

***Directional Antenna System  
for  
WOTB, Pearl River, Louisiana***

May 8, 2013

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 WOTB.

The antenna is the ERI model MP-8C-DA configuration. The circular polarized system consists of 8 full-wavelength spaced bays using one driven circular polarized radiating element, three horizontal parasitic elements placed one quarter wave above and below each bay and two vertical parasitic elements per bay. The antenna was mounted on the North 150 degrees East tower face with bracketry to provide an antenna orientation of North 140 degrees East. The antenna was tested on a Rohn 90 tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 88.7 megahertz, which is the center of the FM broadcast channel assigned to WOTB.

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 WOTB, Pearl River, Louisiana

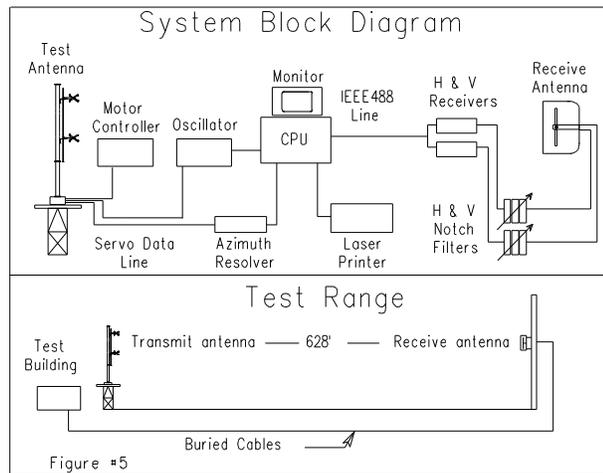
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## DESCRIPTION OF THE TEST PROCEDURE

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 Rohn 90 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 88.7 MHz and was constantly monitored by a Rohde & Schwarz ESVD measuring receiver.

# Directional Antenna System For WOTB, Pearl River, Louisiana

(Continued)

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 Heliac 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 coordinated graph paper in a clockwise direction. Both horizontal and vertical components were recorded separately.

## CONCLUSIONS

The circular polarized system consists of 8 full-wavelength spaced bays using one driven circular polarized radiating element, three 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-8C-DA array is to be mounted on the North 150 degrees East tower face of the Rohn 90 tower at a bearing of North 140 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 measured individual horizontal and vertical components, the composite maximum of either the horizontal or vertical component at any azimuth and the FCC filed envelope pattern. The horizontal plane relative field list for the composite pattern and the individual H & V components are shown as Figure #1 & 1A respectively. The actual measured pattern does not exceed the authorized FCC composite pattern at any azimuth.

Directional Antenna System  
For  
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(Continued)

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 0 degrees East does not exceed 11.09 kilowatts (10.449 dBk).

The power at North 270 degrees East does not exceed 15.29 kilowatts (11.844 dBk).

The power at North 330 degrees East does not exceed 3.24 kilowatts (5.105 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 97 feet 4 inches.

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.



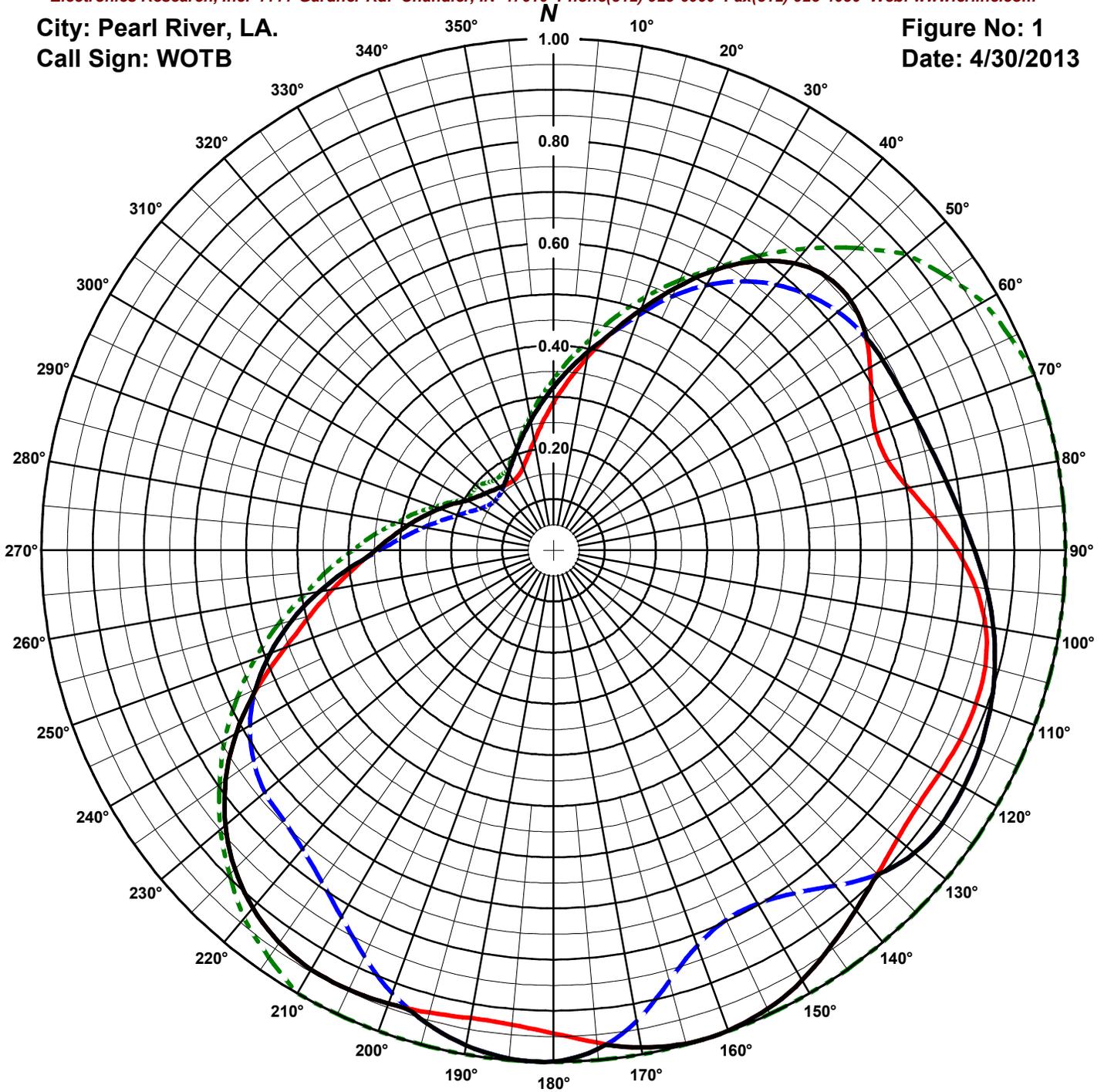
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# ERI<sup>®</sup> Horizontal Plane Relative Field Pattern

Electronics Research, Inc. 7777 Gardner Rd. Chandler, IN 47610 Phone(812) 925-6000 Fax(812) 925-4030 Web: www.eriinc.com

City: Pearl River, LA.  
Call Sign: WOTB

Figure No: 1  
Date: 4/30/2013



Antenna Orientation: 140° True

Frequency: 88.7 MHz  
Antenna Type: MP-8C-DA

Antenna Mounting: Custom  
Tower Type: Rohn 90 tower

**HORIZONTAL**

RMS: .695  
Maximum: 1 @ 162°  
Minimum: .157 @ 329°

**VERTICAL**

RMS: .678  
Maximum: 1 @ 182°  
Minimum: .149 @ 311°

**COMPOSITE**

RMS: .713  
Maximum: 1 @ 162°  
Minimum: .159 @ 322°

**FCC ENVELOPE**

RMS: .775  
Maximum: 1 @ 70°  
Minimum: .178 @ 320°

Measured patterns of the horizontal and vertical components, with the composite maximum of either the the H or V components and the filed FCC envelope pattern BNPED-20071022BAN.

# 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 Web: www.eriinc.com

Figure# 1

Station: WOTB

Location: Pearl River, LA.

Frequency: 88.7 MHz

Date: 4/30/2013

Antenna: MP-8C-DA

Antenna Orientation: 140° True

Number of Bays: 8

Azimuth	Envelope			Polarization	Azimuth	Envelope			Polarization
	Field	kW	dBk	Maximum		Field	kW	dBk	Maximum
0°	0.319	10.171	10.074	Max H (and or ) V	180°	0.999	99.785	19.991	Max H (and or ) V
5°	0.355	12.609	11.007	Max H (and or ) V	185°	0.997	99.367	19.972	Max H (and or ) V
10°	0.395	15.577	11.925	Max H (and or ) V	190°	0.982	96.468	19.844	Max H (and or ) V
15°	0.440	19.359	12.869	Max H (and or ) V	195°	0.957	91.559	19.617	Max H (and or ) V
20°	0.501	25.104	13.997	Max H (and or ) V	200°	0.943	88.886	19.488	Max H (and or ) V
25°	0.566	32.014	15.053	Max H (and or ) V	205°	0.947	89.716	19.529	Max H (and or ) V
30°	0.632	39.995	16.020	Max H (and or ) V	210°	0.946	89.464	19.516	Max H (and or ) V
35°	0.689	47.496	16.767	Max H (and or ) V	215°	0.935	87.384	19.414	Max H (and or ) V
40°	0.732	53.591	17.291	Max H (and or ) V	220°	0.913	83.331	19.208	Max H (and or ) V
45°	0.755	57.047	17.562	Max H (and or ) V	225°	0.880	77.435	18.889	Max H (and or ) V
50°	0.758	57.466	17.594	Max H (and or ) V	230°	0.836	69.909	18.445	Max H (and or ) V
55°	0.743	55.149	17.415	Max H (and or ) V	235°	0.781	61.043	17.856	Max H (and or ) V
60°	0.743	55.135	17.414	Max H (and or ) V	240°	0.716	51.197	17.092	Max H (and or ) V
65°	0.746	55.616	17.452	Max H (and or ) V	245°	0.642	41.167	16.145	Max H (and or ) V
70°	0.753	56.643	17.531	Max H (and or ) V	250°	0.589	34.657	15.398	Max H (and or ) V
75°	0.764	58.324	17.658	Max H (and or ) V	255°	0.529	27.988	14.470	Max H (and or ) V
80°	0.779	60.691	17.831	Max H (and or ) V	260°	0.464	21.576	13.340	Max H (and or ) V
85°	0.799	63.783	18.047	Max H (and or ) V	265°	0.399	15.956	12.029	Max H (and or ) V
90°	0.823	67.652	18.303	Max H (and or ) V	270°	0.348	12.104	10.829	Max H (and or ) V
95°	0.849	72.080	18.578	Max H (and or ) V	275°	0.315	9.941	9.974	Max H (and or ) V
100°	0.873	76.171	18.818	Max H (and or ) V	280°	0.287	8.214	9.145	Max H (and or ) V
105°	0.892	79.630	19.011	Max H (and or ) V	285°	0.261	6.789	8.318	Max H (and or ) V
110°	0.908	82.391	19.159	Max H (and or ) V	290°	0.237	5.612	7.491	Max H (and or ) V
115°	0.919	84.415	19.264	Max H (and or ) V	295°	0.215	4.630	6.656	Max H (and or ) V
120°	0.926	85.673	19.328	Max H (and or ) V	300°	0.194	3.779	5.774	Max H (and or ) V
125°	0.928	86.122	19.351	Max H (and or ) V	305°	0.182	3.316	5.206	Max H (and or ) V
130°	0.920	84.674	19.277	Max H (and or ) V	310°	0.173	2.994	4.763	Max H (and or ) V
135°	0.896	80.237	19.044	Max H (and or ) V	315°	0.166	2.756	4.403	Max H (and or ) V
140°	0.918	84.310	19.259	Max H (and or ) V	320°	0.161	2.591	4.134	Max H (and or ) V
145°	0.945	89.248	19.506	Max H (and or ) V	325°	0.163	2.672	4.269	Max H (and or ) V
150°	0.970	94.176	19.739	Max H (and or ) V	330°	0.175	3.072	4.874	Max H (and or ) V
155°	0.989	97.850	19.906	Max H (and or ) V	335°	0.191	3.631	5.600	Max H (and or ) V
160°	0.999	99.734	19.988	Max H (and or ) V	340°	0.209	4.381	6.415	Max H (and or ) V
165°	0.998	99.635	19.984	Max H (and or ) V	345°	0.232	5.360	7.292	Max H (and or ) V
170°	0.987	97.366	19.884	Max H (and or ) V	350°	0.257	6.615	8.206	Max H (and or ) V
175°	0.979	95.856	19.816	Max H (and or ) V	355°	0.286	8.200	9.138	Max H (and or ) V

**Horizontal Polarization:**

**Maximum: 9.045 (9.564 dB)**

**Horizontal Plane: 9.045 (9.564 dB)**

**Maximum ERP: 100.000 kW**

**Vertical Polarization:**

**Maximum: 9.045 (9.564 dB)**

**Horizontal Plane: 9.045 (9.564 dB)**

**Maximum ERP: 100.000 kW**

**Total Input Power: 11.055 kW**

**Reference: WOTB1M.FIG**

This list shows the the maximum azimuth values of either the horizontal or vertical components.

# 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 Web: www.eriinc.com

Figure# 1A

Date: 4/30/2013

Station: WOTB

Antenna: MP-8C-DA

Location: Pearl River, LA.

Antenna Orientation: 140° True

Frequency: 88.7 MHz

Number of Bays: 8

Azimuth	Horizontal			Vertical			Azimuth	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.288	8.311	9.197	0.319	10.171	10.074	180°	0.944	89.127	19.500	0.999	99.785	19.991
5°	0.333	11.058	10.437	0.355	12.609	11.007	185°	0.931	86.617	19.376	0.997	99.367	19.972
10°	0.383	14.690	11.670	0.395	15.577	11.925	190°	0.928	86.190	19.355	0.982	96.468	19.844
15°	0.440	19.359	12.869	0.439	19.232	12.840	195°	0.936	87.522	19.421	0.957	91.559	19.617
20°	0.501	25.104	13.997	0.490	23.996	13.801	200°	0.943	88.886	19.488	0.921	84.821	19.285
25°	0.566	32.014	15.053	0.547	29.890	14.755	205°	0.947	89.716	19.529	0.875	76.530	18.838
30°	0.632	39.995	16.020	0.598	35.742	15.532	210°	0.946	89.464	19.516	0.828	68.512	18.358
35°	0.689	47.496	16.767	0.641	41.130	16.142	215°	0.935	87.384	19.414	0.790	62.380	17.950
40°	0.732	53.591	17.291	0.677	45.840	16.612	220°	0.913	83.331	19.208	0.762	58.122	17.643
45°	0.755	57.047	17.562	0.705	49.703	16.964	225°	0.880	77.435	18.889	0.745	55.576	17.449
50°	0.758	57.466	17.594	0.725	52.591	17.209	230°	0.836	69.909	18.445	0.736	54.168	17.337
55°	0.743	55.149	17.415	0.738	54.409	17.357	235°	0.781	61.043	17.856	0.715	51.139	17.088
60°	0.714	51.009	17.076	0.743	55.135	17.414	240°	0.716	51.197	17.092	0.684	46.843	16.706
65°	0.686	47.018	16.723	0.746	55.616	17.452	245°	0.639	40.804	16.107	0.642	41.167	16.145
70°	0.670	44.914	16.524	0.753	56.643	17.531	250°	0.558	31.092	14.926	0.589	34.657	15.398
75°	0.676	45.728	16.602	0.764	58.324	17.658	255°	0.492	24.225	13.843	0.529	27.988	14.470
80°	0.703	49.485	16.945	0.779	60.691	17.831	260°	0.438	19.167	12.826	0.464	21.576	13.340
85°	0.745	55.528	17.445	0.799	63.783	18.047	265°	0.390	15.184	11.814	0.399	15.956	12.029
90°	0.789	62.236	17.940	0.823	67.652	18.303	270°	0.348	12.104	10.829	0.340	11.563	10.631
95°	0.828	68.529	18.359	0.849	72.080	18.578	275°	0.315	9.941	9.974	0.294	8.651	9.371
100°	0.857	73.463	18.661	0.873	76.171	18.818	280°	0.287	8.214	9.145	0.257	6.595	8.192
105°	0.873	76.233	18.821	0.892	79.630	19.011	285°	0.261	6.789	8.318	0.225	5.077	7.056
110°	0.878	77.069	18.869	0.908	82.391	19.159	290°	0.237	5.612	7.491	0.199	3.972	5.990
115°	0.877	76.856	18.857	0.919	84.415	19.264	295°	0.215	4.630	6.656	0.179	3.193	5.043
120°	0.871	75.845	18.799	0.926	85.673	19.328	300°	0.194	3.779	5.774	0.164	2.674	4.271
125°	0.869	75.594	18.785	0.928	86.122	19.351	305°	0.182	3.316	5.206	0.154	2.364	3.737
130°	0.877	76.979	18.864	0.920	84.674	19.277	310°	0.173	2.994	4.763	0.149	2.234	3.492
135°	0.895	80.050	19.034	0.896	80.237	19.044	315°	0.166	2.756	4.403	0.150	2.260	3.542
140°	0.918	84.310	19.259	0.855	73.180	18.644	320°	0.161	2.591	4.134	0.155	2.407	3.815
145°	0.945	89.248	19.506	0.819	66.996	18.260	325°	0.158	2.491	3.964	0.163	2.672	4.269
150°	0.970	94.176	19.739	0.798	63.629	18.037	330°	0.157	2.463	3.914	0.175	3.072	4.874
155°	0.989	97.850	19.906	0.797	63.550	18.031	335°	0.161	2.603	4.155	0.191	3.631	5.600
160°	0.999	99.734	19.988	0.822	67.585	18.298	340°	0.173	2.984	4.749	0.209	4.381	6.415
165°	0.998	99.635	19.984	0.872	76.052	18.811	345°	0.191	3.659	5.633	0.232	5.360	7.292
170°	0.987	97.366	19.884	0.935	87.336	19.412	350°	0.217	4.706	6.726	0.257	6.615	8.206
175°	0.966	93.283	19.698	0.979	95.856	19.816	355°	0.250	6.235	7.948	0.286	8.200	9.138

**Horizontal Polarization:**

**Maximum: 9.045 (9.564 dB)**

**Horizontal Plane: 9.045 (9.564 dB)**

**Maximum ERP: 100.000 kW**

**Vertical Polarization:**

**Maximum: 9.045 (9.564 dB)**

**Horizontal Plane: 9.045 (9.564 dB)**

**Maximum ERP: 100.000 kW**

**Total Input Power: 11.055 kW**

**Reference: WOTB1M.FIG**

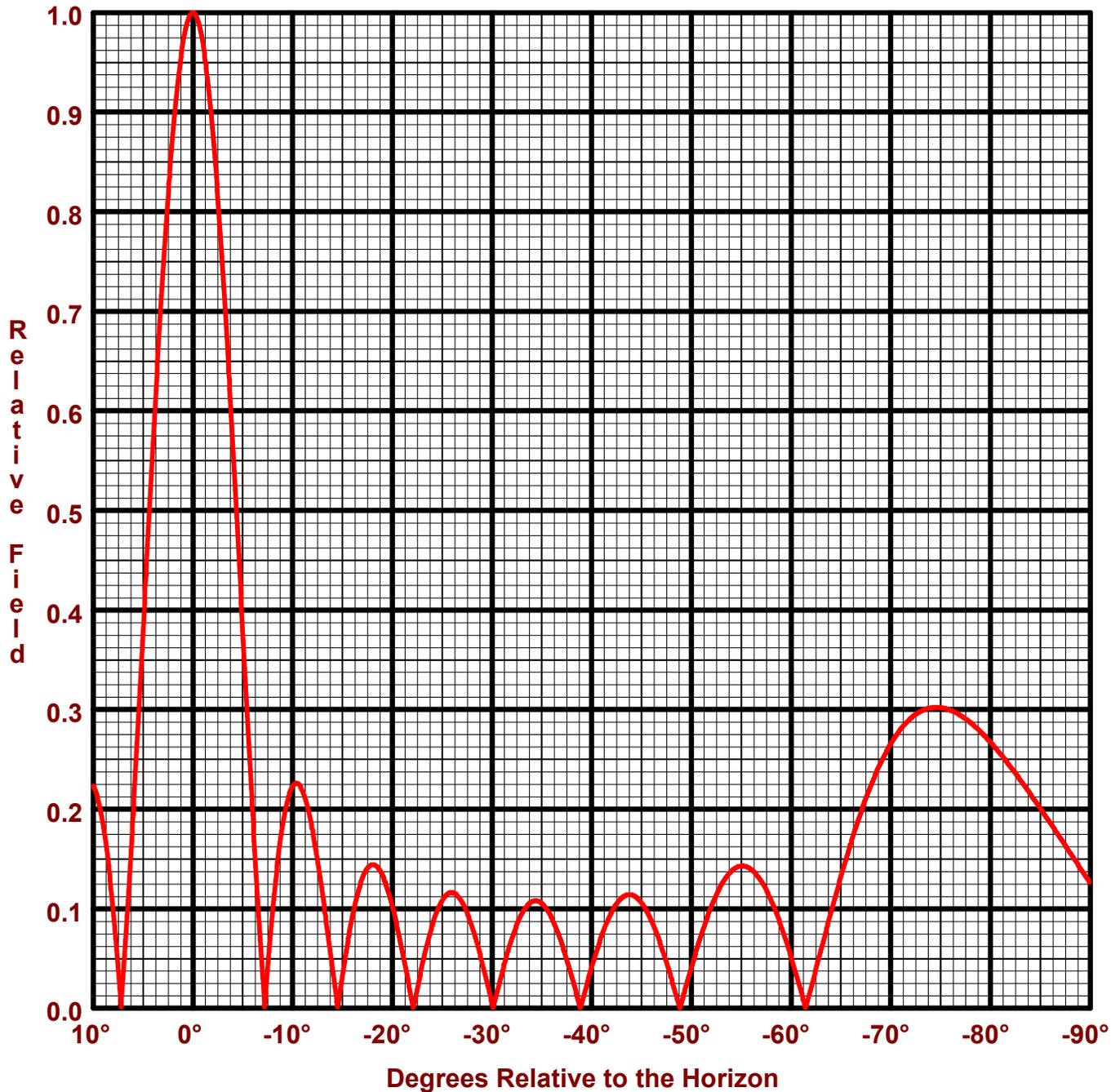
**This list shows the azimuth values for the horizontal and vertical components.**

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

Electronics Research, Inc. 7777 Gardner Rd. Chandler, IN 47610 Phone(812) 925-6000 Fax(812) 925-4030 Web: www.eriinc.com

Figure No: 3  
Call Sign: WOTB  
Location: Pearl River, LA.  
Frequency: 88.7 MHz  
8 bay MP-8C-DA antenna

Date: 4/30/2013  
H/V Power Ratio: 1  
1 Wave-length Spacing  
0° Beam Tilt  
0% First Null Fill



Horizontal Polarization:  
Maximum: 9.045 (9.564 dB)  
Horizontal Plane: 9.045 (9.564 dB)  
Maximum ERP: 100.000 kW

Vertical Polarization:  
Maximum: 9.045 (9.564 dB)  
Horizontal Plane: 9.045 (9.564 dB)  
Maximum ERP: 100.000 kW

# Directional Antenna System for WOTB, Pearl River, Louisiana

(Continued)

## ANTENNA SPECIFICATIONS

Antenna Type: MP-8C-DA  
Frequency: 88.7 MHz  
Number of Bays: Eight

## MECHANICAL SPECIFICATIONS

Mounting: Custom  
System length: 81 ft 6 in  
Aperture length required: 97 ft 4 in<sup>1</sup>  
Orientation: 140° true  
Input flange to the antenna 3 1/8" female.

## ELECTRICAL SPECIFICATIONS

(For directional use)

Maximum horizontal ERP: 100 kW (20 dBk)  
Horizontal maximum power gain: 9.045 (9.564 dB)  
Maximum vertical ERP: 100 kW (20 dBk)  
Vertical maximum power gain: 9.045 (9.564 dB)  
Total input power: 11.055 kW (10.435 dBk)

