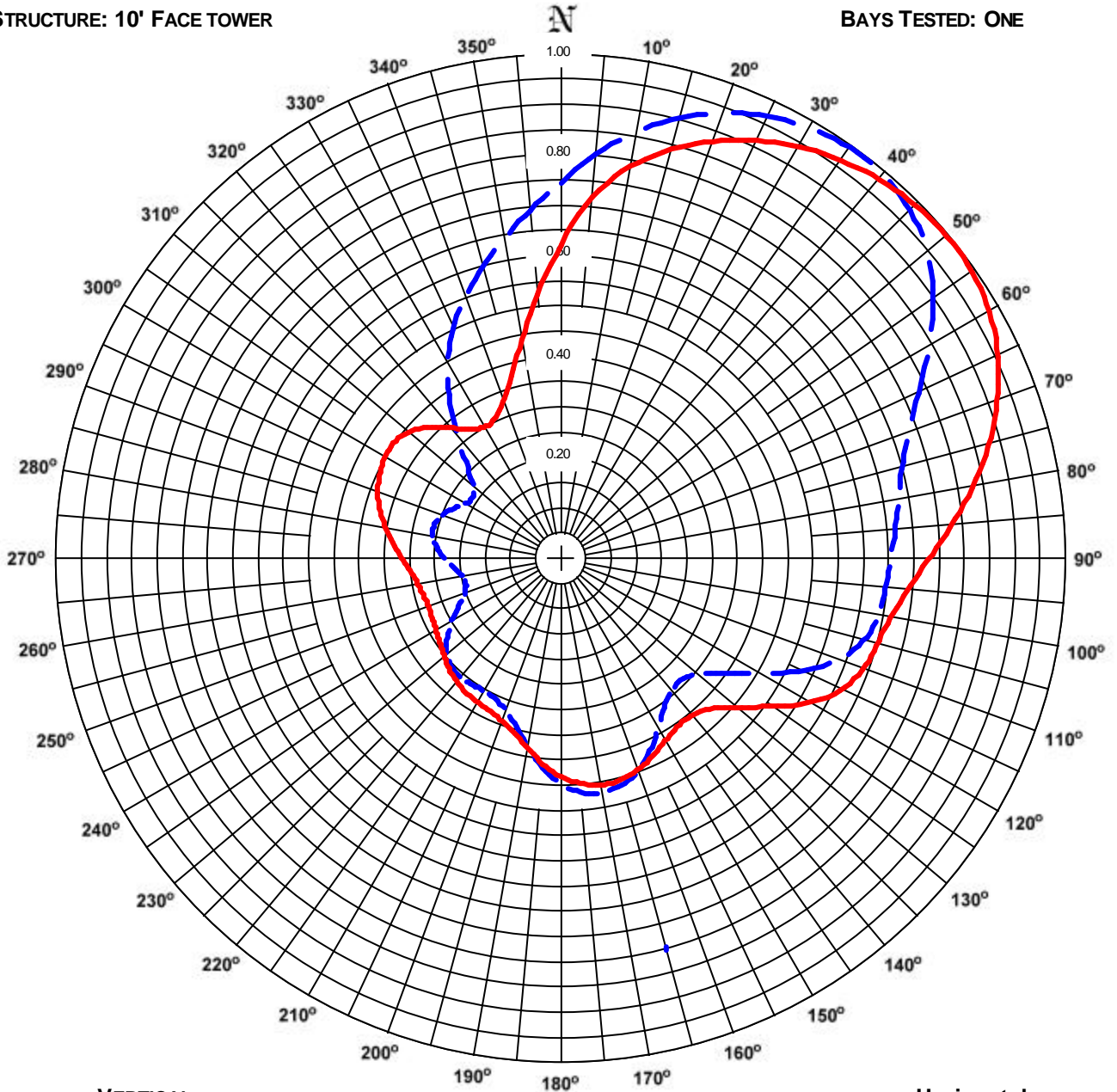
Total Input Power: 1.832 kW

ERI® *Horizontal Plane Relative Field Pattern*

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

FIGURE NO: 2
STATION: KLRS
LOCATION: LODI, CA
ANTENNA: 1093-1CP-DA
STRUCTURE: 10' FACE TOWER

DATE: 11/4/08
FREQUENCY: 89.7 MHz
ORIENTATION: 44° TRUE
MOUNTING: CUSTOM
BAYS TESTED: ONE



VERTICAL

RMS: 0.556
MAXIMUM: 1.000 @ 37° TRUE
MINIMUM: 0.194 @ 257° TRUE

Horizontal

RMS: 0.577
Maximum: 1.000 @ 50° True
Minimum: 0.278 @ 250° True

COMMENTS: MEASURED PATTERNS OF THE HORIZONTAL AND VERTICAL COMPONENTS.

ERI[®] *Horizontal Plane Relative Field List*

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

Station: KLRS
Location: Lodi, CA
Frequency: 89.7 MHz

Antenna: 1093-1CP-DA
Orientation: 44° True
Tower: 10' Face tower

Figure: 2
Date: 11/4/08
Reference: KLRS2M.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.627	0.98	-0.08	0.749	1.40	1.47	180°	0.428	0.46	-3.39	0.442	0.49	-3.11
5°	0.722	1.30	1.15	0.810	1.64	2.14	185°	0.404	0.41	-3.88	0.411	0.42	-3.74
10°	0.793	1.57	1.96	0.863	1.86	2.70	190°	0.378	0.36	-4.48	0.374	0.35	-4.56
15°	0.844	1.78	2.50	0.908	2.06	3.14	195°	0.355	0.31	-5.02	0.340	0.29	-5.38
20°	0.885	1.96	2.91	0.944	2.23	3.48	200°	0.339	0.29	-5.42	0.317	0.25	-6.00
25°	0.919	2.11	3.24	0.971	2.36	3.73	205°	0.331	0.27	-5.63	0.304	0.23	-6.35
30°	0.947	2.24	3.50	0.989	2.45	3.89	210°	0.327	0.27	-5.73	0.301	0.23	-6.46
35°	0.969	2.35	3.70	0.999	2.50	3.97	215°	0.323	0.26	-5.83	0.302	0.23	-6.41
40°	0.985	2.43	3.85	0.997	2.48	3.95	220°	0.318	0.25	-5.98	0.305	0.23	-6.34
45°	0.996	2.48	3.94	0.980	2.40	3.80	225°	0.310	0.24	-6.20	0.303	0.23	-6.38
50°	1.000	2.50	3.98	0.949	2.25	3.52	230°	0.300	0.23	-6.48	0.294	0.22	-6.66
55°	0.996	2.48	3.95	0.902	2.03	3.08	235°	0.291	0.21	-6.74	0.276	0.19	-7.21
60°	0.982	2.41	3.82	0.842	1.77	2.49	240°	0.284	0.20	-6.95	0.251	0.16	-8.01
65°	0.956	2.29	3.59	0.783	1.53	1.85	245°	0.280	0.20	-7.09	0.226	0.13	-8.95
70°	0.920	2.12	3.26	0.734	1.35	1.29	250°	0.278	0.19	-7.14	0.205	0.11	-9.79
75°	0.878	1.93	2.85	0.700	1.22	0.88	255°	0.280	0.20	-7.08	0.195	0.09	-10.24
80°	0.828	1.72	2.34	0.679	1.15	0.62	260°	0.286	0.20	-6.90	0.196	0.10	-10.16
85°	0.775	1.50	1.77	0.665	1.11	0.44	265°	0.296	0.22	-6.59	0.208	0.11	-9.65
90°	0.727	1.32	1.21	0.653	1.07	0.28	270°	0.311	0.24	-6.16	0.226	0.13	-8.94
95°	0.690	1.19	0.75	0.646	1.04	0.18	275°	0.330	0.27	-5.65	0.244	0.15	-8.28
100°	0.664	1.10	0.42	0.639	1.02	0.09	280°	0.351	0.31	-5.11	0.257	0.16	-7.83
105°	0.649	1.05	0.22	0.620	0.96	-0.17	285°	0.370	0.34	-4.65	0.261	0.17	-7.69
110°	0.636	1.01	0.05	0.581	0.84	-0.74	290°	0.386	0.37	-4.29	0.254	0.16	-7.91
115°	0.610	0.93	-0.31	0.520	0.67	-1.71	295°	0.397	0.39	-4.04	0.239	0.14	-8.45
120°	0.565	0.80	-0.98	0.449	0.50	-2.98	300°	0.404	0.41	-3.89	0.222	0.12	-9.09
125°	0.506	0.64	-1.94	0.390	0.38	-4.21	305°	0.405	0.41	-3.88	0.214	0.11	-9.40
130°	0.452	0.51	-2.92	0.351	0.31	-5.10	310°	0.395	0.39	-4.08	0.226	0.13	-8.95
135°	0.416	0.43	-3.63	0.336	0.28	-5.48	315°	0.373	0.35	-4.59	0.261	0.17	-7.69
140°	0.402	0.40	-3.94	0.340	0.29	-5.39	320°	0.343	0.29	-5.32	0.316	0.25	-6.02
145°	0.403	0.41	-3.92	0.357	0.32	-4.96	325°	0.318	0.25	-5.98	0.382	0.37	-4.38
150°	0.413	0.43	-3.69	0.385	0.37	-4.31	330°	0.305	0.23	-6.34	0.448	0.50	-2.99
155°	0.429	0.46	-3.37	0.417	0.44	-3.61	335°	0.309	0.24	-6.21	0.507	0.64	-1.92
160°	0.443	0.49	-3.09	0.445	0.49	-3.06	340°	0.334	0.28	-5.55	0.556	0.77	-1.11
165°	0.451	0.51	-2.93	0.462	0.53	-2.73	345°	0.379	0.36	-4.45	0.601	0.90	-0.44
170°	0.452	0.51	-2.92	0.468	0.55	-2.62	350°	0.444	0.49	-3.07	0.648	1.05	0.21
175°	0.444	0.49	-3.07	0.461	0.53	-2.74	355°	0.529	0.70	-1.54	0.697	1.21	0.84

Polarization:	Horizontal	Vertical
Maximum Field:	1.000 @ 50° True	1.000 @ 37° True
Minimum Field:	0.278 @ 250° True	0.194 @ 257° True
RMS:	0.577	0.556
Maximum ERP:	2.500 kW	2.500 kW
Maximum Power Gain:	1.365 (1.350 dB)	1.365 (1.350 dB)

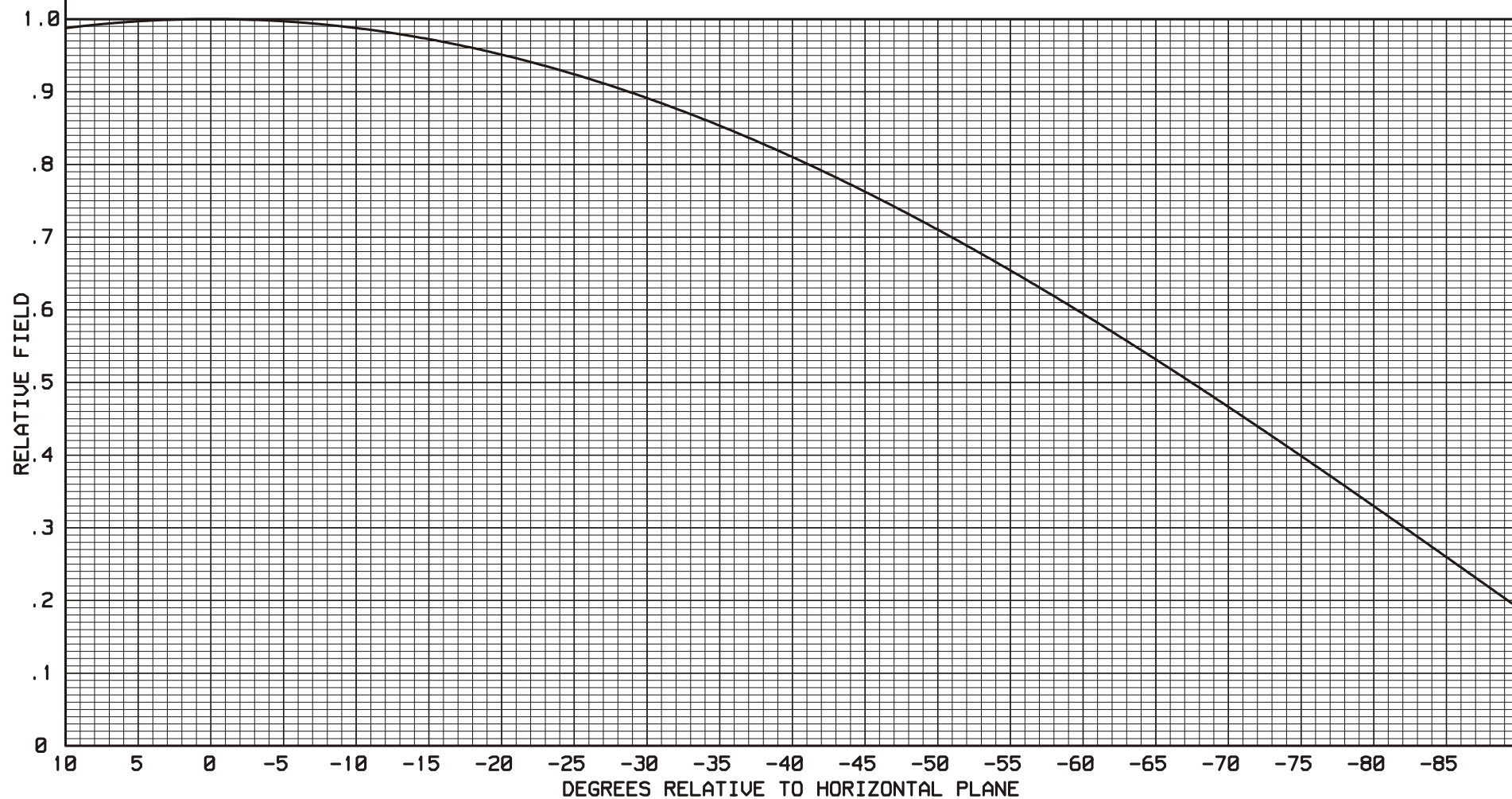
Total Input Power: 1.832 kW

ELECTRONICS RESEARCH, INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610

----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD
ERI TYPE 1093-1CP-DA ANTENNA

SINGLE LEVEL

FIGURE 3



Directional Antenna System for KLRS, Lodi, California

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	1093-1CP-DA
Frequency:	89.7 MHz
Number of Bays:	One

MECHANICAL SPECIFICATIONS

Mounting:	Custom
System length:	10 ft
Aperture length required:	20 ft.
Orientation:	44° true
Input flange to the antenna 1 5/8 inch female	

ELECTRICAL SPECIFICATIONS

(For directional use)

Maximum horizontal ERP:	2.500 kW (3.979 dBk)
Horizontal maximum power gain:	1.365 (1.350 dB)
Maximum vertical ERP:	2.500 kW (3.979 dBk)
Vertical maximum power gain:	1.365 (1.350 dB)
Total input power:	1.832 kW (2.628 dBk)

