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 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.

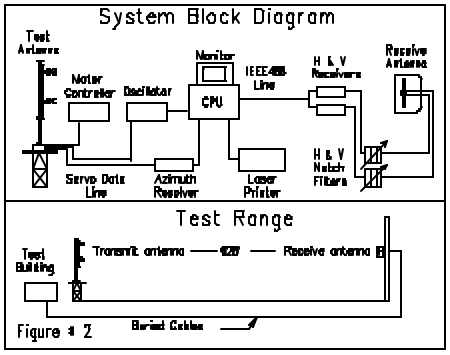


Figure # 2

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.

(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 that 85% of the filed composite pattern.

(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.

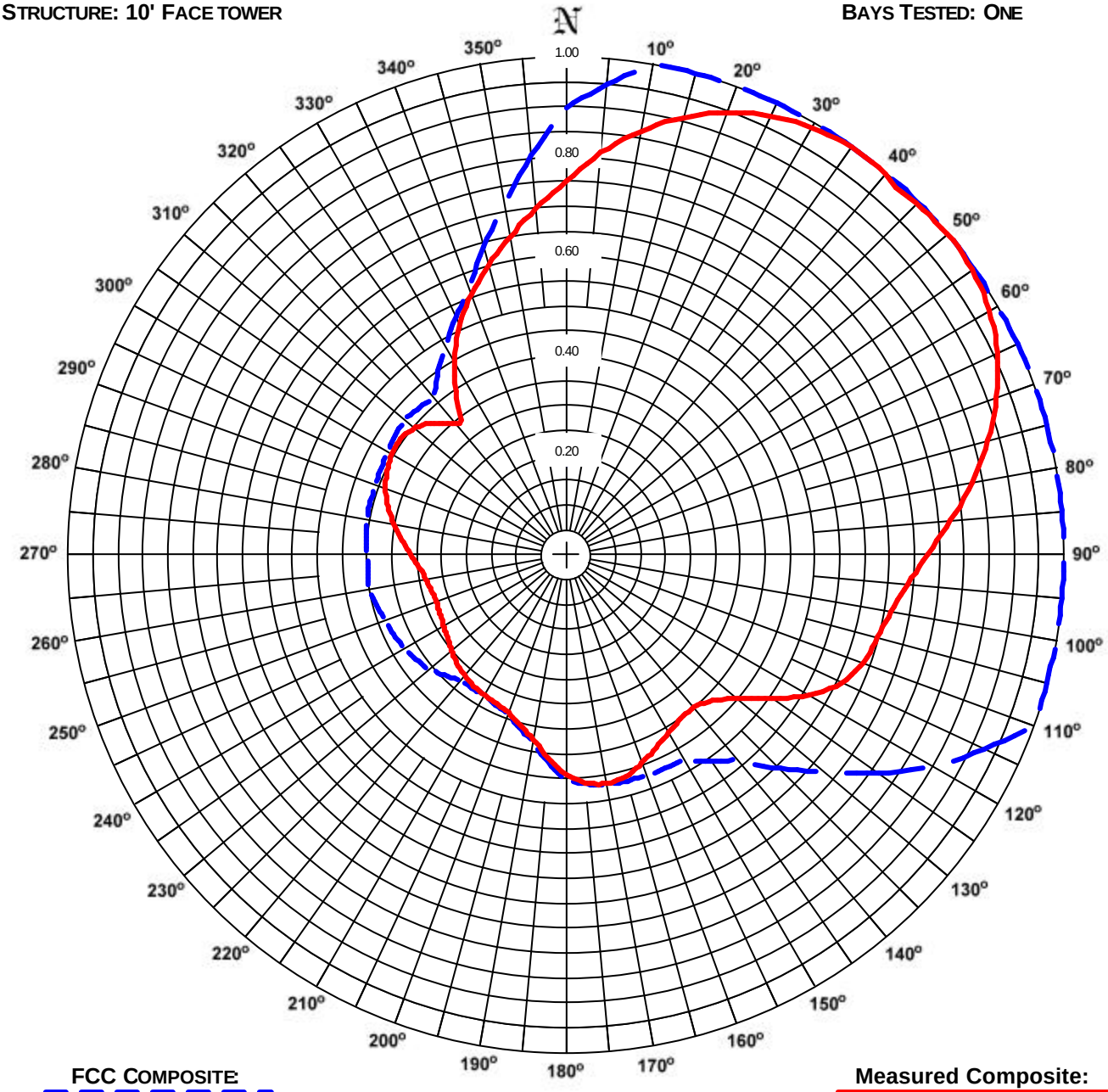
The Microsoft Word document on file electronically at Electronic Research, Inc. governs the specifications, scope, and configuration of the product described. All other representations whether verbal, printed, or electronic are subordinate to the master copy of this document on file at ERI.

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 THAT 85% OF THE FCC FILED COMPOSITE PATTERN BMPED-20070827AEH.

ERI® Horizontal Plane Relative Field List

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

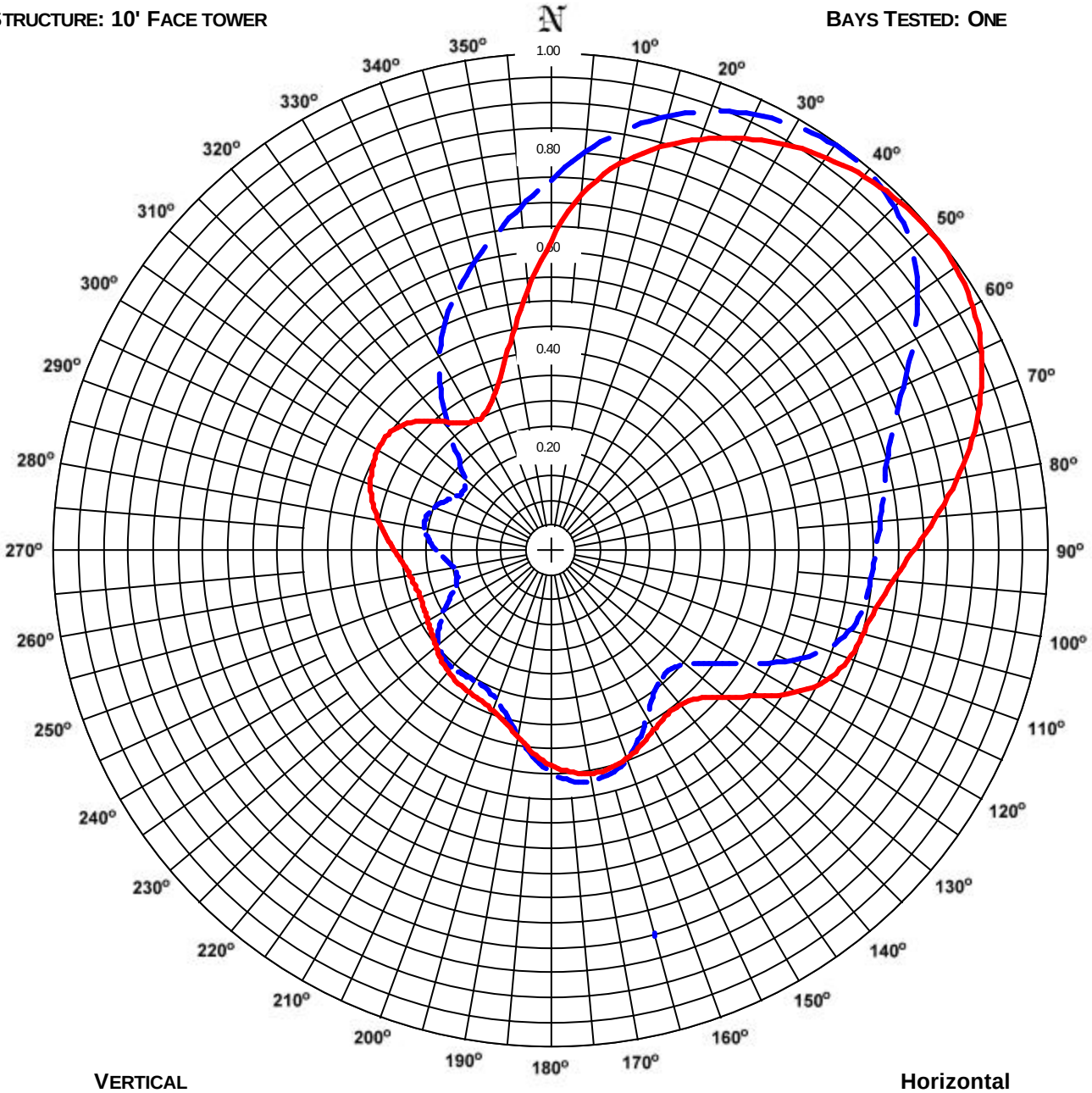
Total Input Power: 1.832 kW

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

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

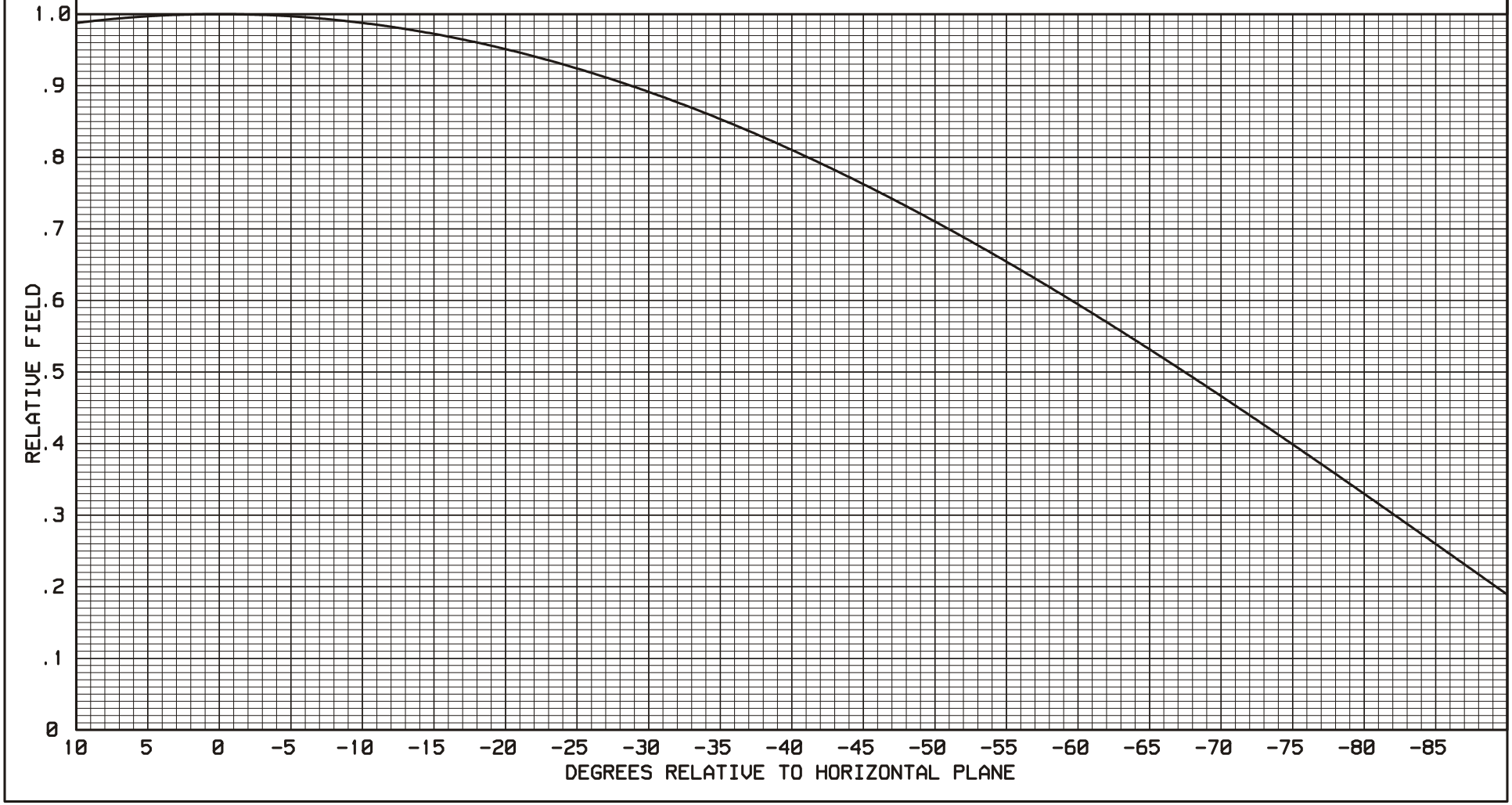
ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610

FIGURE 3

----THEORETICAL----
VERTICAL PLANE RELATIVE FIELD

ERI TYPE 1093-1CP-DA ANTENNA

SINGLE LEVEL



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)