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 WTMQ, Lumpkin, Georgia

February 18, 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 WTMQ.

The antenna is the ERI model 1091-2CP-DA configuration. The circular polarized system consists of 2 full-wavelength spaced bays using one driven circular polarized radiating element. The antenna was mounted on the North 8 degrees East tower leg with bracketry to provide an antenna orientation of North 3 degrees East. The antenna was tested on a 48" Fort Worth tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 88.5 megahertz, which is the center of the FM broadcast channel assigned to WTMQ.

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
WTMQ, Lumpkin, Georgia

(Continued)

DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of one bay level of the 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 48" Fort Worth 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 88.5 MHz and was constantly monitored by a Rohde & Schwarz ESVD measuring receiver.

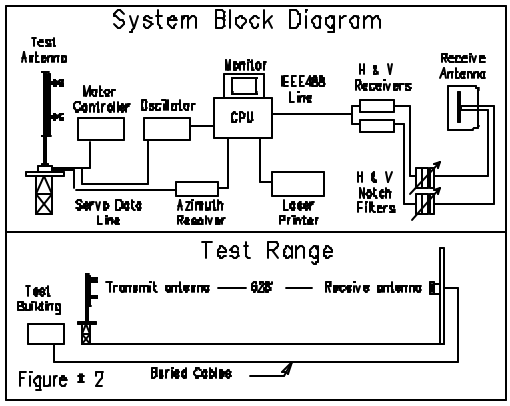


Figure # 2

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 Pentium computer system. Relative field strength was plotted as a function of azimuth.

(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 2 full-wavelength spaced bays 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 1091-2CP-DA array is to be mounted on the North 8 degrees East tower leg of the 48" Fort Worth tower at a bearing of North 3 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 23 kilowatts (13.617 dBk).

The power at North 80 degrees East does not exceed 2.3 kilowatts (3.617 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 31 feet.

(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.

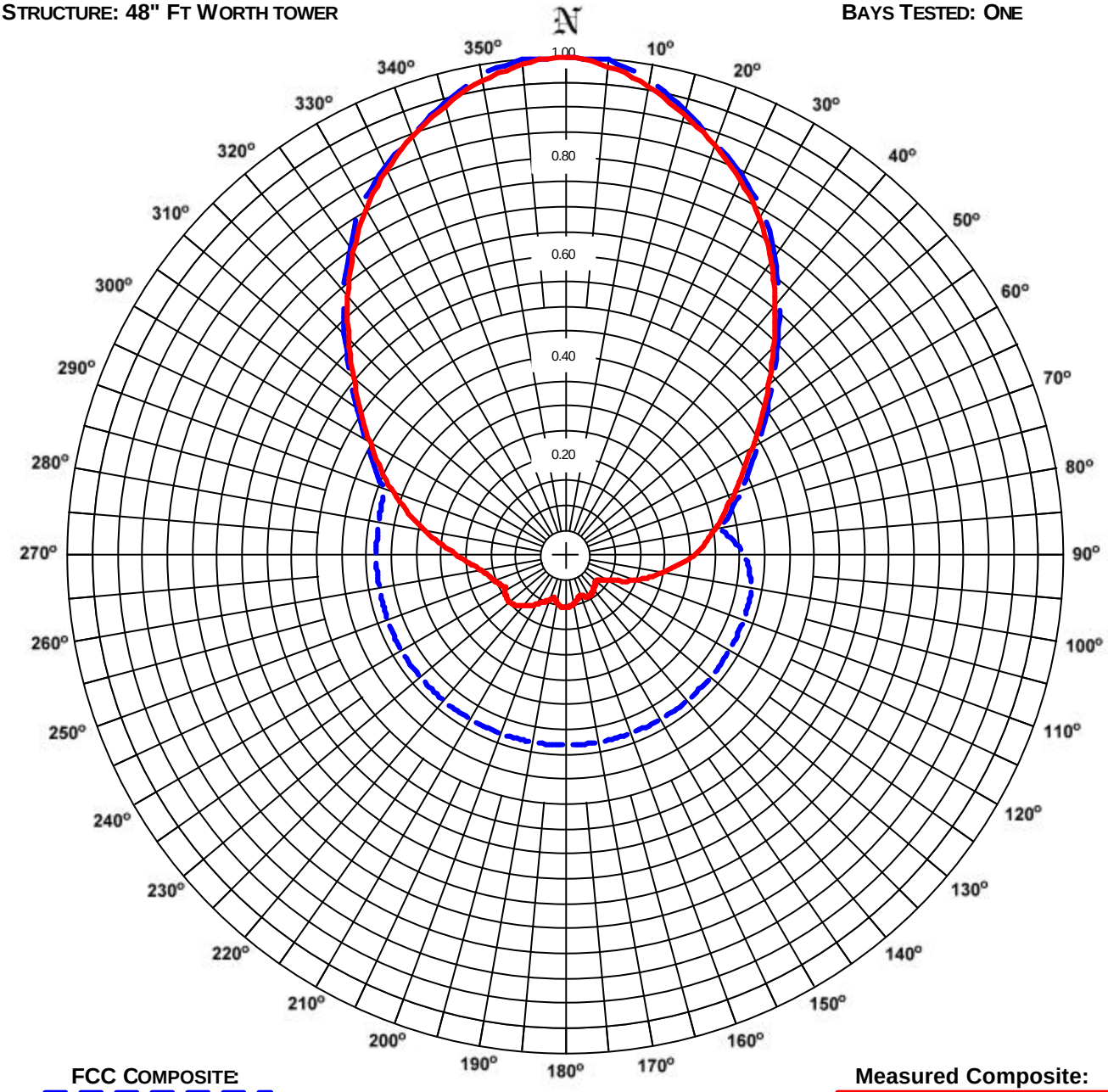
ELECTRONICS RESEARCH, INC.

ERI® Horizontal Plane Relative Field Pattern

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: WTMQ
LOCATION: LUMPKIN, GA
ANTENNA: 1091-2CP-DA
STRUCTURE: 48" FT WORTH TOWER

DATE: 2/13/2008
FREQUENCY: 88.5 MHZ
ORIENTATION: 3° TRUE
MOUNTING: CUSTOM
BAYS TESTED: ONE



FCC COMPOSITE:

RMS: 0.553
MAXIMUM: 1.000 @ 0° TRUE
MINIMUM: 0.315 @ 80° TRUE

Measured Composite:

RMS: 0.482
Maximum: 1.000 @ 0° True
Minimum: 0.080 @ 130° True

COMMENTS: 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-20070718AEP.

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: WTMQ
Location: Lumpkin, GA
Frequency: 88.5 MHz

Antenna: 1091-2CP-DA
Orientation: 3° True
Tower: 48" Ft Worth tower

Figure: 1
Date: 2/13/2008
Reference: wtmq1m.fig

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0º	1.000	23.00	13.62	H (and/or) V	180º	0.105	0.25	-6.00	H (and/or) V
5º	0.986	22.34	13.49	H (and/or) V	185º	0.103	0.25	-6.11	H (and/or) V
10º	0.958	21.09	13.24	H (and/or) V	190º	0.097	0.22	-6.64	H (and/or) V
15º	0.918	19.40	12.88	H (and/or) V	195º	0.087	0.17	-7.62	H (and/or) V
20º	0.876	17.67	12.47	H (and/or) V	200º	0.095	0.21	-6.86	H (and/or) V
25º	0.832	15.91	12.02	H (and/or) V	205º	0.102	0.24	-6.22	H (and/or) V
30º	0.782	14.06	11.48	H (and/or) V	210º	0.111	0.28	-5.48	H (and/or) V
35º	0.720	11.92	10.76	H (and/or) V	215º	0.122	0.34	-4.68	H (and/or) V
40º	0.656	9.90	9.96	H (and/or) V	220º	0.131	0.40	-4.02	H (and/or) V
45º	0.591	8.03	9.05	H (and/or) V	225º	0.141	0.46	-3.42	H (and/or) V
50º	0.533	6.53	8.15	H (and/or) V	230º	0.146	0.49	-3.11	H (and/or) V
55º	0.480	5.29	7.23	H (and/or) V	235º	0.145	0.48	-3.16	H (and/or) V
60º	0.433	4.31	6.34	H (and/or) V	240º	0.139	0.44	-3.52	H (and/or) V
65º	0.392	3.53	5.48	H (and/or) V	245º	0.142	0.46	-3.36	H (and/or) V
70º	0.359	2.96	4.71	H (and/or) V	250º	0.150	0.52	-2.87	H (and/or) V
75º	0.330	2.51	3.99	H (and/or) V	255º	0.159	0.58	-2.35	H (and/or) V
80º	0.304	2.13	3.28	H (and/or) V	260º	0.172	0.68	-1.67	H (and/or) V
85º	0.282	1.82	2.61	H (and/or) V	265º	0.191	0.84	-0.77	H (and/or) V
90º	0.257	1.52	1.83	H (and/or) V	270º	0.216	1.08	0.31	H (and/or) V
95º	0.226	1.18	0.70	H (and/or) V	275º	0.248	1.42	1.52	H (and/or) V
100º	0.196	0.89	-0.53	H (and/or) V	280º	0.285	1.87	2.73	H (and/or) V
105º	0.170	0.66	-1.78	H (and/or) V	285º	0.326	2.44	3.87	H (and/or) V
110º	0.146	0.49	-3.12	H (and/or) V	290º	0.367	3.10	4.91	H (and/or) V
115º	0.120	0.33	-4.83	H (and/or) V	295º	0.409	3.84	5.85	H (and/or) V
120º	0.098	0.22	-6.55	H (and/or) V	300º	0.453	4.72	6.74	H (and/or) V
125º	0.084	0.16	-7.86	H (and/or) V	305º	0.502	5.79	7.62	H (and/or) V
130º	0.080	0.15	-8.35	H (and/or) V	310º	0.556	7.11	8.52	H (and/or) V
135º	0.083	0.16	-8.04	H (and/or) V	315º	0.616	8.74	9.41	H (and/or) V
140º	0.087	0.18	-7.56	H (and/or) V	320º	0.680	10.64	10.27	H (and/or) V
145º	0.092	0.19	-7.14	H (and/or) V	325º	0.744	12.73	11.05	H (and/or) V
150º	0.094	0.20	-6.94	H (and/or) V	330º	0.803	14.82	11.71	H (and/or) V
155º	0.090	0.19	-7.31	H (and/or) V	335º	0.853	16.74	12.24	H (and/or) V
160º	0.083	0.16	-7.99	H (and/or) V	340º	0.897	18.50	12.67	H (and/or) V
165º	0.091	0.19	-7.25	H (and/or) V	345º	0.936	20.13	13.04	H (and/or) V
170º	0.097	0.22	-6.64	H (and/or) V	350º	0.969	21.59	13.34	H (and/or) V
175º	0.102	0.24	-6.21	H (and/or) V	355º	0.991	22.59	13.54	H (and/or) V

Polarization: **Envelope**
Maximum Field: **1.000 @ 0° True**
Minimum Field: **0.080 @ 130° True**
RMS: **0.482**
Maximum ERP: **23.000 kW**
Maximum Power Gain: **4.144 (6.174 dB)**

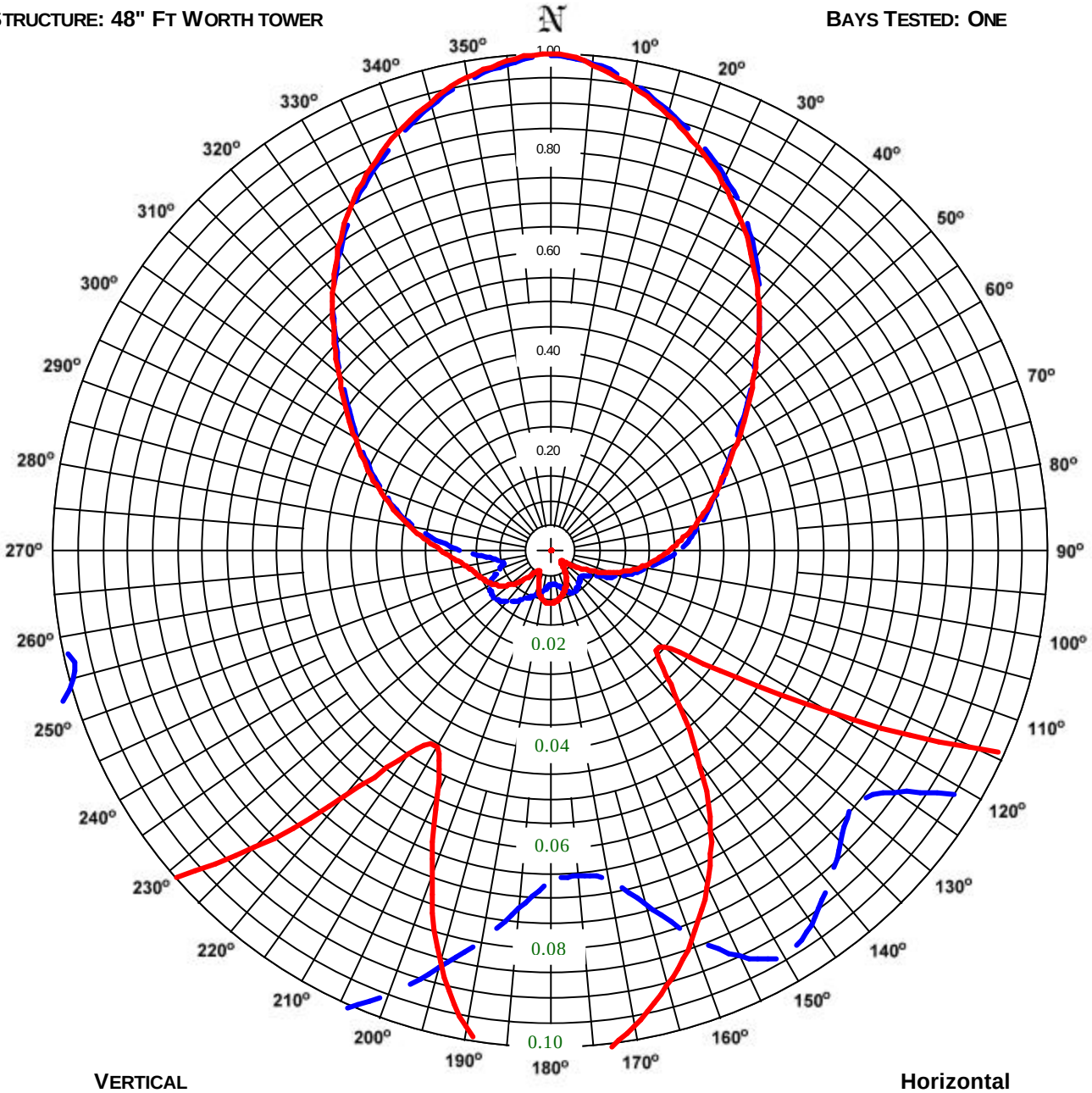
Total Input Power: 5.551 kW

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: 2
STATION: WTMQ
LOCATION: LUMPKIN, GA
ANTENNA: 1091-2CP-DA
STRUCTURE: 48" FT WORTH TOWER

DATE: 2/13/2008
FREQUENCY: 88.5 MHZ
ORIENTATION: 3° TRUE
MOUNTING: CUSTOM
BAYS TESTED: ONE



VERTICAL

RMS: 0.478
MAXIMUM: 0.998 @ 0° TRUE
MINIMUM: 0.065 @ 176° TRUE

10X Scale

Horizontal

RMS: 0.478
Maximum: 1.000 @ 0° True
Minimum: 0.029 @ 132° 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: WTMQ
Location: Lumpkin, GA
Frequency: 88.5 MHz

Antenna: 1091-2CP-DA
Orientation: 3° True
Tower: 48" Ft Worth tower

Figure: 2
Date: 2/13/2008
Reference: wtmq1m.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	1.000	23.00	13.62	0.998	22.91	13.60	180°	0.105	0.25	-6.00	0.067	0.10	-9.92
5°	0.982	22.19	13.46	0.986	22.34	13.49	185°	0.103	0.25	-6.11	0.072	0.12	-9.22
10°	0.950	20.77	13.17	0.958	21.09	13.24	190°	0.097	0.22	-6.64	0.080	0.15	-8.36
15°	0.910	19.06	12.80	0.918	19.40	12.88	195°	0.086	0.17	-7.74	0.087	0.17	-7.62
20°	0.866	17.27	12.37	0.876	17.67	12.47	200°	0.070	0.11	-9.52	0.095	0.21	-6.86
25°	0.820	15.46	11.89	0.832	15.91	12.02	205°	0.054	0.07	-11.75	0.102	0.24	-6.22
30°	0.769	13.59	11.33	0.782	14.06	11.48	210°	0.046	0.05	-13.21	0.111	0.28	-5.48
35°	0.712	11.66	10.67	0.720	11.92	10.76	215°	0.050	0.06	-12.47	0.122	0.34	-4.68
40°	0.652	9.77	9.90	0.656	9.90	9.96	220°	0.064	0.10	-10.21	0.131	0.40	-4.02
45°	0.591	8.03	9.05	0.591	8.03	9.05	225°	0.084	0.16	-7.89	0.141	0.46	-3.42
50°	0.533	6.53	8.15	0.530	6.47	8.11	230°	0.103	0.25	-6.08	0.146	0.49	-3.11
55°	0.480	5.29	7.23	0.474	5.18	7.14	235°	0.120	0.33	-4.82	0.145	0.48	-3.16
60°	0.433	4.31	6.34	0.427	4.19	6.22	240°	0.132	0.40	-3.96	0.139	0.44	-3.52
65°	0.392	3.53	5.48	0.390	3.50	5.44	245°	0.142	0.46	-3.36	0.127	0.37	-4.31
70°	0.356	2.92	4.65	0.359	2.96	4.71	250°	0.150	0.52	-2.87	0.111	0.28	-5.50
75°	0.324	2.42	3.83	0.330	2.51	3.99	255°	0.159	0.58	-2.35	0.099	0.23	-6.45
80°	0.294	1.98	2.98	0.304	2.13	3.28	260°	0.172	0.68	-1.67	0.104	0.25	-6.07
85°	0.264	1.61	2.06	0.282	1.82	2.61	265°	0.191	0.84	-0.77	0.130	0.39	-4.08
90°	0.237	1.29	1.10	0.257	1.52	1.83	270°	0.216	1.08	0.31	0.173	0.68	-1.65
95°	0.210	1.02	0.07	0.226	1.18	0.70	275°	0.248	1.42	1.52	0.222	1.13	0.54
100°	0.183	0.77	-1.14	0.196	0.89	-0.53	280°	0.285	1.87	2.73	0.275	1.74	2.40
105°	0.153	0.54	-2.66	0.170	0.66	-1.78	285°	0.326	2.44	3.87	0.319	2.34	3.69
110°	0.123	0.35	-4.59	0.146	0.49	-3.12	290°	0.367	3.10	4.91	0.361	3.00	4.77
115°	0.093	0.20	-7.02	0.120	0.33	-4.83	295°	0.409	3.84	5.85	0.402	3.71	5.70
120°	0.065	0.10	-10.19	0.098	0.22	-6.55	300°	0.453	4.72	6.74	0.446	4.57	6.60
125°	0.042	0.04	-14.00	0.084	0.16	-7.86	305°	0.502	5.79	7.62	0.495	5.63	7.51
130°	0.030	0.02	-16.87	0.080	0.15	-8.35	310°	0.556	7.11	8.52	0.550	6.97	8.43
135°	0.031	0.02	-16.55	0.083	0.16	-8.04	315°	0.616	8.74	9.41	0.613	8.64	9.37
140°	0.041	0.04	-14.22	0.087	0.18	-7.56	320°	0.680	10.64	10.27	0.678	10.59	10.25
145°	0.053	0.06	-11.93	0.092	0.19	-7.14	325°	0.744	12.73	11.05	0.738	12.52	10.97
150°	0.065	0.10	-10.18	0.094	0.20	-6.94	330°	0.803	14.82	11.71	0.795	14.53	11.62
155°	0.075	0.13	-8.92	0.090	0.19	-7.31	335°	0.853	16.74	12.24	0.844	16.39	12.15
160°	0.083	0.16	-7.99	0.082	0.15	-8.12	340°	0.897	18.50	12.67	0.888	18.12	12.58
165°	0.091	0.19	-7.25	0.073	0.12	-9.09	345°	0.936	20.13	13.04	0.928	19.79	12.97
170°	0.097	0.22	-6.64	0.067	0.10	-9.83	350°	0.969	21.59	13.34	0.961	21.25	13.27
175°	0.102	0.24	-6.21	0.065	0.10	-10.06	355°	0.991	22.59	13.54	0.984	22.27	13.48

Polarization:	**Horizontal**	**Vertical**
Maximum Field:	**1.000 @ 0° True**	**0.998 @ 0° True**
Minimum Field:	**0.029 @ 132° True**	**0.065 @ 176° True**
RMS:	**0.478**	**0.478**
Maximum ERP:	**23.000 kW**	**22.911 kW**
Maximum Power Gain:	**4.144 (6.174 dB)**	**4.128 (6.157 dB)**

Total Input Power: 5.551 kW

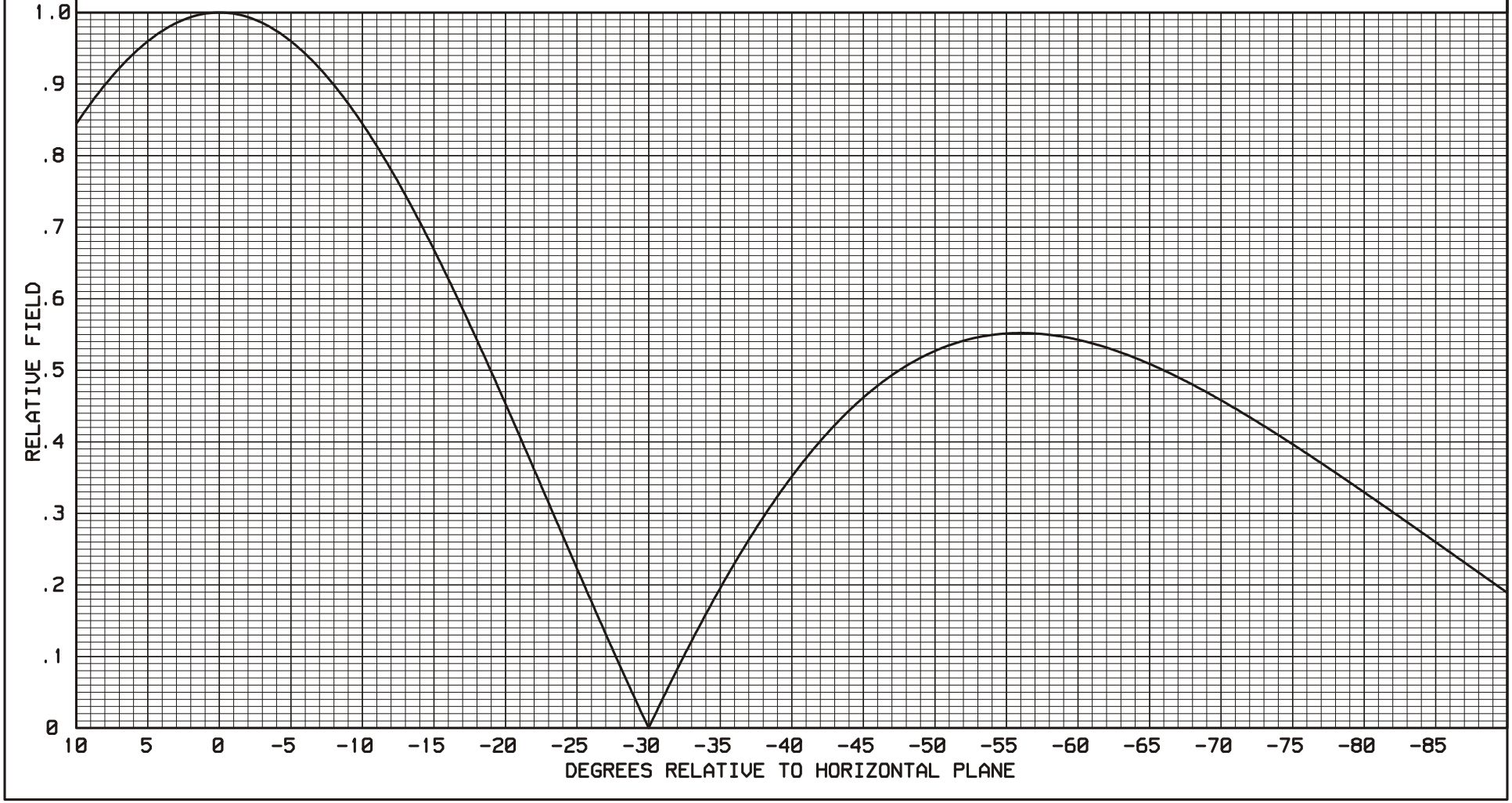
ELECTRONICS RESEARCH,INC.
7777 GARDNER ROAD
CHANDLER, IN. 47610

FIGURE 3

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

ERI TYPE 1091-2CP-DA ANTENNA
0 DEGREE BEAM TILT
0 PERCENT NULL FILL

BAY SPACING:
ONE-WAVELENGTH



Directional Antenna System
for
WTMQ, Lumpkin, Georgia

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	1091-2CP-DA
Frequency:	88.5 MHZ
Number of Bays:	Two

MECHANICAL SPECIFICATIONS

Mounting:	Custom
System length:	22 ft 1 in
Aperture length required:	31 ft
Orientation:	3° true

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

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	23 kW (13.617 dBk)
Horizontal maximum power gain:	4.144 (6.174 dB)
Maximum vertical ERP:	22.911 kW (13.6 dBk)
Vertical maximum power gain:	4.128 (6.157 dB)
Total input power:	5.551 kW (7.443 dBk)