ERI® 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 KCMT, Oro Valley, Arizona

April 11, 2005

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 KCMT.

The antenna is the ERI model MPF-6AC-DA-SP configuration. The circular polarized system consists of 6 half-wavelength spaced bays using one driven circular polarized radiating element per bay, two horizontal parasitic elements per bay and two vertical parasitic elements that extend through the aperture of the antenna. The antenna was tested on a 18" o.d. pole, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 102.1 megahertz, which is the center of the FM broadcast channel assigned to KCMT.

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
KCMT, Oro Valley, Arizona

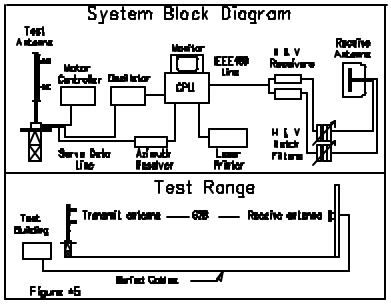
(Continued)

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 18" 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 azimuth indicating mechanism, resolution of this azimuth measuring device is one-tenth of a degree.



The antenna under test was operated in the transmitting mode and fed from a Wavetek Model 3000 signal generator. The frequency of the signal source was set at 102.1 MHz and was constantly monitored by an Anritsu Model ML521B measuring receiver.

A broad-band 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 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.

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 6 half-wavelength spaced bays using one driven circular polarized radiating element per bay, two horizontal parasitic elements per 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 MPF-6AC-DA-SP array is to be mounted on the 18" o.d. pole at a bearing of North 10 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 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.

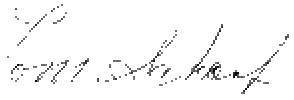
The clear vertical length of the structure required to support the antenna is 39 feet if the antenna is to be top mounted.

Directional Antenna System
For
KCMT, Oro Valley, Arizona

(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® Horizontal Plane Relative Field Pattern

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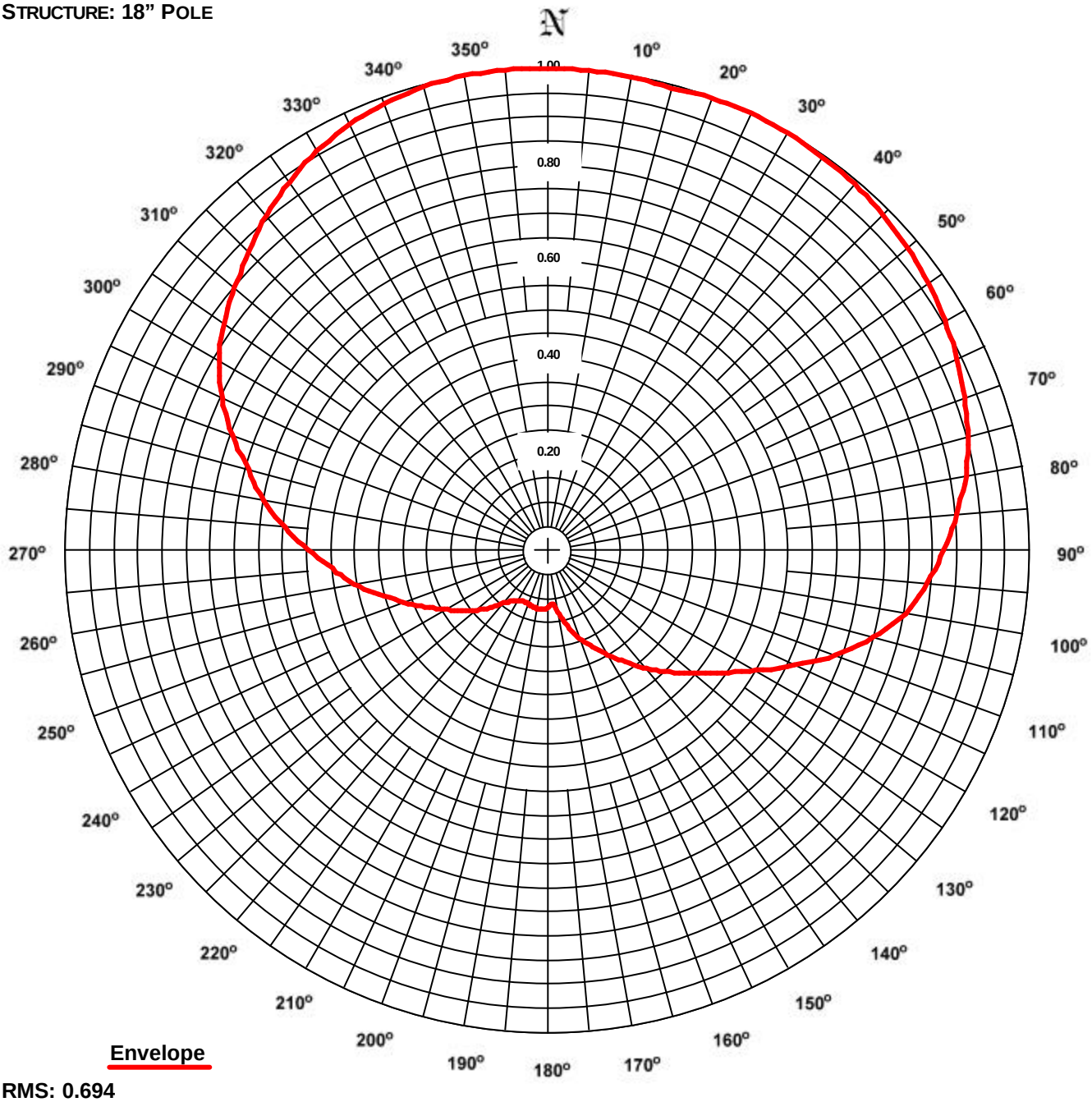
FIGURE: 1
STATION: KCMT
LOCATION: ORO VALLEY, AZ
ANTENNA TYPE: MPF-6AC-HW-SP
STRUCTURE: 18" POLE

DATE: 4/11/05
FREQUENCY: 102.1 MHZ
ORIENTATION: 15° TRUE
MOUNTING: CUSTOM



Envelope

RMS: 0.694
Maximum: 1.000 @ 26° True
Minimum: 0.111 @ 175° 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 BPH-20041203AEY

ERI® Horizontal Plane Relative Field List

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Station: KCMT
Location: Oro Valley, AZ
Frequency: 102.1 MHz

Antenna: MPF-6AC-HW-SP
Orientation: 15° True
Tower: 18" Pole

Figure: 1
Date: 4/11/05
Reference: kcmt1m.fig

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0º	1.000	99.99	20.00	Vertical	180º	0.120	1.44	1.59	Horizontal
5º	0.999	99.78	19.99	Vertical	185º	0.124	1.54	1.87	Horizontal
10º	0.997	99.31	19.97	Vertical	190º	0.124	1.53	1.83	Horizontal
15º	0.993	98.60	19.94	Horizontal	195º	0.121	1.47	1.66	Horizontal
20º	0.998	99.56	19.98	Horizontal	200º	0.119	1.41	1.49	Horizontal
25º	1.000	99.98	20.00	Horizontal	205º	0.118	1.40	1.45	Horizontal
30º	0.999	99.84	19.99	Horizontal	210º	0.122	1.48	1.72	Horizontal
35º	0.996	99.29	19.97	Horizontal	215º	0.130	1.69	2.29	Horizontal
40º	0.992	98.35	19.93	Horizontal	220º	0.144	2.06	3.14	Vertical
45º	0.985	97.03	19.87	Horizontal	225º	0.169	2.87	4.57	Vertical
50º	0.976	95.33	19.79	Horizontal	230º	0.196	3.85	5.86	Vertical
55º	0.966	93.26	19.70	Horizontal	235º	0.221	4.87	6.87	Vertical
60º	0.953	90.84	19.58	Horizontal	240º	0.247	6.10	7.85	Vertical
65º	0.939	88.09	19.45	Horizontal	245º	0.280	7.85	8.95	Vertical
70º	0.922	85.01	19.29	Horizontal	250º	0.318	10.11	10.05	Vertical
75º	0.903	81.63	19.12	Horizontal	255º	0.361	13.05	11.16	Horizontal
80º	0.883	77.97	18.92	Horizontal	260º	0.408	16.62	12.21	Horizontal
85º	0.853	72.76	18.62	Horizontal	265º	0.449	20.12	13.04	Horizontal
90º	0.824	67.90	18.32	Horizontal	270º	0.498	24.80	13.94	Vertical
95º	0.793	62.87	17.98	Horizontal	275º	0.548	30.04	14.78	Vertical
100º	0.756	57.13	17.57	Horizontal	280º	0.599	35.82	15.54	Vertical
105º	0.700	48.98	16.90	Horizontal	285º	0.642	41.19	16.15	Vertical
110º	0.637	40.62	16.09	Horizontal	290º	0.696	48.48	16.86	Horizontal
115º	0.567	32.16	15.07	Horizontal	295º	0.745	55.51	17.44	Horizontal
120º	0.501	25.10	14.00	Horizontal	300º	0.786	61.85	17.91	Horizontal
125º	0.444	19.74	12.95	Horizontal	305º	0.820	67.32	18.28	Horizontal
130º	0.399	15.92	12.02	Vertical	310º	0.847	71.76	18.56	Horizontal
135º	0.358	12.85	11.09	Vertical	315º	0.877	76.95	18.86	Vertical
140º	0.322	10.37	10.16	Vertical	320º	0.908	82.40	19.16	Vertical
145º	0.284	8.08	9.08	Vertical	325º	0.934	87.23	19.41	Vertical
150º	0.251	6.30	7.99	Vertical	330º	0.956	91.36	19.61	Vertical
155º	0.223	4.97	6.96	Vertical	335º	0.973	94.73	19.76	Vertical
160º	0.195	3.82	5.82	Vertical	340º	0.986	97.29	19.88	Vertical
165º	0.164	2.69	4.30	Vertical	345º	0.995	99.02	19.96	Vertical
170º	0.136	1.85	2.67	Vertical	350º	0.999	99.90	20.00	Vertical
175º	0.111	1.24	0.94	Horizontal	355º	1.000	100.00	20.00	Vertical

Polarization: **Envelope**
Maximum Field: **1.000 @ 26° True**
Minimum Field: **0.111 @ 175° True**
RMS: **0.694**
Maximum ERP: **100.000 kW**
Maximum Power Gain: **3.324 (5.217 dB)**

Total Input Power: 30.081 kW

ERI® Horizontal Plane Relative Field Pattern

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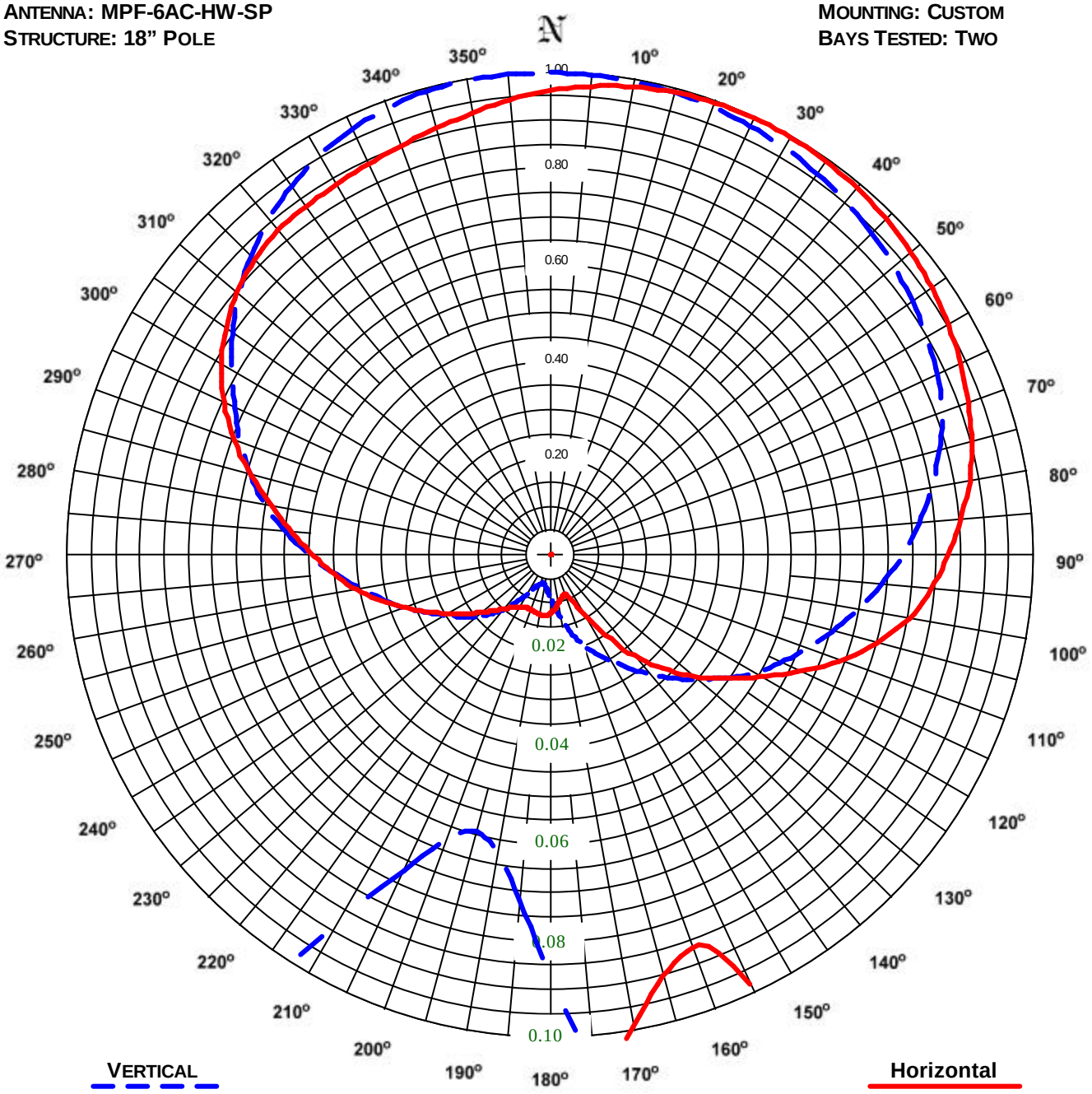
FIGURE NO: 2
STATION: KCMT
LOCATION: ORO VALLEY, AZ
ANTENNA: MPF-6AC-HW-SP
STRUCTURE: 18" POLE

DATE: 4/11/05
FREQUENCY: 102.1 MHZ
ORIENTATION: 15° TRUE
MOUNTING: CUSTOM
BAYS TESTED: TWO



VERTICAL

RMS: 0.672
MAXIMUM: 1.000 @ 352° TRUE
MINIMUM: 0.059 @ 195° TRUE

10X

Horizontal

RMS: 0.679
Maximum: 1.000 @ 26° True
Minimum: 0.086 @ 159° 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: KCMT
Location: Oro Valley, AZ
Frequency: 102.1 MHz

Antenna: MPF-6AC-HW-SP
Orientation: 15° True
Tower: 18" Pole

Figure: 2
Date: 4/11/05
Reference: kcmt1m.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.963	92.69	19.67	1.000	99.99	20.00	180°	0.120	1.44	1.59	0.087	0.75	-1.24
5°	0.976	95.16	19.78	0.999	99.78	19.99	185°	0.124	1.54	1.87	0.072	0.51	-2.88
10°	0.986	97.14	19.87	0.997	99.31	19.97	190°	0.124	1.53	1.83	0.063	0.39	-4.08
15°	0.993	98.60	19.94	0.993	98.58	19.94	195°	0.121	1.47	1.66	0.059	0.35	-4.57
20°	0.998	99.56	19.98	0.988	97.59	19.89	200°	0.119	1.41	1.49	0.063	0.39	-4.07
25°	1.000	99.98	20.00	0.982	96.36	19.84	205°	0.118	1.40	1.45	0.072	0.52	-2.87
30°	0.999	99.84	19.99	0.974	94.87	19.77	210°	0.122	1.48	1.72	0.087	0.76	-1.21
35°	0.996	99.29	19.97	0.965	93.15	19.69	215°	0.130	1.69	2.29	0.116	1.34	1.27
40°	0.992	98.35	19.93	0.955	91.18	19.60	220°	0.143	2.04	3.10	0.144	2.06	3.14
45°	0.985	97.03	19.87	0.943	89.00	19.49	225°	0.160	2.57	4.10	0.169	2.87	4.57
50°	0.976	95.33	19.79	0.931	86.59	19.37	230°	0.182	3.33	5.22	0.196	3.85	5.86
55°	0.966	93.26	19.70	0.916	83.98	19.24	235°	0.209	4.37	6.40	0.221	4.87	6.87
60°	0.953	90.84	19.58	0.901	81.17	19.09	240°	0.240	5.77	7.61	0.247	6.10	7.85
65°	0.939	88.09	19.45	0.884	78.18	18.93	245°	0.276	7.62	8.82	0.280	7.85	8.95
70°	0.922	85.01	19.29	0.863	74.52	18.72	250°	0.316	10.01	10.00	0.318	10.11	10.05
75°	0.903	81.63	19.12	0.834	69.54	18.42	255°	0.361	13.05	11.16	0.355	12.62	11.01
80°	0.883	77.97	18.92	0.803	64.46	18.09	260°	0.408	16.62	12.21	0.397	15.76	11.98
85°	0.853	72.76	18.62	0.766	58.71	17.69	265°	0.449	20.12	13.04	0.445	19.81	12.97
90°	0.824	67.90	18.32	0.730	53.32	17.27	270°	0.490	23.99	13.80	0.498	24.80	13.94
95°	0.793	62.87	17.98	0.688	47.33	16.75	275°	0.535	28.65	14.57	0.548	30.04	14.78
100°	0.756	57.13	17.57	0.647	41.90	16.22	280°	0.585	34.25	15.35	0.599	35.82	15.54
105°	0.700	48.98	16.90	0.605	36.55	15.63	285°	0.640	40.97	16.12	0.642	41.19	16.15
110°	0.637	40.62	16.09	0.565	31.88	15.04	290°	0.696	48.48	16.86	0.684	46.82	16.70
115°	0.567	32.16	15.07	0.525	27.55	14.40	295°	0.745	55.51	17.44	0.721	51.96	17.16
120°	0.501	25.10	14.00	0.485	23.55	13.72	300°	0.786	61.85	17.91	0.759	57.65	17.61
125°	0.444	19.74	12.95	0.441	19.47	12.89	305°	0.820	67.32	18.28	0.803	64.47	18.09
130°	0.390	15.19	11.82	0.399	15.92	12.02	310°	0.847	71.76	18.56	0.842	70.94	18.51
135°	0.330	10.89	10.37	0.358	12.85	11.09	315°	0.866	75.05	18.75	0.877	76.95	18.86
140°	0.271	7.32	8.65	0.322	10.37	10.16	320°	0.878	77.12	18.87	0.908	82.40	19.16
145°	0.199	3.98	6.00	0.284	8.08	9.08	325°	0.883	77.90	18.92	0.934	87.23	19.41
150°	0.141	1.98	2.97	0.251	6.30	7.99	330°	0.887	78.65	18.96	0.956	91.36	19.61
155°	0.098	0.96	-0.18	0.223	4.97	6.96	335°	0.894	79.87	19.02	0.973	94.73	19.76
160°	0.086	0.75	-1.27	0.195	3.82	5.82	340°	0.903	81.59	19.12	0.986	97.29	19.88
165°	0.090	0.82	-0.89	0.164	2.69	4.30	345°	0.915	83.81	19.23	0.995	99.02	19.96
170°	0.099	0.98	-0.09	0.136	1.85	2.67	350°	0.930	86.55	19.37	0.999	99.90	20.00
175°	0.111	1.24	0.94	0.107	1.15	0.62	355°	0.947	89.76	19.53	1.000	100.00	20.00

Polarization:	**Horizontal**	**Vertical**
Maximum Field:	**1.000 @ 26° True**	**1.000 @ 352° True**
Minimum Field:	**0.086 @ 159° True**	**0.059 @ 195° True**
RMS:	**0.679**	**0.672**
Maximum ERP:	**100.000 kW**	**100.000 kW**
Maximum Power Gain:	**3.324 (5.217 dB)**	**3.324 (5.217 dB)**

Total Input Power: 30.081 kW

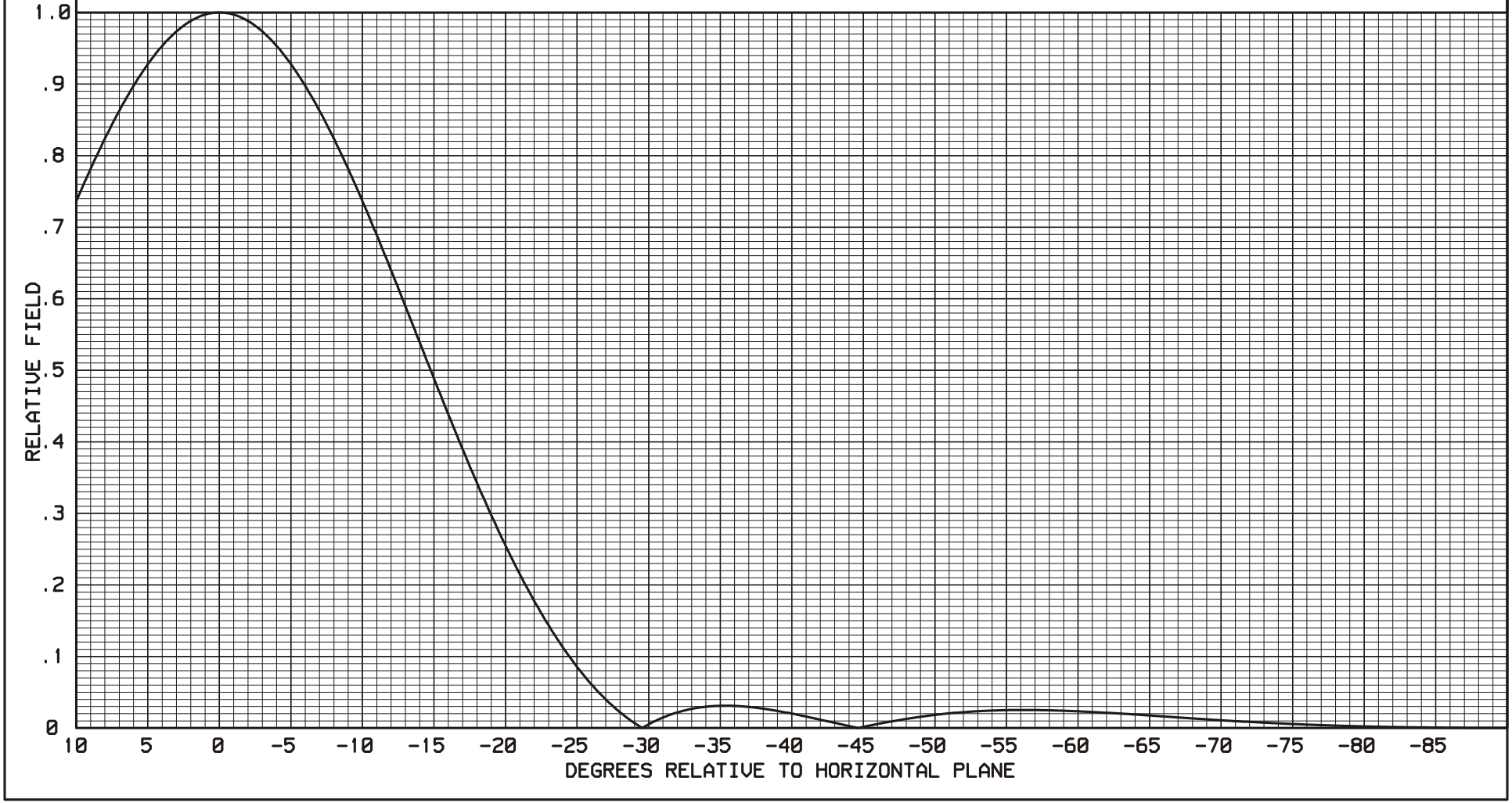
ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610

FIGURE 3

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

ERI TYPE MPF-6AC-DA-SP ANTENNA
0 DEGREE(S) ELECTRICAL BEAM TILT
0 PERCENT FIRST NULL FILL
0 PERCENT SECOND NULL FILL

ELEMENT SPACING:
HALF-WAVE



Directional Antenna System
for
KCMT, Oro Valley, Arizona

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	MPF-6AC-DA-SP
Frequency:	102.1 MHz
Number of Bays:	6

MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	27 ft 7 in
Aperture length required:	39 ft.
Orientation:	15° true

Input flange to the antenna 3 1/8 inch female

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	100 kW (20 dBk)
Horizontal maximum power gain:	3.324 (5.217 dB)
Maximum vertical ERP:	100 kW (20 dBk)
Vertical maximum power gain:	3.324 (5.217 dB)
Total input power:	30.081 kW (14.783 dBk)

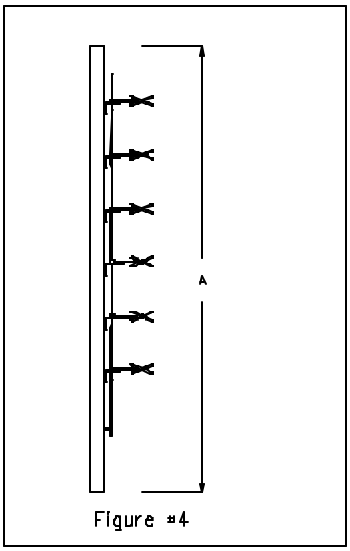


Figure #4