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 KVKL, Las Vegas, Nevada

September 23, 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 KVKL.

The antenna is the ERI model 1092-5CP-DA configuration. The circular polarized system consists of 5 full-wavelength spaced bays using two driven circular polarized radiating elements attached to two flat panels and two vertical parasitic elements per bay. The antenna was mounted on the North 35 degrees East tower face with bracketry to provide an antenna orientation of North 35 degrees East. The antenna was tested on a 42" face tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 91.1 megahertz, which is the center of the FM broadcast channel assigned to KVKL.

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
Proposed For
KVKL, Las Vegas, Nevada

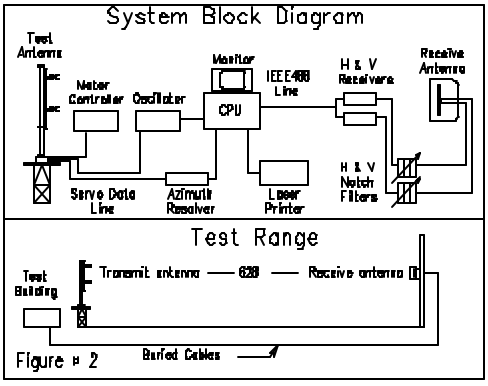
(Continued)

DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of one bay levels of the circular polarized system with the associated 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 a 42" 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 a HP8657D signal generator. The frequency of the signal source was set at 91.1 MHz and was constantly monitored by a Rohde & Schwarz ESVD measuring receiver.

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 5 full-wavelength spaced bays using two driven circular polarized radiating elements attached to two flat planes 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 1092-5CP-DA array is to be mounted on the North 35 degrees East tower face of the 42" face tower at a bearing of North 35 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 45.000 kilowatts (16.532 dBk).

The power at North 160-270 degrees East does not exceed 1.500 kilowatts (1.761 dBk).

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

(Continued)

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 63 feet 2 in.

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

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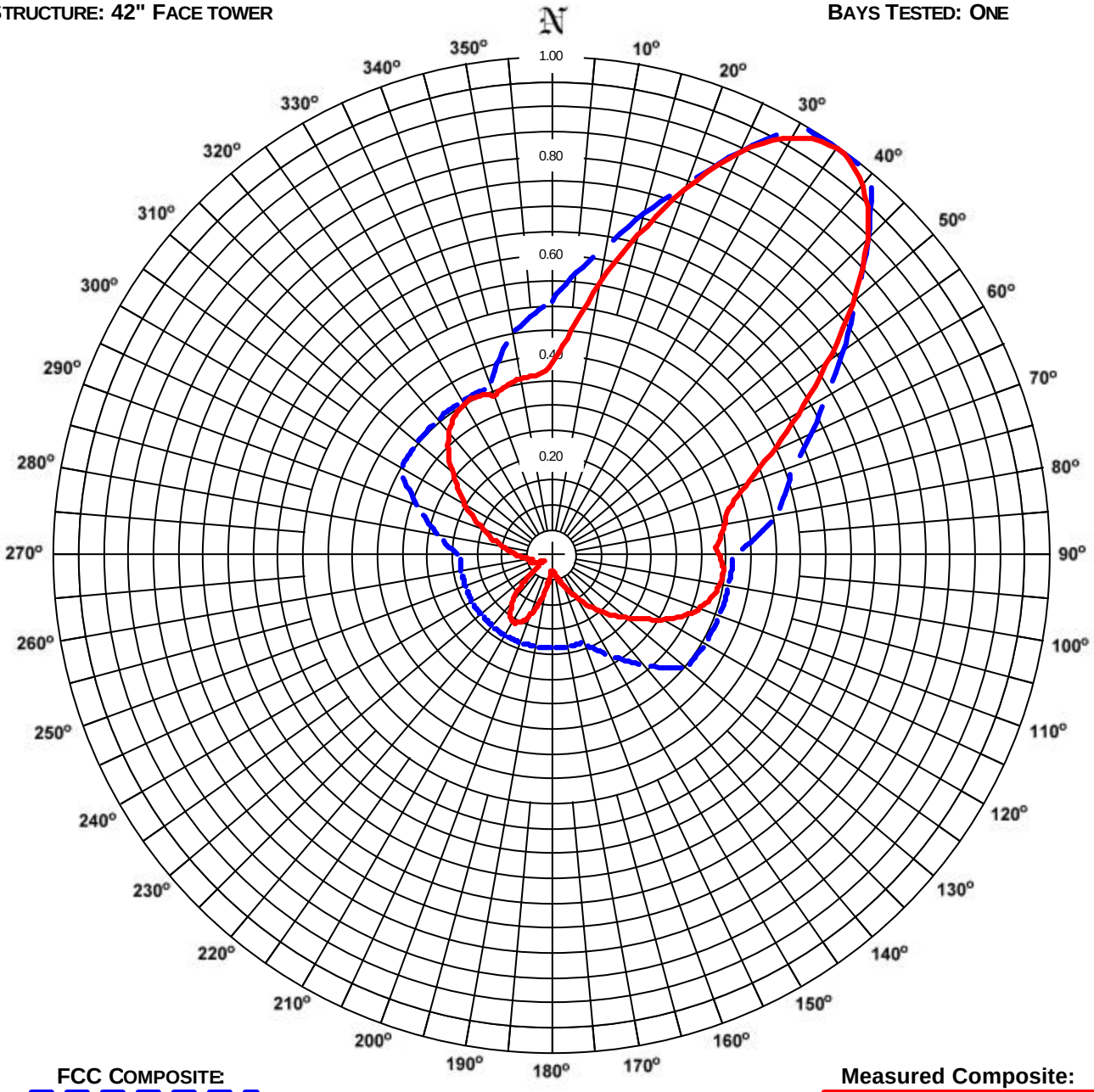
FIGURE NO: 1
STATION: KVKL
LOCATION: LAS VEGAS, NV
ANTENNA: 1092-5CP-DA
STRUCTURE: 42" FACE TOWER

DATE: 9/11/2008
FREQUENCY: 91.1 MHZ
ORIENTATION: 35° TRUE
MOUNTING: CUSTOM
BAYS TESTED: ONE



FCC COMPOSITE:

RMS: 0.438
MAXIMUM: 1.000 @ 30° TRUE
MINIMUM: 0.184 @ 160° TRUE

Measured Composite:

RMS: 0.386
Maximum: 1.000 @ 35° True
Minimum: 0.018 @ 241° 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-20070305ABP.

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: KVKL
Location: Las Vegas, NV
Frequency: 91.1 MHz

Antenna: 1092-5CP-DA
Orientation: 35° True
Tower: 42" Face tower

Figure: 1
Date: 9/11/2008
Reference: kvkl1m.fig

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0º	0.389	6.82	8.34	Horizontal	180º	0.030	0.04	-13.89	Vertical
5º	0.455	9.32	9.69	Horizontal	185º	0.041	0.08	-11.16	Horizontal
10º	0.559	14.06	11.48	Horizontal	190º	0.068	0.21	-6.76	Horizontal
15º	0.667	20.04	13.02	Horizontal	195º	0.097	0.43	-3.69	Horizontal
20º	0.785	27.75	14.43	Horizontal	200º	0.124	0.69	-1.62	Horizontal
25º	0.895	36.05	15.57	Horizontal	205º	0.145	0.94	-0.26	Horizontal
30º	0.971	42.46	16.28	Horizontal	210º	0.151	1.03	0.12	Horizontal
35º	1.000	45.00	16.53	Horizontal	215º	0.144	0.93	-0.32	Horizontal
40º	0.972	42.48	16.28	Horizontal	220º	0.124	0.69	-1.62	Horizontal
45º	0.896	36.13	15.58	Horizontal	225º	0.093	0.39	-4.07	Horizontal
50º	0.789	28.01	14.47	Horizontal	230º	0.062	0.17	-7.57	Vertical
55º	0.672	20.34	13.08	Horizontal	235º	0.037	0.06	-12.04	Vertical
60º	0.571	14.66	11.66	Horizontal	240º	0.019	0.02	-17.72	Vertical
65º	0.485	10.59	10.25	Horizontal	245º	0.029	0.04	-14.11	Horizontal
70º	0.414	7.70	8.86	Horizontal	250º	0.039	0.07	-11.62	Horizontal
75º	0.370	6.15	7.89	Horizontal	255º	0.044	0.09	-10.64	Horizontal
80º	0.352	5.57	7.46	Horizontal	260º	0.042	0.08	-10.98	Horizontal
85º	0.335	5.06	7.04	Horizontal	265º	0.049	0.11	-9.72	Vertical
90º	0.338	5.13	7.10	Vertical	270º	0.064	0.18	-7.37	Vertical
95º	0.346	5.38	7.31	Vertical	275º	0.079	0.28	-5.55	Vertical
100º	0.341	5.25	7.20	Vertical	280º	0.097	0.42	-3.74	Vertical
105º	0.330	4.90	6.90	Vertical	285º	0.117	0.62	-2.10	Vertical
110º	0.312	4.37	6.40	Vertical	290º	0.141	0.89	-0.51	Vertical
115º	0.286	3.68	5.66	Vertical	295º	0.167	1.26	0.99	Vertical
120º	0.253	2.89	4.61	Vertical	300º	0.199	1.78	2.50	Vertical
125º	0.220	2.19	3.40	Vertical	305º	0.227	2.31	3.63	Vertical
130º	0.191	1.64	2.16	Vertical	310º	0.258	3.00	4.77	Vertical
135º	0.165	1.22	0.88	Vertical	315º	0.294	3.89	5.90	Vertical
140º	0.140	0.88	-0.57	Vertical	320º	0.322	4.65	6.68	Vertical
145º	0.115	0.59	-2.29	Vertical	325º	0.341	5.23	7.19	Vertical
150º	0.090	0.37	-4.37	Vertical	330º	0.352	5.59	7.47	Vertical
155º	0.073	0.24	-6.20	Vertical	335º	0.355	5.67	7.54	Vertical
160º	0.059	0.16	-8.10	Vertical	340º	0.343	5.30	7.24	Vertical
165º	0.047	0.10	-9.98	Vertical	345º	0.354	5.65	7.52	Horizontal
170º	0.039	0.07	-11.72	Vertical	350º	0.362	5.89	7.70	Horizontal
175º	0.033	0.05	-13.10	Vertical	355º	0.365	5.99	7.77	Horizontal

Polarization: **Envelope**
Maximum Field: **1.000 @ 35° True**
Minimum Field: **0.018 @ 241° True**
RMS: **0.386**
Maximum ERP: **45.000 kW**
Maximum Power Gain: **18.803 (12.742 dB)**

Total Input Power: 2.3393 kW

ERI® Horizontal Plane Relative Field Pattern

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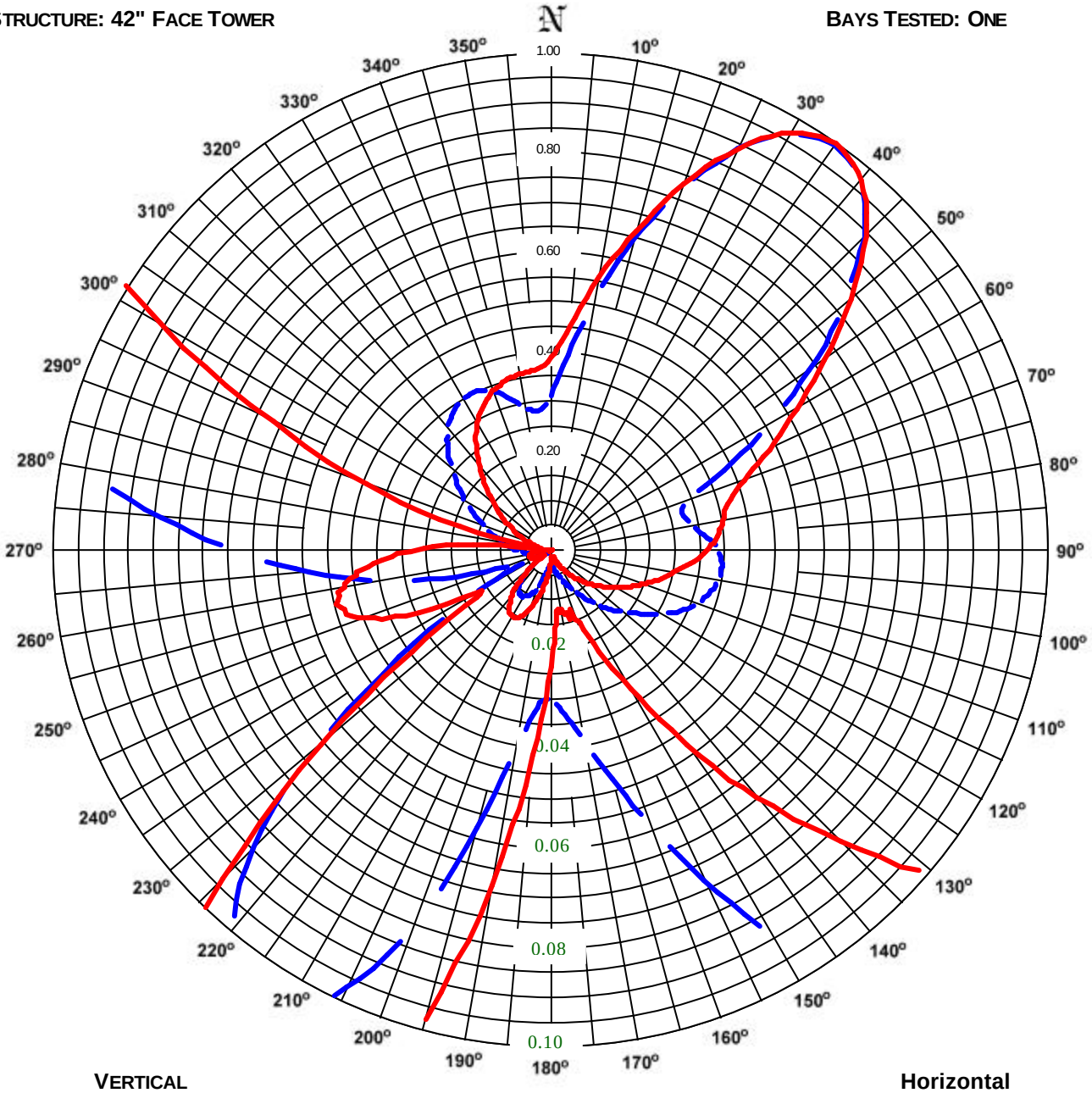
FIGURE NO: 2
STATION: KVKL
LOCATION: LAS VEGAS, NV
ANTENNA: 1092-5CP-DA
STRUCTURE: 42" FACE TOWER

DATE: 9/11/2008
FREQUENCY: 91.1 MHZ
ORIENTATION: 35° TRUE
MOUNTING: CUSTOM
BAYS TESTED: ONE



VERTICAL

RMS: 0.370
MAXIMUM: 0.996 @ 35° TRUE
MINIMUM: 0.006 @ 249° TRUE

10X Scale

Horizontal

RMS: 0.370
Maximum: 1.000 @ 35° True
Minimum: 0.002 @ 280° True

COMMENTS: MEASURED PATTERNS OF THE HORIZONTAL AND VERTICAL COMPONENTS.

ERI® Horizontal Plane Relative Field List

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Station: KVKL
Location: Las Vegas, NV
Frequency: 91.1 MHz

Antenna: 1092-5CP-DA
Orientation: 35° True
Tower: 42" Face tower

Figure: 2
Date: 9/11/2008
Reference: kvkl1m.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0º	0.389	6.82	8.34	0.312	4.37	6.41	180º	0.023	0.02	-16.18	0.030	0.04	-13.89
5º	0.455	9.32	9.69	0.394	7.00	8.45	185º	0.041	0.08	-11.16	0.032	0.04	-13.47
10º	0.559	14.06	11.48	0.518	12.08	10.82	190º	0.068	0.21	-6.76	0.041	0.07	-11.26
15º	0.667	20.04	13.02	0.653	19.22	12.84	195º	0.097	0.43	-3.69	0.058	0.15	-8.26
20º	0.785	27.75	14.43	0.783	27.60	14.41	200º	0.124	0.69	-1.62	0.080	0.29	-5.39
25º	0.895	36.05	15.57	0.893	35.85	15.55	205º	0.145	0.94	-0.26	0.097	0.42	-3.74
30º	0.971	42.46	16.28	0.968	42.16	16.25	210º	0.151	1.03	0.12	0.106	0.51	-2.95
35º	1.000	45.00	16.53	0.996	44.66	16.50	215º	0.144	0.93	-0.32	0.107	0.52	-2.87
40º	0.972	42.48	16.28	0.968	42.14	16.25	220º	0.124	0.69	-1.62	0.100	0.45	-3.50
45º	0.896	36.13	15.58	0.892	35.77	15.54	225º	0.093	0.39	-4.07	0.085	0.32	-4.91
50º	0.789	28.01	14.47	0.768	26.53	14.24	230º	0.061	0.16	-7.83	0.062	0.17	-7.57
55º	0.672	20.34	13.08	0.634	18.07	12.57	235º	0.030	0.04	-13.79	0.037	0.06	-12.04
60º	0.571	14.66	11.66	0.510	11.69	10.68	240º	0.016	0.01	-19.42	0.019	0.02	-17.72
65º	0.485	10.59	10.25	0.385	6.67	8.24	245º	0.029	0.04	-14.11	0.009	0.00	-24.45
70º	0.414	7.70	8.86	0.293	3.85	5.86	250º	0.039	0.07	-11.62	0.007	0.00	-26.70
75º	0.370	6.15	7.89	0.276	3.42	5.34	255º	0.044	0.09	-10.64	0.020	0.02	-17.63
80º	0.352	5.57	7.46	0.289	3.76	5.76	260º	0.042	0.08	-10.98	0.034	0.05	-12.94
85º	0.335	5.06	7.04	0.316	4.49	6.52	265º	0.037	0.06	-12.14	0.049	0.11	-9.72
90º	0.312	4.39	6.43	0.338	5.13	7.10	270º	0.028	0.04	-14.50	0.064	0.18	-7.37
95º	0.283	3.60	5.57	0.346	5.38	7.31	275º	0.016	0.01	-19.64	0.079	0.28	-5.55
100º	0.251	2.85	4.54	0.341	5.25	7.20	280º	0.002	0.00	-39.93	0.097	0.42	-3.74
105º	0.224	2.26	3.54	0.330	4.90	6.90	285º	0.019	0.02	-17.89	0.117	0.62	-2.10
110º	0.195	1.71	2.34	0.312	4.37	6.40	290º	0.039	0.07	-11.56	0.141	0.89	-0.51
115º	0.171	1.31	1.18	0.286	3.68	5.66	295º	0.062	0.17	-7.67	0.167	1.26	0.99
120º	0.146	0.96	-0.20	0.253	2.89	4.61	300º	0.090	0.37	-4.37	0.199	1.78	2.50
125º	0.123	0.69	-1.64	0.220	2.19	3.40	305º	0.118	0.62	-2.06	0.227	2.31	3.63
130º	0.103	0.48	-3.21	0.191	1.64	2.16	310º	0.152	1.03	0.14	0.258	3.00	4.77
135º	0.083	0.31	-5.14	0.165	1.22	0.88	315º	0.186	1.55	1.90	0.294	3.89	5.90
140º	0.064	0.19	-7.28	0.140	0.88	-0.57	320º	0.221	2.20	3.42	0.322	4.65	6.68
145º	0.047	0.10	-9.94	0.115	0.59	-2.29	325º	0.262	3.10	4.91	0.341	5.23	7.19
150º	0.032	0.05	-13.37	0.090	0.37	-4.37	330º	0.296	3.95	5.96	0.352	5.59	7.47
155º	0.021	0.02	-17.23	0.073	0.24	-6.20	335º	0.323	4.69	6.71	0.355	5.67	7.54
160º	0.015	0.01	-20.18	0.059	0.16	-8.10	340º	0.342	5.26	7.21	0.343	5.30	7.24
165º	0.013	0.01	-21.43	0.047	0.10	-9.98	345º	0.354	5.65	7.52	0.316	4.51	6.54
170º	0.012	0.01	-21.87	0.039	0.07	-11.72	350º	0.362	5.89	7.70	0.293	3.85	5.86
175º	0.012	0.01	-21.65	0.033	0.05	-13.10	355º	0.365	5.99	7.77	0.284	3.62	5.59

Polarization:	**Horizontal**	**Vertical**
Maximum Field:	**1.000 @ 35° True**	**0.996 @ 35° True**
Minimum Field:	**0.002 @ 280° True**	**0.006 @ 249° True**
RMS:	**0.370**	**0.370**
Maximum ERP:	**45.000 kW**	**44.657 kW**
Maximum Power Gain:	**18.803 (12.742 dB)**	**18.695 (12.709 dB)**

Total Input Power: 2.393 kW

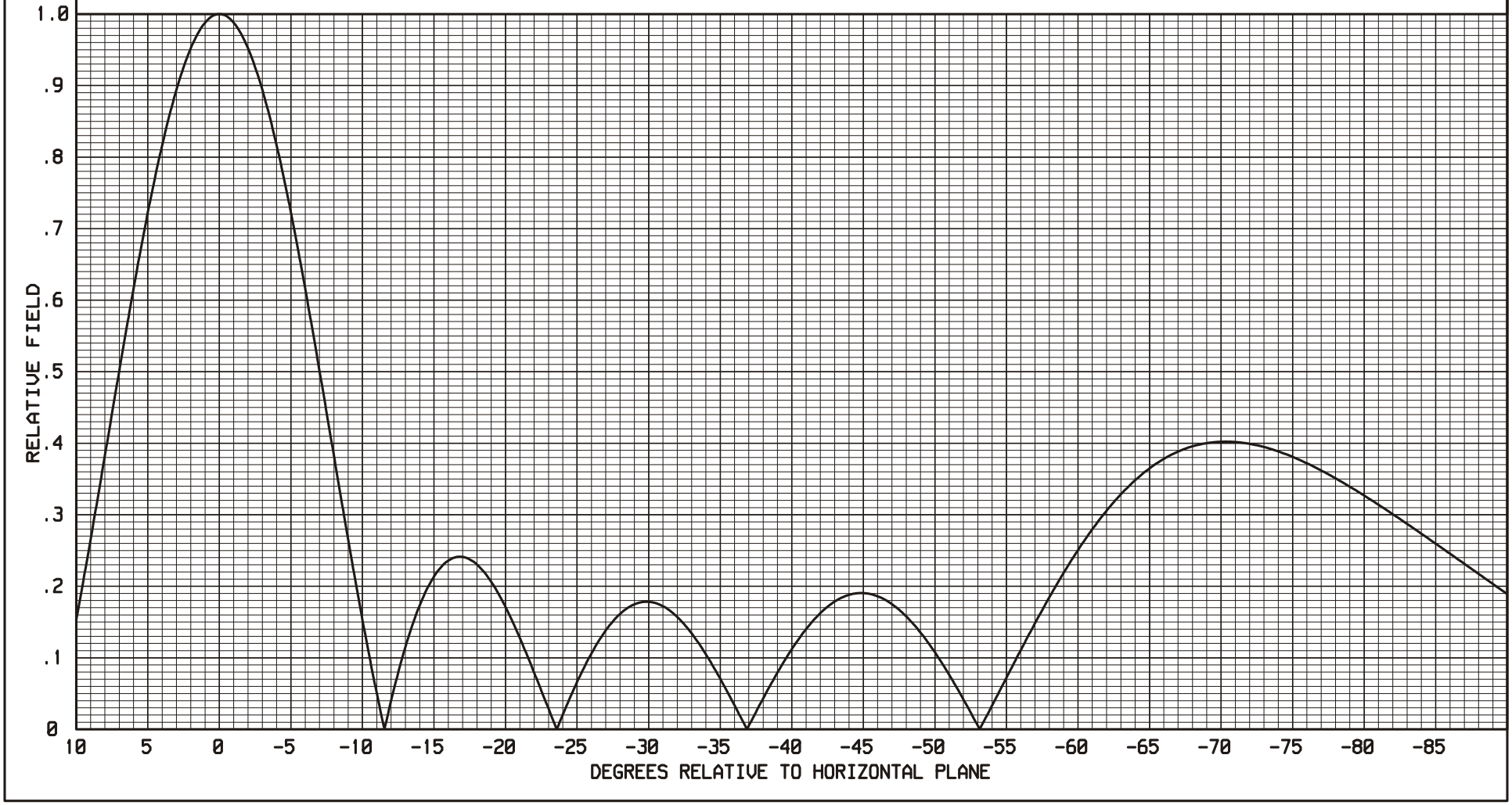
ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610

FIGURE 3

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

ERI TYPE 1092-5CP-DA ANTENNA
0 DEGREE BEAM TILT
0 PERCENT NULL FILL

BAY SPACING:
FULL WAVE



Directional Antenna System
for
KVKL, Las Vegas, Nevada

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	1092-5CP-DA
Frequency:	91.1 MHz
Number of Bays:	Five

MECHANICAL SPECIFICATIONS

Mounting:	Custom
System length:	54 ft
Aperture length required:	63 ft 2 in
Orientation:	35° true

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

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	45.000 kW (16.532 dBk)
Horizontal maximum power gain:	18.803 (12.742 dB)
Maximum vertical ERP:	44.657 kW (16.499 dBk)
Vertical maximum power gain:	18.659 (12.709 dB)
Total input power:	2.393 kW (3.790 dBk)