



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  
KLVM, Prunedale, California***

April 4, 2006

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 KLVM.

The antenna is the ERI model 1091-1CP-DA configuration. The circular polarized system consists of one bay using one driven circular polarized radiating element. The antenna was mounted on the North 252 degrees East tower face with bracketry to provide an antenna orientation of North 227 degrees East. The antenna was tested on a 36" face 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 KLVM.

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 KLVM, Prunedale, California

(Continued)

## DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of a full-scale model of the complete circular polarized system. The elements and brackets that were used in this test are electrically equivalent to those that will be supplied with the antenna.

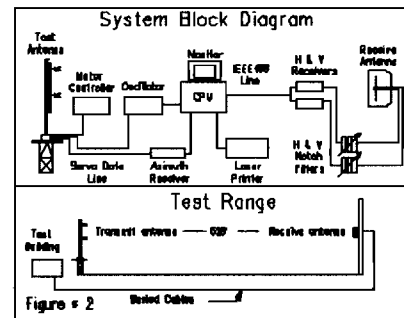
The power distribution and phase relationship to the antenna elements was adjusted in order to achieve the directional radiation patterns for both horizontal and vertical polarization components.

The proof-of-performance was accomplished using a 36" 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 North Atlantic Model 8500 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 a HP8657D signal generator calibrated 1-05. The frequency of the signal source was set at 89.7 MHz and was constantly monitored by an Anritsu Model ML521B measuring receiver calibrated 6-05.

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 Helix cables to an Anritsu Model ML521B measuring receiver.

This data was interfaced to a Hewlett-Packard Laser Jet 4P printer by means of a Pentium computer system. Relative field strength was plotted as a function of azimuth.



Directional Antenna System  
For  
KLVM, Prunedale, California

(Continued)

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 one bay using one driven circular polarized radiating element. 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 1091-1CP-DA array is to be mounted on the North 252 degrees East tower face of the 36" face tower at a bearing of North 227 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 measured horizontal plane relative field pattern, for both the horizontal and vertical polarization components, is shown on Figure #2 attached. 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 0.450 kilowatts (-3.468 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 20 feet.

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(Continued)

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.

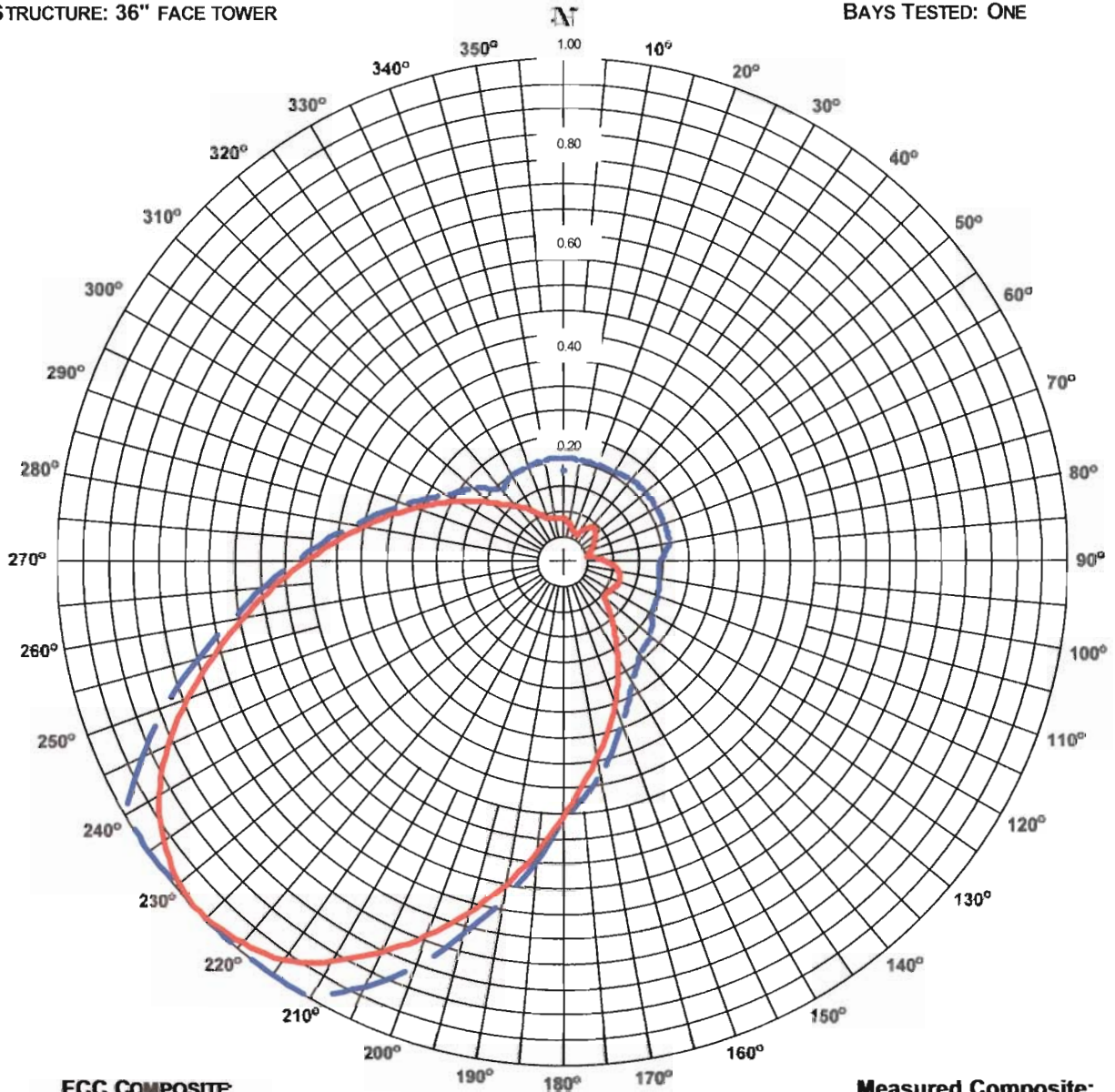


# ERI<sup>®</sup> Horizontal Plane Relative Field Pattern

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: KLVM  
LOCATION: PRUNEDALE, CA  
ANTENNA: 1091-1CP-DA  
STRUCTURE: 36" FACE TOWER

DATE: 3/31/2006  
FREQUENCY: 89.7 MHz  
ORIENTATION: 227° TRUE  
MOUNTING: CUSTOM  
BAYS TESTED: ONE



## FCC COMPOSITE

RMS: 0.485  
MAXIMUM: 1.000 @ 210° TRUE  
MINIMUM: 0.185 @ 320° TRUE

## Measured Composite:

RMS: 0.444  
Maximum: 1.000 @ 226° True  
Minimum: 0.050 @ 78° 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

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**Station: KLVM**  
**Location: Prunedale, CA**  
**Frequency: 89.7 MHz**

**Antenna: 1091-1CP-DA**  
**Orientation: 227° True**  
**Tower: 36" face tower**

**Figure: 1**  
**Date: 3/31/2006**  
**Reference: klvm2m.fig**

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.087	0.00	-24.65	Horizontal	180°	0.507	0.12	-9.37	Horizontal
5°	0.083	0.00	-25.06	Horizontal	185°	0.576	0.15	-8.26	Horizontal
10°	0.077	0.00	-25.77	Horizontal	190°	0.648	0.19	-7.24	Horizontal
15°	0.070	0.00	-26.59	Horizontal	195°	0.720	0.23	-6.32	Horizontal
20°	0.064	0.00	-27.31	Horizontal	200°	0.790	0.28	-5.52	Horizontal
25°	0.062	0.00	-27.63	Horizontal	205°	0.853	0.33	-4.85	Horizontal
30°	0.068	0.00	-26.84	Vertical	210°	0.915	0.38	-4.24	Vertical
35°	0.082	0.00	-25.22	Vertical	215°	0.964	0.42	-3.79	Vertical
40°	0.091	0.00	-24.33	Vertical	220°	0.985	0.44	-3.60	Vertical
45°	0.092	0.00	-24.16	Vertical	225°	0.999	0.45	-3.47	Horizontal
50°	0.087	0.00	-24.71	Vertical	230°	0.992	0.44	-3.54	Horizontal
55°	0.077	0.00	-25.79	Horizontal	235°	0.966	0.42	-3.77	Horizontal
60°	0.072	0.00	-26.36	Horizontal	240°	0.922	0.38	-4.17	Horizontal
65°	0.065	0.00	-27.21	Horizontal	245°	0.864	0.34	-4.74	Horizontal
70°	0.058	0.00	-28.21	Horizontal	250°	0.793	0.28	-5.49	Horizontal
75°	0.052	0.00	-29.13	Horizontal	255°	0.717	0.23	-6.36	Horizontal
80°	0.056	0.00	-28.47	Vertical	260°	0.645	0.19	-7.28	Vertical
85°	0.073	0.00	-26.15	Vertical	265°	0.576	0.15	-8.26	Vertical
90°	0.090	0.00	-24.38	Vertical	270°	0.512	0.12	-9.28	Vertical
95°	0.104	0.00	-23.16	Vertical	275°	0.454	0.09	-10.32	Vertical
100°	0.113	0.01	-22.41	Vertical	280°	0.404	0.07	-11.33	Vertical
105°	0.118	0.01	-22.05	Vertical	285°	0.358	0.06	-12.39	Vertical
110°	0.118	0.01	-22.01	Vertical	290°	0.315	0.04	-13.51	Vertical
115°	0.116	0.01	-22.20	Vertical	295°	0.277	0.03	-14.63	Vertical
120°	0.111	0.01	-22.53	Vertical	300°	0.243	0.03	-15.76	Vertical
125°	0.107	0.01	-22.86	Vertical	305°	0.212	0.02	-16.94	Vertical
130°	0.107	0.01	-22.88	Horizontal	310°	0.184	0.02	-18.16	Vertical
135°	0.128	0.01	-21.32	Horizontal	315°	0.163	0.01	-19.21	Vertical
140°	0.154	0.01	-19.72	Horizontal	320°	0.146	0.01	-20.15	Vertical
145°	0.184	0.02	-18.16	Horizontal	325°	0.131	0.01	-21.10	Vertical
150°	0.219	0.02	-16.64	Horizontal	330°	0.117	0.01	-22.10	Vertical
155°	0.259	0.03	-15.19	Horizontal	335°	0.104	0.00	-23.13	Vertical
160°	0.303	0.04	-13.83	Horizontal	340°	0.092	0.00	-24.17	Vertical
165°	0.348	0.05	-12.64	Horizontal	345°	0.091	0.00	-24.27	Horizontal
170°	0.393	0.07	-11.59	Horizontal	350°	0.091	0.00	-24.33	Horizontal
175°	0.445	0.09	-10.50	Horizontal	355°	0.089	0.00	-24.48	Horizontal

**Polarization:**  
**Maximum Field:** 1.000 @ 226° True  
**Minimum Field:** 0.050 @ 78° True  
**RMS:** 0.444  
**Maximum ERP:** 0.450 kW  
**Maximum Power Gain:** 2.283 (3.586 dB)

**Total Input Power: 0.197 kW**

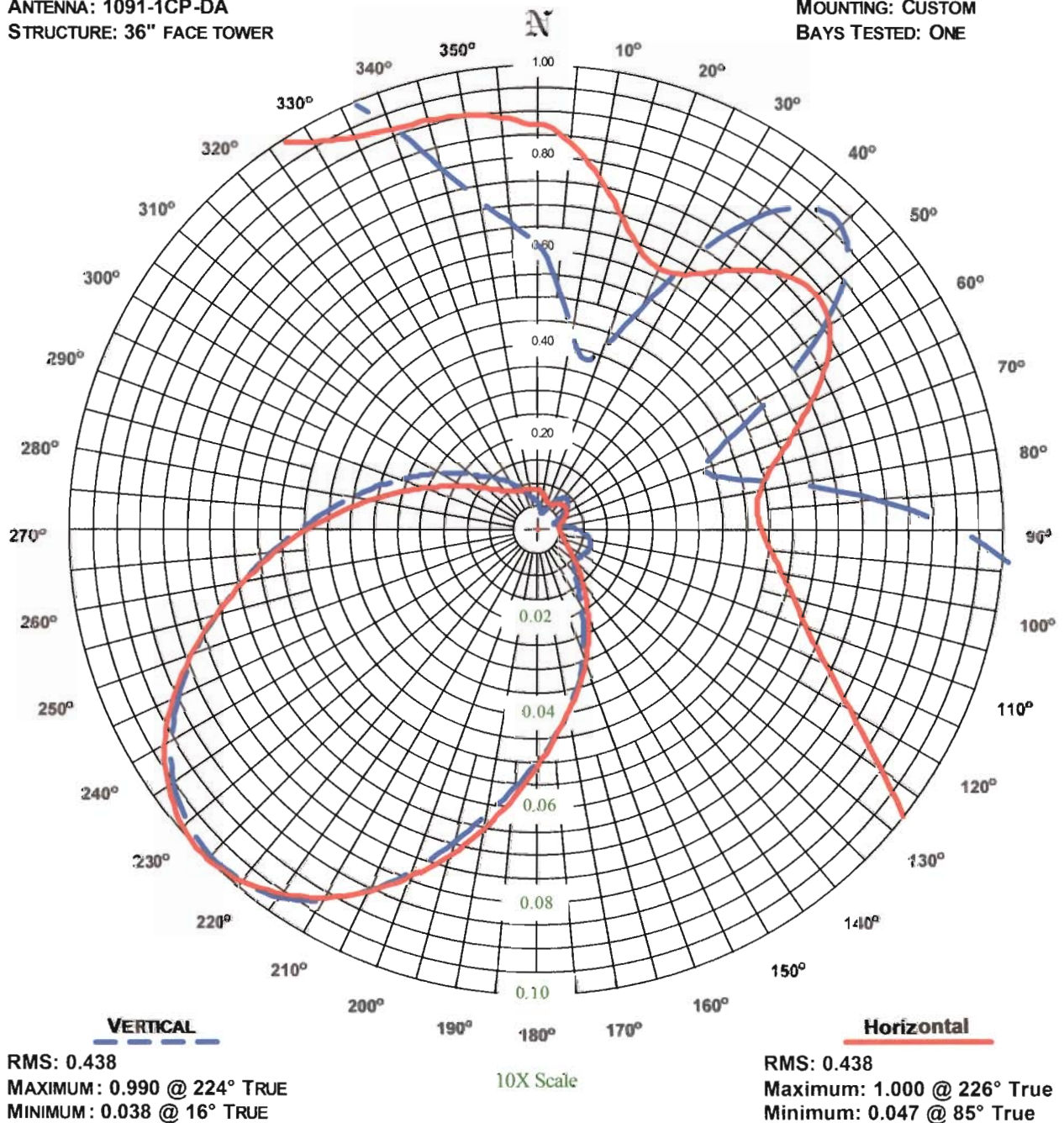


# ERI<sup>®</sup> Horizontal Plane Relative Field Pattern

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FIGURE NO: 2  
STATION: KLVM  
LOCATION: PRUNEDALE, CA  
ANTENNA: 1091-1CP-DA  
STRUCTURE: 36" FACE TOWER

DATE: 3/31/2006  
FREQUENCY: 89.7 MHz  
ORIENTATION: 227° TRUE  
MOUNTING: CUSTOM  
BAYS TESTED: ONE



COMMENTS: MEASURED PATTERNS OF THE HORIZONTAL AND VERTICAL COMPONENTS.

# ERI<sup>®</sup> 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: KLVM**  
**Location: Prunedale, CA**  
**Frequency: 89.7 MHz**

**Antenna: 1091-1CP-DA**  
**Orientation: 227° True**  
**Tower: 36" face tower**

**Figure: 2**  
**Date: 3/31/2006**  
**Reference: klvm2m.fig**

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.087	0.00	-24.65	0.061	0.00	-27.72	180°	0.507	0.12	-9.37	0.497	0.11	-9.54
5°	0.083	0.00	-25.06	0.052	0.00	-29.11	185°	0.576	0.15	-8.26	0.556	0.14	-8.57
10°	0.077	0.00	-25.77	0.043	0.00	-30.83	190°	0.648	0.19	-7.24	0.619	0.17	-7.63
15°	0.070	0.00	-26.59	0.038	0.00	-31.82	195°	0.720	0.23	-6.32	0.693	0.22	-6.65
20°	0.064	0.00	-27.31	0.042	0.00	-31.09	200°	0.790	0.28	-5.52	0.777	0.27	-5.66
25°	0.062	0.00	-27.63	0.053	0.00	-29.03	205°	0.853	0.33	-4.85	0.852	0.33	-4.86
30°	0.063	0.00	-27.42	0.068	0.00	-26.84	210°	0.909	0.37	-4.30	0.915	0.38	-4.24
35°	0.068	0.00	-26.85	0.082	0.00	-25.22	215°	0.954	0.41	-3.88	0.964	0.42	-3.79
40°	0.073	0.00	-26.21	0.091	0.00	-24.33	220°	0.985	0.44	-3.60	0.985	0.44	-3.60
45°	0.077	0.00	-25.74	0.092	0.00	-24.16	225°	0.999	0.45	-3.47	0.990	0.44	-3.56
50°	0.078	0.00	-25.58	0.087	0.00	-24.71	230°	0.992	0.44	-3.54	0.979	0.43	-3.66
55°	0.077	0.00	-25.79	0.075	0.00	-26.02	235°	0.966	0.42	-3.77	0.950	0.41	-3.91
60°	0.072	0.00	-26.36	0.059	0.00	-28.09	240°	0.922	0.38	-4.17	0.906	0.37	-4.33
65°	0.065	0.00	-27.21	0.045	0.00	-30.48	245°	0.864	0.34	-4.74	0.849	0.32	-4.89
70°	0.058	0.00	-28.21	0.038	0.00	-31.79	250°	0.793	0.28	-5.49	0.785	0.28	-5.57
75°	0.052	0.00	-29.13	0.043	0.00	-30.82	255°	0.717	0.23	-6.36	0.716	0.23	-6.37
80°	0.048	0.00	-29.76	0.056	0.00	-28.47	260°	0.642	0.19	-7.31	0.645	0.19	-7.28
85°	0.047	0.00	-29.97	0.073	0.00	-26.15	265°	0.570	0.15	-8.35	0.576	0.15	-8.26
90°	0.048	0.00	-29.82	0.090	0.00	-24.38	270°	0.499	0.11	-9.51	0.512	0.12	-9.28
95°	0.050	0.00	-29.44	0.104	0.00	-23.16	275°	0.431	0.08	-10.79	0.454	0.09	-10.32
100°	0.053	0.00	-28.95	0.113	0.01	-22.41	280°	0.368	0.06	-12.15	0.404	0.07	-11.33
105°	0.057	0.00	-28.38	0.118	0.01	-22.05	285°	0.312	0.04	-13.59	0.358	0.06	-12.39
110°	0.062	0.00	-27.69	0.118	0.01	-22.01	290°	0.263	0.03	-15.08	0.315	0.04	-13.51
115°	0.068	0.00	-26.80	0.116	0.01	-22.20	295°	0.221	0.02	-16.58	0.277	0.03	-14.63
120°	0.078	0.00	-25.68	0.111	0.01	-22.53	300°	0.187	0.02	-18.01	0.243	0.03	-15.76
125°	0.090	0.00	-24.36	0.107	0.01	-22.86	305°	0.161	0.01	-19.34	0.212	0.02	-16.94
130°	0.107	0.01	-22.88	0.106	0.01	-22.94	310°	0.139	0.01	-20.58	0.184	0.02	-18.16
135°	0.128	0.01	-21.32	0.112	0.01	-22.48	315°	0.123	0.01	-21.67	0.163	0.01	-19.21
140°	0.154	0.01	-19.72	0.127	0.01	-21.36	320°	0.111	0.01	-22.58	0.146	0.01	-20.15
145°	0.184	0.02	-18.16	0.154	0.01	-19.72	325°	0.102	0.00	-23.29	0.131	0.01	-21.10
150°	0.219	0.02	-16.64	0.191	0.02	-17.84	330°	0.096	0.00	-23.79	0.117	0.01	-22.10
155°	0.259	0.03	-15.19	0.237	0.03	-15.96	335°	0.093	0.00	-24.08	0.104	0.00	-23.13
160°	0.303	0.04	-13.83	0.291	0.04	-14.19	340°	0.092	0.00	-24.22	0.092	0.00	-24.17
165°	0.348	0.05	-12.64	0.341	0.05	-12.81	345°	0.091	0.00	-24.27	0.081	0.00	-25.32
170°	0.393	0.07	-11.59	0.391	0.07	-11.62	350°	0.091	0.00	-24.33	0.072	0.00	-26.30
175°	0.445	0.09	-10.50	0.443	0.09	-10.55	355°	0.089	0.00	-24.48	0.066	0.00	-27.05

<b>Polarization:</b>	<b>Horizontal</b>	<b>Vertical</b>
<b>Maximum Field:</b>	<b>1.000 @ 226° True</b>	<b>0.990 @ 224° True</b>
<b>Minimum Field:</b>	<b>0.047 @ 85° True</b>	<b>0.038 @ 16° True</b>
<b>RMS:</b>	<b>0.438</b>	<b>0.438</b>
<b>Maximum ERP:</b>	<b>0.450 kW</b>	<b>0.441 kW</b>
<b>Maximum Power Gain:</b>	<b>2.283 (3.586 dB)</b>	<b>2.239 (3.500 dB)</b>

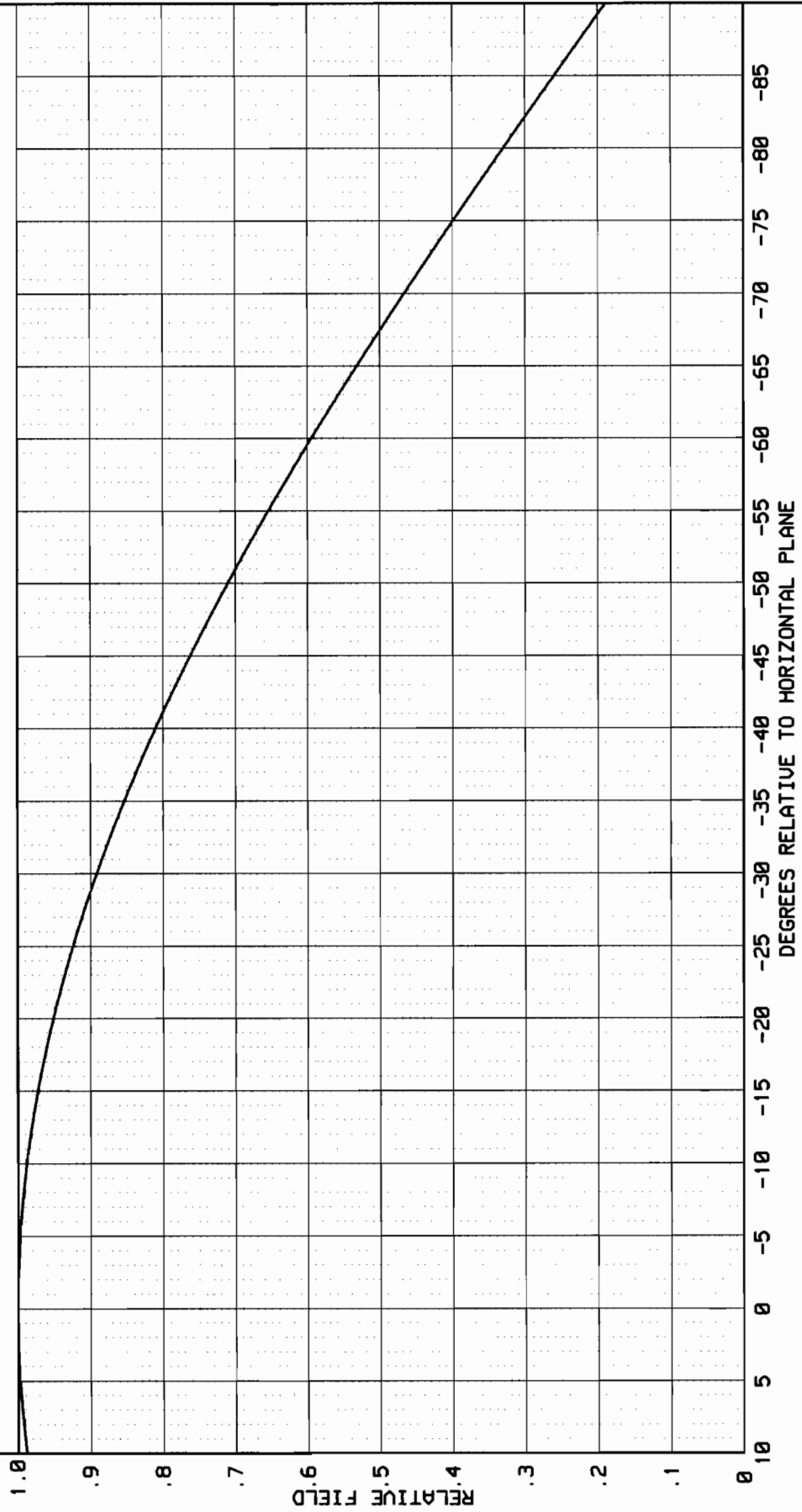
**Total Input Power: 0.197 kW**



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

FIGURE 3

-----THEORETICAL-----  
VERTICAL PLANE RELATIVE FIELD  
ERI TYPE 1091-1CP-DA ANTENNA  
0 DEGREE BEAM TILT  
0 PERCENT NULL FILL



Directional Antenna System  
for  
KLVM, Prunedale, California

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	1091-1CP-DA
Frequency:	89.7
Number of Bays:	one

MECHANICAL SPECIFICATIONS

Mounting:	Custom
System length:	10 ft
Aperture length required:	20 ft
Orientation:	227° true

Input flange to the antenna 1 5/8 inch female

ELECTRICAL SPECIFICATIONS  
(For directional use)

Maximum horizontal ERP:	0.45 kW (3.468 dBk)
Horizontal maximum power gain:	2.283 (3.586 dB)
Maximum vertical ERP:	0.441 kW (3.553 dBk)
Vertical maximum power gain:	2.239 (3.500 dB)
Total input power:	0.197 kW (-7.054 dBk)

