Electronics Research, Inc.

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 KFLR, Phoenix, Arizona

February 22, 2007

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 KFLR.

The antenna is the ERI model MP-4C-DA-SP configuration. The circular polarized system consists of four 0.8 wavelength spaced bays using one driven circular polarized radiating element, two horizontal parasitic elements placed one quarter wave above and below each bay and two vertical parasitic elements per bay. The antenna was tested on a 10 3/4" o.d. pole, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 90.3 megahertz, which is the center of the FM broadcast channel assigned to KFLR.

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
KFLR, Phoenix, Arizona

(Continued)

DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of two bay levels of the circular polarized system with the associated horizontal and 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 3 1/8 inch o.d. rigid coaxial line was used to feed the test antenna, and a section of 3 1/8 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 10 3/4" o.d. pole 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.

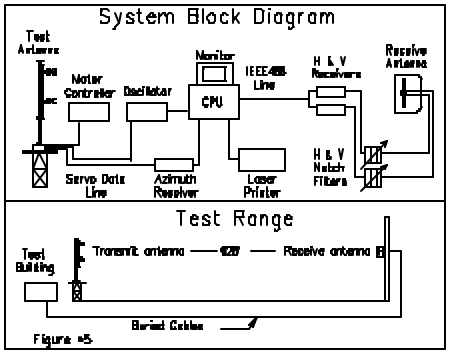

Figure #5

The antenna under test was operated in the transmitting mode and fed from a HP8657D signal generator calibrated 1-05. The frequency of the signal source was set at 90.3 MHz and was constantly monitored by a Rohde & Schwarz ESVD measuring receiver calibrated 11-06.

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 Hewlett-Packard Laser Jet 4P 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 four 0.8 wavelength spaced bays using one driven circular polarized radiating element, two horizontal parasitic elements placed one quarter wave above and below each bay 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 MP-4C-DA-SP array is to be mounted on the 10 3/4" o.d. pole at a bearing of North 320 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 100 kilowatts (20.000 dBk).

The power at North 120-130 degrees East does not exceed 3.50 kilowatts (5.441 dBk).

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

Directional Antenna System
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(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 43 feet 10 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.

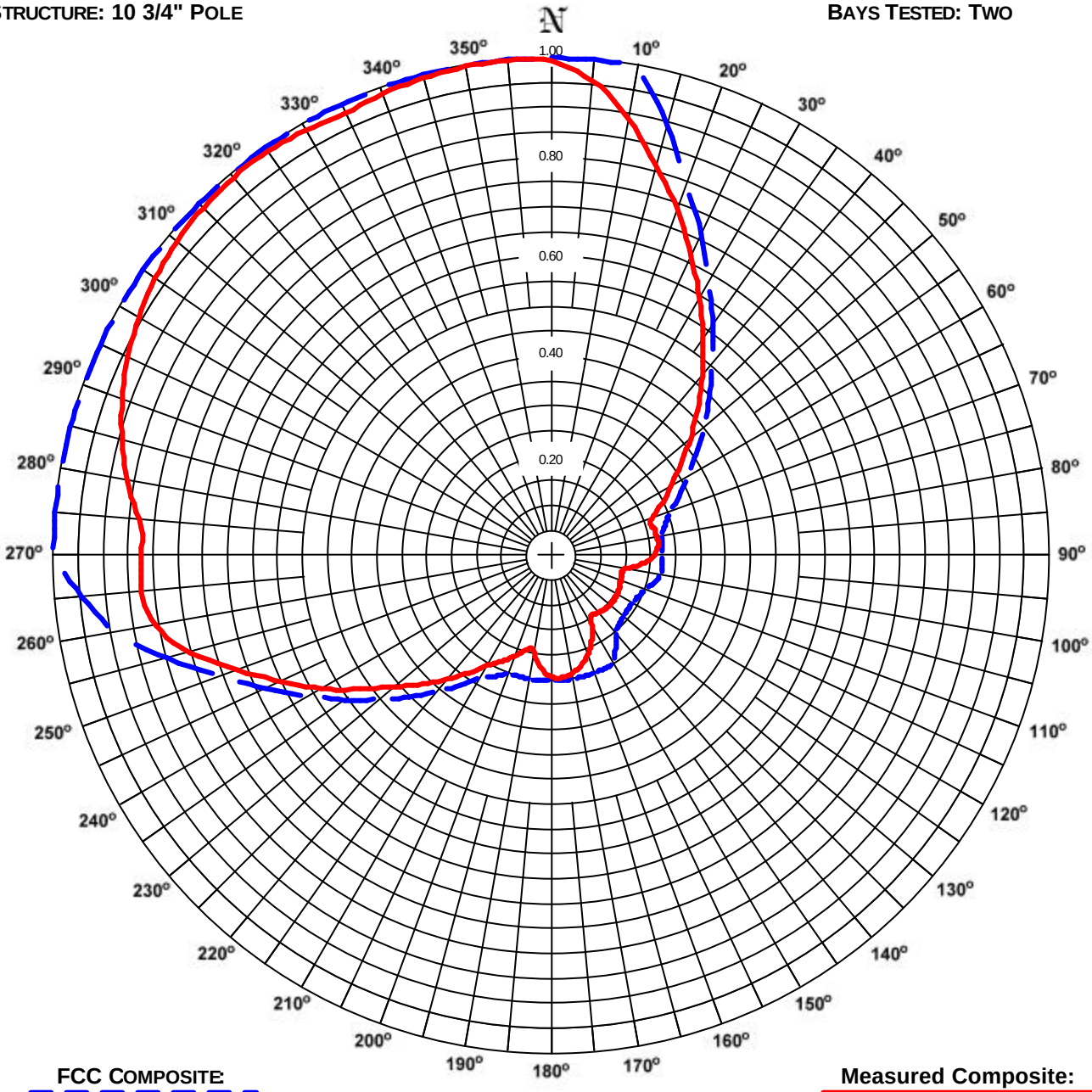
ELECTRONICS RESEARCH, INC.

ERI® Horizontal Plane Relative Field Pattern

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: KFLR
LOCATION: PHOENIX, AZ
ANTENNA: MP-4C-DA-SP
STRUCTURE: 10 3/4" POLE

DATE: 1/31/2007
FREQUENCY: 90.3 MHZ
ORIENTATION: 320° TRUE
MOUNTING: STANDARD
BAYS TESTED: TWO



FCC COMPOSITE:
RMS: 0.651
MAXIMUM: 1.000 @ 0° TRUE
MINIMUM: 0.188 @ 120° TRUE

Measured Composite:
RMS: 0.611
Maximum: 1.000 @ 357° True
Minimum: 0.144 @ 146° 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-20061101ACM

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: KFLR
Location: Phoenix, AZ
Frequency: 90.3 MHz

Antenna: MP-4C-DA-SP
Orientation: 320° True
Tower: 10 3/4" Pole

Figure: 1
Date: 1/31/2007
Reference: kflr1m.fig

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0º	0.993	98.59	19.94	Horizontal	180º	0.243	5.90	7.71	Horizontal
5º	0.958	91.71	19.62	Horizontal	185º	0.228	5.18	7.14	Horizontal
10º	0.893	79.74	19.02	Horizontal	190º	0.199	3.98	6.00	Horizontal
15º	0.813	66.17	18.21	Horizontal	195º	0.197	3.88	5.89	Vertical
20º	0.741	54.91	17.40	Horizontal	200º	0.214	4.60	6.62	Vertical
25º	0.665	44.24	16.46	Horizontal	205º	0.234	5.47	7.38	Vertical
30º	0.598	35.82	15.54	Vertical	210º	0.255	6.51	8.13	Vertical
35º	0.532	28.27	14.51	Vertical	215º	0.287	8.25	9.17	Vertical
40º	0.472	22.32	13.49	Vertical	220º	0.324	10.47	10.20	Vertical
45º	0.415	17.25	12.37	Vertical	225º	0.364	13.26	11.23	Vertical
50º	0.365	13.34	11.25	Vertical	230º	0.410	16.80	12.25	Vertical
55º	0.317	10.04	10.02	Vertical	235º	0.467	21.82	13.39	Horizontal
60º	0.275	7.56	8.78	Vertical	240º	0.532	28.33	14.52	Horizontal
65º	0.244	5.95	7.74	Vertical	245º	0.597	35.68	15.52	Horizontal
70º	0.216	4.68	6.70	Vertical	250º	0.671	45.08	16.54	Horizontal
75º	0.213	4.54	6.57	Horizontal	255º	0.752	56.48	17.52	Horizontal
80º	0.216	4.68	6.70	Horizontal	260º	0.806	65.03	18.13	Horizontal
85º	0.216	4.65	6.68	Horizontal	265º	0.827	68.39	18.35	Horizontal
90º	0.205	4.20	6.24	Horizontal	270º	0.824	67.92	18.32	Horizontal
95º	0.184	3.37	5.28	Horizontal	275º	0.832	69.15	18.40	Vertical
100º	0.152	2.30	3.62	Horizontal	280º	0.864	74.59	18.73	Vertical
105º	0.147	2.15	3.32	Vertical	285º	0.892	79.60	19.01	Vertical
110º	0.149	2.21	3.44	Vertical	290º	0.917	84.12	19.25	Vertical
115º	0.151	2.29	3.60	Vertical	295º	0.939	88.09	19.45	Vertical
120º	0.153	2.35	3.71	Vertical	300º	0.956	91.47	19.61	Vertical
125º	0.154	2.37	3.75	Vertical	305º	0.971	94.22	19.74	Vertical
130º	0.153	2.35	3.71	Vertical	310º	0.981	96.30	19.84	Vertical
135º	0.151	2.29	3.61	Vertical	315º	0.988	97.71	19.90	Vertical
140º	0.149	2.21	3.44	Vertical	320º	0.992	98.42	19.93	Vertical
145º	0.145	2.10	3.22	Vertical	325º	0.992	98.32	19.93	Vertical
150º	0.164	2.68	4.28	Horizontal	330º	0.987	97.41	19.89	Vertical
155º	0.191	3.64	5.62	Horizontal	335º	0.979	95.93	19.82	Horizontal
160º	0.213	4.52	6.55	Horizontal	340º	0.988	97.53	19.89	Horizontal
165º	0.229	5.24	7.20	Horizontal	345º	0.994	98.73	19.94	Horizontal
170º	0.240	5.76	7.60	Horizontal	350º	0.998	99.54	19.98	Horizontal
175º	0.245	6.02	7.80	Horizontal	355º	1.000	99.95	20.00	Horizontal

Polarization: **Envelope**
Maximum Field: **1.000 @ 357° True**
Minimum Field: **0.144 @ 146° True**
RMS: **0.611**
Maximum ERP: **100.000 kW**
Maximum Power Gain: **5.358 (7.290 dB)**

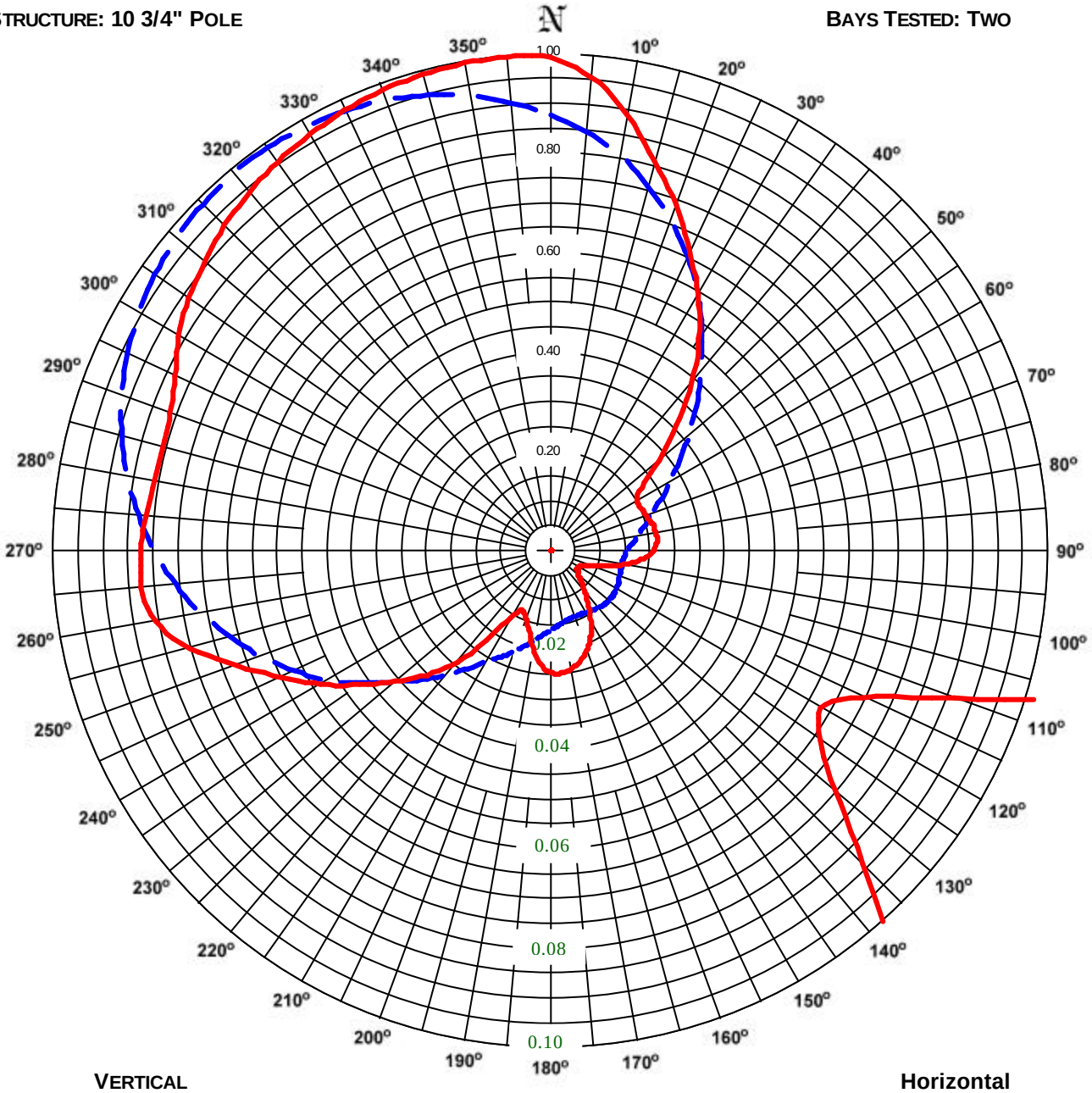
Total Input Power: 18.663 kW

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: KFLR
LOCATION: PHOENIX, AZ
ANTENNA: MP-4C-DA-SP
STRUCTURE: 10 3/4" POLE

DATE: 1/31/2007
FREQUENCY: 90.3 MHZ
ORIENTATION: 320° TRUE
MOUNTING: STANDARD
BAYS TESTED: TWO



VERTICAL

RMS: 0.588
MAXIMUM: 0.992 @ 322° TRUE
MINIMUM: 0.139 @ 160° TRUE

10X Scale

Horizontal

RMS: 0.588
Maximum: 1.000 @ 357° True
Minimum: 0.063 @ 120° 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: KFLR
Location: Phoenix, AZ
Frequency: 90.3 MHz

Antenna: MP-4C-DA-SP
Orientation: 320° True
Tower: 10 3/4" Pole

Figure: 2
Date: 1/31/2007
Reference: kflr1m.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.993	98.59	19.94	0.879	77.23	18.88	180°	0.243	5.90	7.71	0.159	2.52	4.01
5°	0.958	91.71	19.62	0.847	71.80	18.56	185°	0.228	5.18	7.14	0.169	2.86	4.57
10°	0.893	79.74	19.02	0.812	65.95	18.19	190°	0.199	3.98	6.00	0.182	3.31	5.20
15°	0.813	66.17	18.21	0.761	57.87	17.62	195°	0.165	2.71	4.34	0.197	3.88	5.89
20°	0.741	54.91	17.40	0.713	50.78	17.06	200°	0.142	2.01	3.03	0.214	4.60	6.62
25°	0.665	44.24	16.46	0.653	42.65	16.30	205°	0.132	1.73	2.38	0.234	5.47	7.38
30°	0.597	35.64	15.52	0.598	35.82	15.54	210°	0.147	2.17	3.37	0.255	6.51	8.13
35°	0.522	27.22	14.35	0.532	28.27	14.51	215°	0.205	4.20	6.23	0.287	8.25	9.17
40°	0.443	19.59	12.92	0.472	22.32	13.49	220°	0.290	8.40	9.25	0.324	10.47	10.20
45°	0.358	12.84	11.08	0.415	17.25	12.37	225°	0.351	12.35	10.92	0.364	13.26	11.23
50°	0.287	8.21	9.14	0.365	13.34	11.25	230°	0.407	16.56	12.19	0.410	16.80	12.25
55°	0.225	5.04	7.03	0.317	10.04	10.02	235°	0.467	21.82	13.39	0.462	21.32	13.29
60°	0.201	4.05	6.08	0.275	7.56	8.78	240°	0.532	28.33	14.52	0.520	27.05	14.32
65°	0.203	4.12	6.15	0.244	5.95	7.74	245°	0.597	35.68	15.52	0.568	32.21	15.08
70°	0.207	4.30	6.33	0.216	4.68	6.70	250°	0.671	45.08	16.54	0.619	38.35	15.84
75°	0.213	4.54	6.57	0.195	3.81	5.81	255°	0.752	56.48	17.52	0.665	44.21	16.46
80°	0.216	4.68	6.70	0.178	3.16	4.99	260°	0.806	65.03	18.13	0.714	50.96	17.07
85°	0.216	4.65	6.68	0.164	2.69	4.30	265°	0.827	68.39	18.35	0.757	57.26	17.58
90°	0.205	4.20	6.24	0.154	2.38	3.76	270°	0.824	67.92	18.32	0.796	63.35	18.02
95°	0.184	3.37	5.28	0.148	2.20	3.41	275°	0.817	66.67	18.24	0.832	69.15	18.40
100°	0.152	2.30	3.62	0.146	2.13	3.28	280°	0.809	65.43	18.16	0.864	74.59	18.73
105°	0.114	1.30	1.15	0.147	2.15	3.32	285°	0.806	64.96	18.13	0.892	79.60	19.01
110°	0.086	0.75	-1.27	0.149	2.21	3.44	290°	0.813	66.17	18.21	0.917	84.12	19.25
115°	0.069	0.48	-3.18	0.151	2.29	3.60	295°	0.833	69.43	18.42	0.939	88.09	19.45
120°	0.063	0.40	-4.03	0.153	2.35	3.71	300°	0.863	74.45	18.72	0.956	91.47	19.61
125°	0.066	0.44	-3.59	0.154	2.37	3.75	305°	0.888	78.83	18.97	0.971	94.22	19.74
130°	0.075	0.56	-2.51	0.153	2.35	3.71	310°	0.908	82.49	19.16	0.981	96.30	19.84
135°	0.089	0.79	-1.01	0.151	2.29	3.61	315°	0.927	85.84	19.34	0.988	97.71	19.90
140°	0.109	1.18	0.72	0.149	2.21	3.44	320°	0.943	88.89	19.49	0.992	98.42	19.93
145°	0.134	1.79	2.52	0.145	2.10	3.22	325°	0.957	91.59	19.62	0.992	98.32	19.93
150°	0.164	2.68	4.28	0.142	2.01	3.04	330°	0.969	93.94	19.73	0.987	97.41	19.89
155°	0.191	3.64	5.62	0.140	1.96	2.93	335°	0.979	95.93	19.82	0.979	95.75	19.81
160°	0.213	4.52	6.55	0.139	1.95	2.89	340°	0.988	97.53	19.89	0.966	93.36	19.70
165°	0.229	5.24	7.20	0.141	1.98	2.97	345°	0.994	98.73	19.94	0.950	90.28	19.56
170°	0.240	5.76	7.60	0.145	2.09	3.20	350°	0.998	99.54	19.98	0.930	86.53	19.37
175°	0.245	6.02	7.80	0.150	2.26	3.55	355°	1.000	99.95	20.00	0.906	82.16	19.15

Polarization:	**Horizontal**	**Vertical**
Maximum Field:	**1.000 @ 357° True**	**0.992 @ 322° True**
Minimum Field:	**0.063 @ 120° True**	**0.139 @ 160° True**
RMS:	**0.588**	**0.588**
Maximum ERP:	**100.000 kW**	**98.500 kW**
Maximum Power Gain:	**5.358 (7.290 dB)**	**5.278 (7.225 dB)**

Total Input Power: 18.663 kW

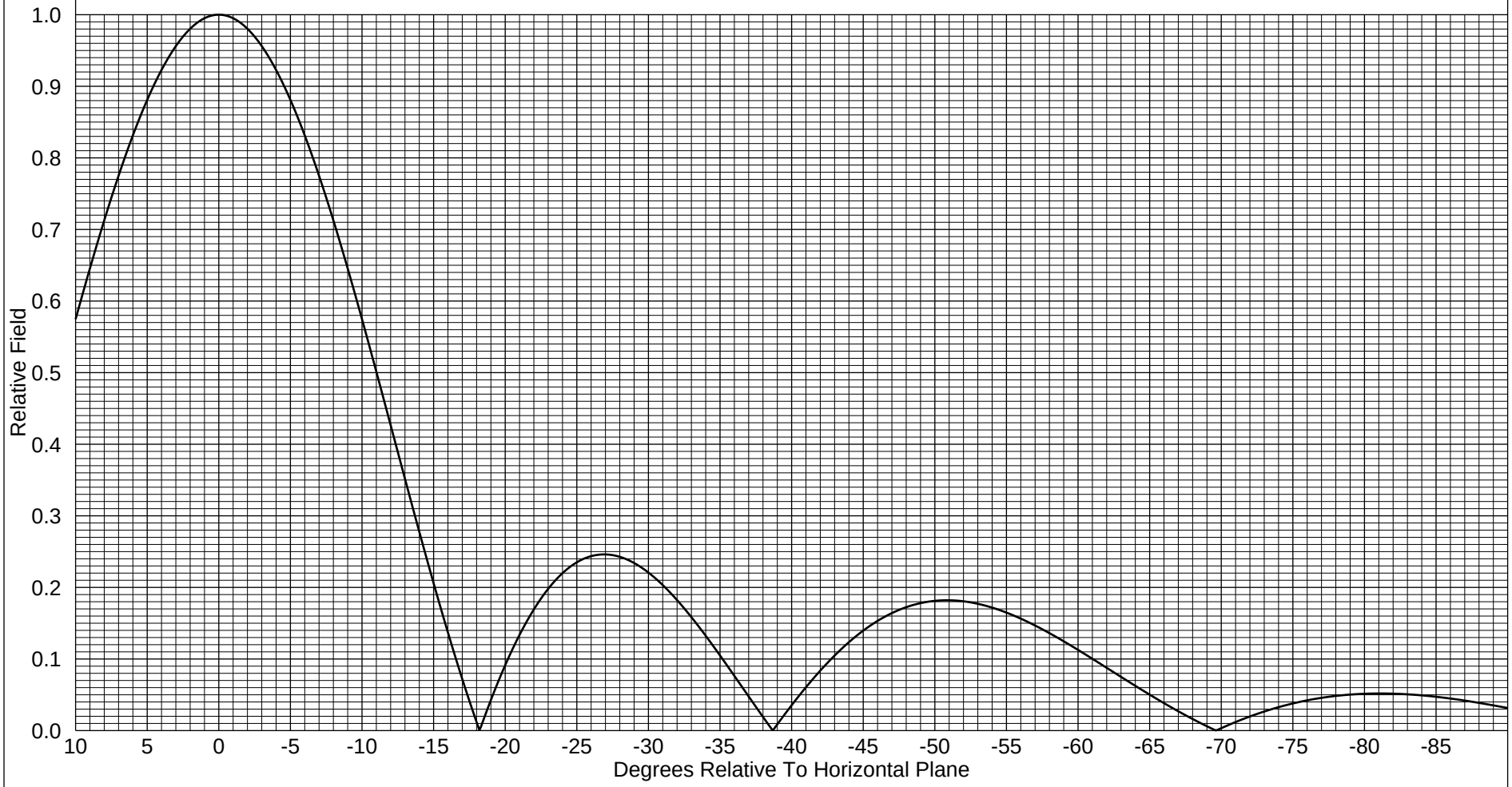
Electronics Research, Inc.
7777 Gardner Road
Chandler, In. 47610

Figure 3

----Theoretical----

Vertical Plane Relative Field
4 ERI ROTOTILLER(TM) ELEMENTS
0.00 Degree(s) Electrical Beam Tilt
0.0 Percent First Null Fill
0.0 Percent Second Null Fill

Element Spacing:
0.8-WAVELENGTH



Directional Antenna System
for
KFLR, Phoenix, Arizona

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	MP-4C-DA-SP
Frequency:	90.3MHz
Number of Bays:	four

MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	28 ft 10 in
Aperture length required:	43 ft 10 in
Orientation:	320° true

Input flange to the antenna 3 1/8“ female.

ELECTRICAL SPECIFICATIONS
(For directional use)
(0.8 wave length spacing)

Maximum horizontal ERP:	100 kW (20.000 dBk)
Horizontal maximum power gain:	5.358 (7.290 dB)
Maximum vertical ERP:	98.5 kW (19.934 dBk)
Vertical maximum power gain:	5.278 (7.225 dB)
Total input power:	18.663 kW (12.710 dBk)