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 WTZB, Englewood, Florida

June 21, 2010

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 WTZB.

The antenna is the ERI model LP-4C-DA configuration. The circular polarized system consists of 4 full-wavelength spaced bays using one driven circular polarized radiating element, one 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 248 degrees East tower face with bracketry to provide an antenna orientation of North 248 degrees East. The antenna was tested on an 18" EZ-Way tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 105.9 megahertz, which is the center of the FM broadcast channel assigned to WTZB.

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
WTZB, Englewood, Florida

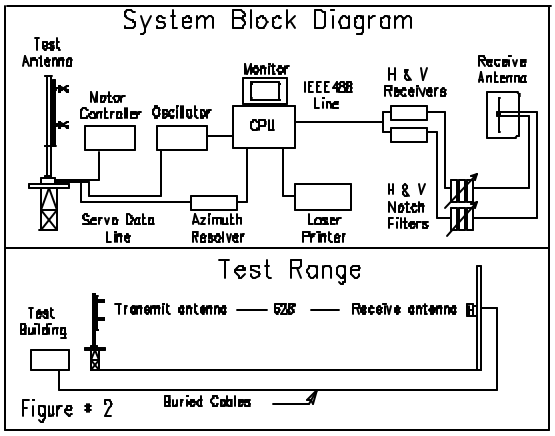
(Continued)

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 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 18" 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 105.9 MHz and was constantly monitored by a Rohde & Schwarz ESVD measuring receiver.

(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 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 4 full-wavelength spaced bays using one driven circular polarized radiating element, one 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 LP-4C-DA array is to be mounted on the North 248 degrees East tower face of the 18" EZ-Way tower at a bearing of North 248 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 25 kilowatts (13.979 dBk).

The power at North 20 degrees East does not exceed 9.1 kilowatts (9.59 dBk).

Directional Antenna System
Proposed For
WTZB, Englewood, Florida

(Continued)

The power at North 30 degrees East does not exceed 9.2 kilowatts (9.638 dBk).

The power at North 40 degrees East does not exceed 9.9 kilowatts (9.956 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 43 feet if the antenna is to be top mounted.

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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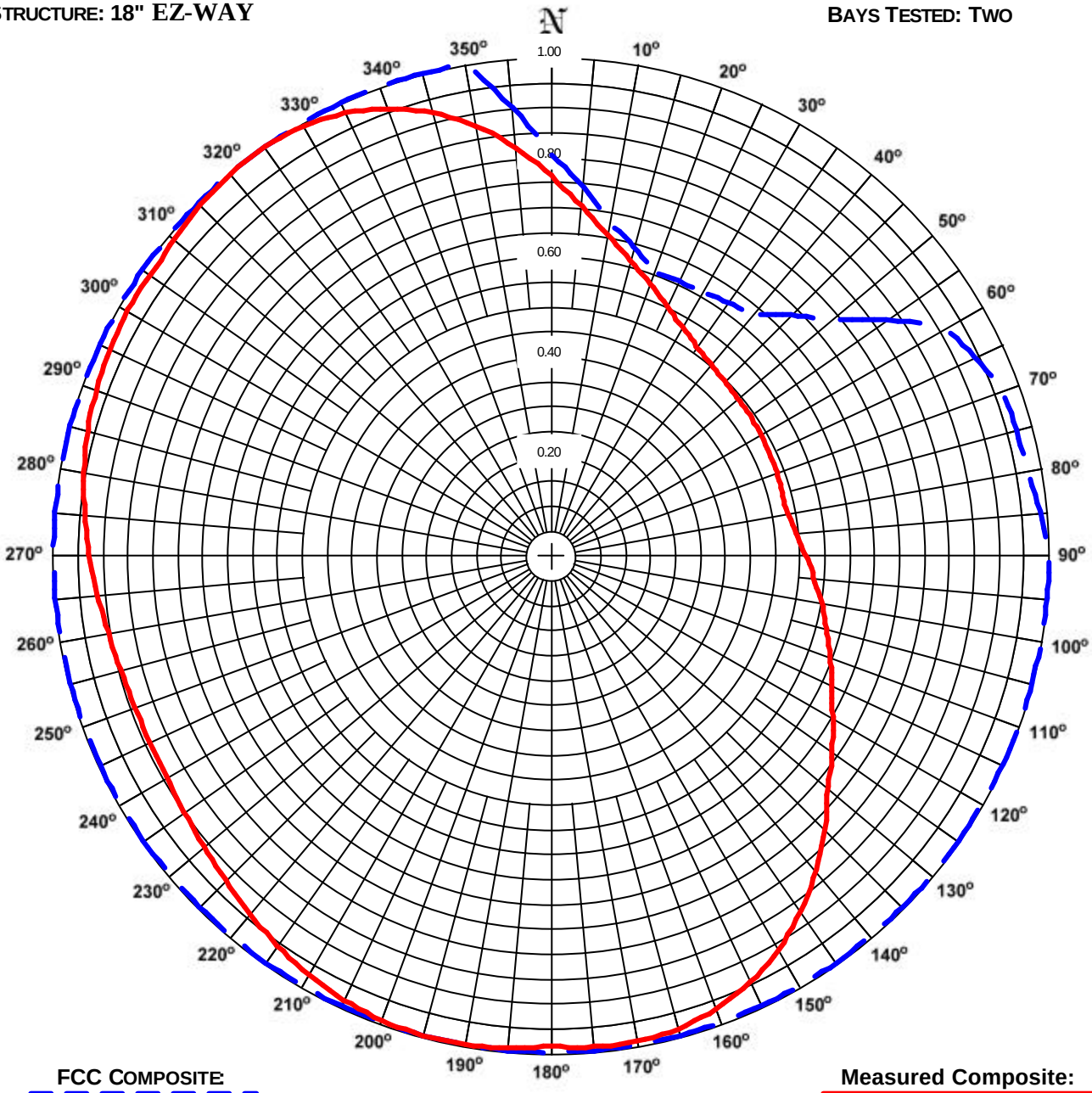
FIGURE NO: 1
STATION: WTZB
LOCATION: ENGLEWOOD, FL
ANTENNA: LP-4C-DA
STRUCTURE: 18" EZ-WAY

DATE: 3/31/2010
FREQUENCY: 105.9 MHZ
ORIENTATION: 248° TRUE
MOUNTING: STANDARD
BAYS TESTED: TWO



FCC COMPOSITE:
RMS: 0.949
MAXIMUM: 1.000 @ 90° TRUE
MINIMUM: 0.603 @ 20° TRUE

Measured Composite:
RMS: 0.825
Maximum: 1.000 @ 193° True
Minimum: 0.480 @ 79° 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-20100121AAH.

ERI® Horizontal Plane Relative Field List

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Station: WTZB
Location: Englewood, FL
Frequency: 105.9 MHz

Antenna: LP-4C-DA
Orientation: 248° True
Tower: 18" EZ-WAY

Figure: 1
Date: 3/31/2010
Reference: wtzb3m.fig

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.760	14.43	11.59	Vertical	180°	0.987	24.36	13.87	Vertical
5°	0.701	12.29	10.90	Vertical	185°	0.995	24.73	13.93	Horizontal
10°	0.652	10.62	10.26	Vertical	190°	0.999	24.95	13.97	Horizontal
15°	0.612	9.36	9.71	Vertical	195°	1.000	24.99	13.98	Horizontal
20°	0.579	8.37	9.23	Vertical	200°	0.996	24.79	13.94	Horizontal
25°	0.550	7.57	8.79	Vertical	205°	0.987	24.35	13.86	Horizontal
30°	0.528	6.96	8.42	Horizontal	210°	0.974	23.73	13.75	Horizontal
35°	0.510	6.51	8.13	Horizontal	215°	0.959	22.97	13.61	Horizontal
40°	0.498	6.20	7.92	Vertical	220°	0.942	22.17	13.46	Horizontal
45°	0.491	6.03	7.80	Vertical	225°	0.926	21.42	13.31	Horizontal
50°	0.489	5.97	7.76	Vertical	230°	0.912	20.78	13.18	Horizontal
55°	0.487	5.94	7.74	Vertical	235°	0.900	20.27	13.07	Horizontal
60°	0.486	5.91	7.72	Vertical	240°	0.893	19.94	13.00	Horizontal
65°	0.484	5.86	7.68	Vertical	245°	0.890	19.82	12.97	Horizontal
70°	0.482	5.81	7.64	Vertical	250°	0.891	19.83	12.97	Horizontal
75°	0.481	5.78	7.62	Vertical	255°	0.895	20.04	13.02	Horizontal
80°	0.481	5.78	7.62	Horizontal	260°	0.904	20.43	13.10	Horizontal
85°	0.494	6.11	7.86	Horizontal	265°	0.915	20.94	13.21	Horizontal
90°	0.511	6.52	8.14	Horizontal	270°	0.928	21.53	13.33	Horizontal
95°	0.530	7.02	8.46	Horizontal	275°	0.941	22.13	13.45	Horizontal
100°	0.551	7.58	8.80	Horizontal	280°	0.953	22.70	13.56	Horizontal
105°	0.573	8.21	9.14	Horizontal	285°	0.964	23.21	13.66	Horizontal
110°	0.596	8.89	9.49	Horizontal	290°	0.972	23.61	13.73	Horizontal
115°	0.623	9.69	9.86	Horizontal	295°	0.978	23.90	13.78	Horizontal
120°	0.653	10.66	10.28	Horizontal	300°	0.981	24.06	13.81	Horizontal
125°	0.689	11.88	10.75	Horizontal	305°	0.982	24.12	13.82	Horizontal
130°	0.725	13.14	11.19	Horizontal	310°	0.987	24.38	13.87	Vertical
135°	0.778	15.12	11.80	Vertical	315°	0.995	24.73	13.93	Vertical
140°	0.828	17.13	12.34	Vertical	320°	0.999	24.95	13.97	Vertical
145°	0.874	19.08	12.81	Vertical	325°	1.000	24.98	13.98	Vertical
150°	0.915	20.94	13.21	Vertical	330°	0.993	24.66	13.92	Vertical
155°	0.947	22.44	13.51	Vertical	335°	0.978	23.90	13.78	Vertical
160°	0.971	23.57	13.72	Vertical	340°	0.953	22.69	13.56	Vertical
165°	0.986	24.31	13.86	Vertical	345°	0.918	21.07	13.24	Vertical
170°	0.993	24.67	13.92	Vertical	350°	0.874	19.08	12.81	Vertical
175°	0.993	24.64	13.92	Vertical	355°	0.820	16.81	12.26	Vertical

Polarization: **Envelope**
Maximum Field: **1.000 @ 193° True**
Minimum Field: **0.480 @ 79° True**
RMS: **0.825**
Maximum ERP: **25.000 kW**
Maximum Power Gain: **3.120 (4.942 dB)**

Total Input Power: 8.013 kW

ERI® Horizontal Plane Relative Field Pattern

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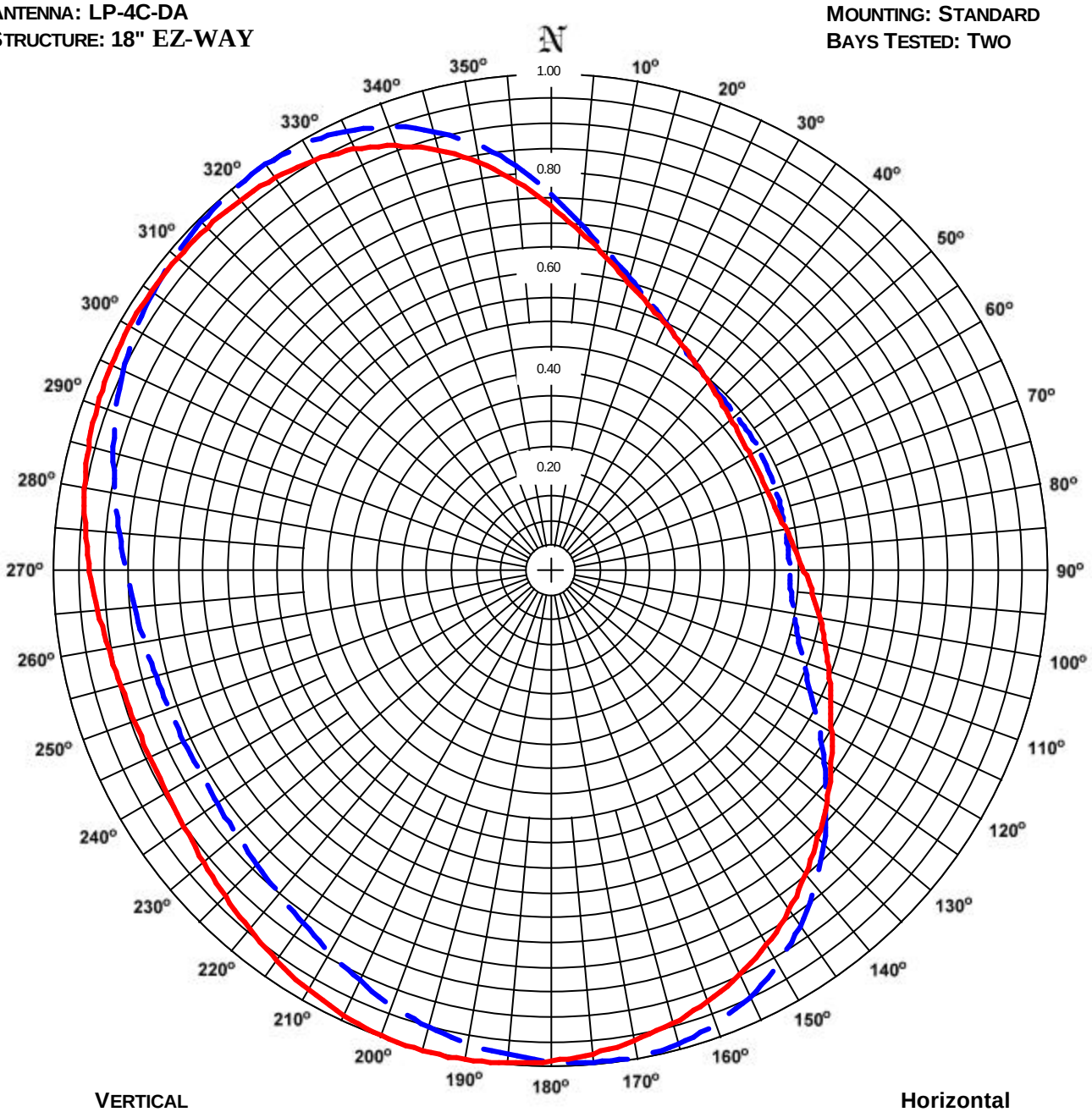
FIGURE NO: 2
STATION: WTZB
LOCATION: ENGLEWOOD, FL
ANTENNA: LP-4C-DA
STRUCTURE: 18" EZ-WAY

DATE: 3/31/2010
FREQUENCY: 105.9 MHz
ORIENTATION: 248° TRUE
MOUNTING: STANDARD
BAYS TESTED: TWO



VERTICAL

RMS: 0.797
MAXIMUM: 1.000 @ 323° TRUE
MINIMUM: 0.479 @ 83° TRUE

Horizontal

RMS: 0.813
Maximum: 1.000 @ 193° True
Minimum: 0.463 @ 64° True

COMMENTS: MEASURED PATTERNS OFTHE HORIZONTAL AND VERTICAL COMPONENTS.

ERI® Horizontal Plane Relative Field List

Station: WTZB
Location: Englewood, FL
Frequency: 105.9 MHz

Antenna: LP-4C-DA
Orientation: 248° True
Tower: 18" EZ-WAY

Figure: 2
Date: 3/31/2010
Reference: wtzb3m.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.735	13.51	11.31	0.760	14.43	11.59	180°	0.987	24.34	13.86	0.987	24.36	13.87
5°	0.686	11.77	10.71	0.701	12.29	10.90	185°	0.995	24.73	13.93	0.978	23.92	13.79
10°	0.641	10.29	10.12	0.652	10.62	10.26	190°	0.999	24.95	13.97	0.966	23.31	13.68
15°	0.603	9.09	9.58	0.612	9.36	9.71	195°	1.000	24.99	13.98	0.950	22.56	13.53
20°	0.572	8.19	9.13	0.579	8.37	9.23	200°	0.996	24.79	13.94	0.931	21.67	13.36
25°	0.548	7.51	8.76	0.550	7.57	8.79	205°	0.987	24.35	13.86	0.909	20.67	13.15
30°	0.528	6.96	8.42	0.527	6.94	8.41	210°	0.974	23.73	13.75	0.887	19.66	12.94
35°	0.510	6.51	8.13	0.510	6.49	8.13	215°	0.959	22.97	13.61	0.867	18.78	12.74
40°	0.496	6.14	7.88	0.498	6.20	7.92	220°	0.942	22.17	13.46	0.850	18.06	12.57
45°	0.484	5.85	7.67	0.491	6.03	7.80	225°	0.926	21.42	13.31	0.836	17.48	12.42
50°	0.475	5.63	7.50	0.489	5.97	7.76	230°	0.912	20.78	13.18	0.826	17.04	12.32
55°	0.468	5.48	7.39	0.487	5.94	7.74	235°	0.900	20.27	13.07	0.819	16.75	12.24
60°	0.464	5.39	7.32	0.486	5.91	7.72	240°	0.893	19.94	13.00	0.815	16.59	12.20
65°	0.463	5.37	7.30	0.484	5.86	7.68	245°	0.890	19.82	12.97	0.814	16.57	12.19
70°	0.465	5.42	7.34	0.482	5.81	7.64	250°	0.891	19.83	12.97	0.817	16.68	12.22
75°	0.471	5.55	7.44	0.481	5.78	7.62	255°	0.895	20.04	13.02	0.822	16.90	12.28
80°	0.481	5.78	7.62	0.480	5.75	7.60	260°	0.904	20.43	13.10	0.830	17.24	12.37
85°	0.494	6.11	7.86	0.480	5.75	7.60	265°	0.915	20.94	13.21	0.841	17.70	12.48
90°	0.511	6.52	8.14	0.481	5.79	7.62	270°	0.928	21.53	13.33	0.855	18.28	12.62
95°	0.530	7.02	8.46	0.486	5.91	7.72	275°	0.941	22.13	13.45	0.871	18.98	12.78
100°	0.551	7.58	8.80	0.497	6.18	7.91	280°	0.953	22.70	13.56	0.891	19.83	12.97
105°	0.573	8.21	9.14	0.516	6.64	8.22	285°	0.964	23.21	13.66	0.912	20.77	13.17
110°	0.596	8.89	9.49	0.542	7.34	8.65	290°	0.972	23.61	13.73	0.932	21.71	13.37
115°	0.623	9.69	9.86	0.578	8.35	9.22	295°	0.978	23.90	13.78	0.950	22.55	13.53
120°	0.653	10.66	10.28	0.623	9.70	9.87	300°	0.981	24.06	13.81	0.965	23.28	13.67
125°	0.689	11.88	10.75	0.672	11.29	10.53	305°	0.982	24.12	13.82	0.978	23.89	13.78
130°	0.725	13.14	11.19	0.724	13.12	11.18	310°	0.981	24.07	13.82	0.987	24.38	13.87
135°	0.760	14.45	11.60	0.778	15.12	11.80	315°	0.978	23.93	13.79	0.995	24.73	13.93
140°	0.798	15.91	12.02	0.828	17.13	12.34	320°	0.973	23.69	13.75	0.999	24.95	13.97
145°	0.836	17.45	12.42	0.874	19.08	12.81	325°	0.967	23.36	13.68	1.000	24.98	13.98
150°	0.869	18.89	12.76	0.915	20.94	13.21	330°	0.955	22.82	13.58	0.993	24.66	13.92
155°	0.898	20.15	13.04	0.947	22.44	13.51	335°	0.937	21.97	13.42	0.978	23.90	13.78
160°	0.922	21.26	13.28	0.971	23.57	13.72	340°	0.911	20.77	13.17	0.953	22.69	13.56
165°	0.943	22.24	13.47	0.986	24.31	13.86	345°	0.878	19.25	12.84	0.918	21.07	13.24
170°	0.961	23.09	13.63	0.993	24.67	13.92	350°	0.836	17.46	12.42	0.874	19.08	12.81
175°	0.975	23.79	13.76	0.993	24.64	13.92	355°	0.787	15.48	11.90	0.820	16.81	12.26

Polarization:	**Horizontal**	**Vertical**
Maximum Field:	**1.000 @ 193° True**	**1.000 @ 323° True**
Minimum Field:	**0.463 @ 64° True**	**0.479 @ 83° True**
RMS:	**0.813**	**0.797**
Maximum ERP:	**25.000 kW**	**25.000 kW**
Maximum Power Gain:	**3.120 (4.942 dB)**	**3.120 (4.942 dB)**

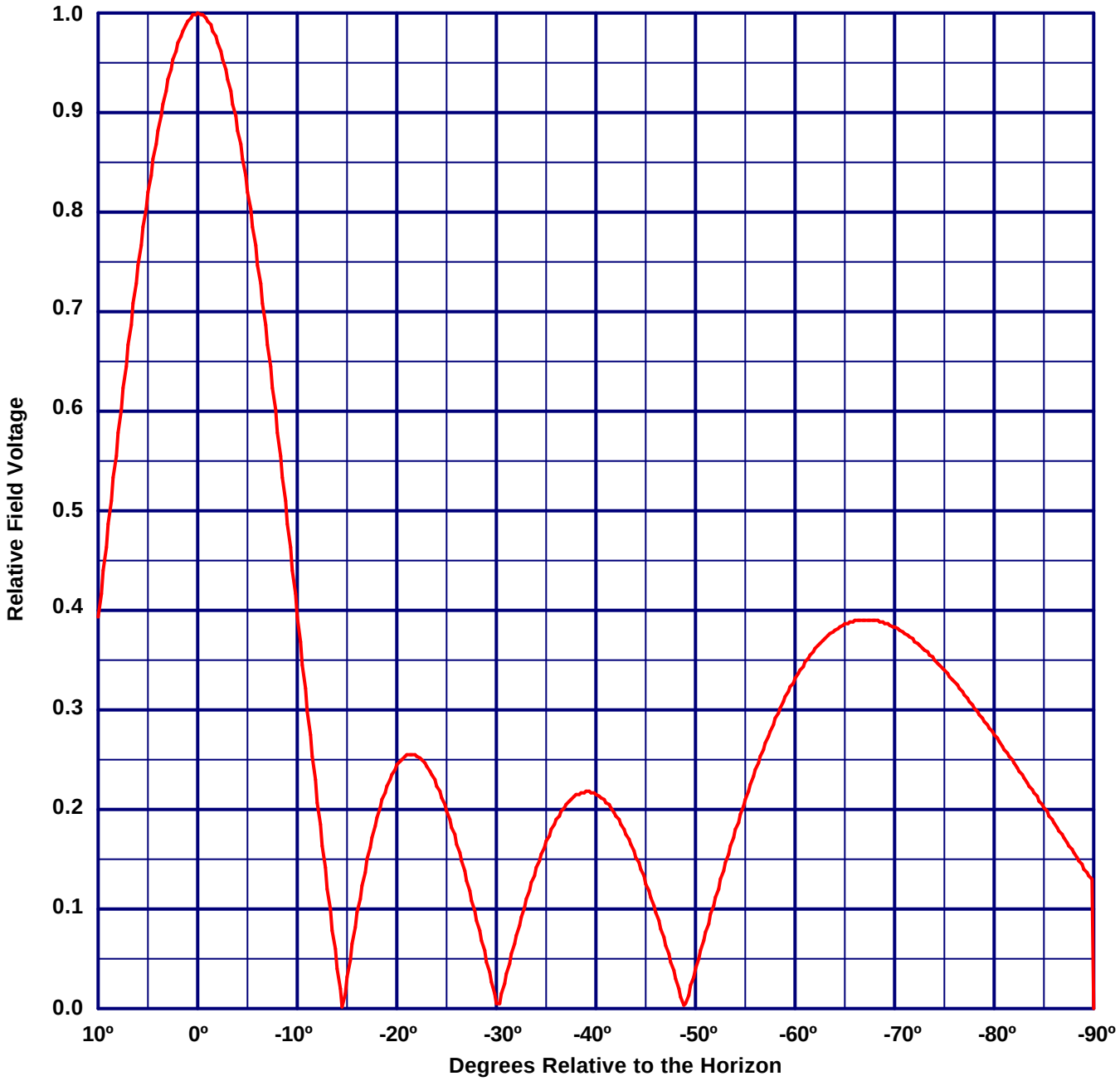
Total Input Power: 8.013kW

Vertical Plane Relative Field Pattern

WTZB, Englewood, FL, 105.9 MHz

Figure#: 3 Date: 3/31/2010

A 4 level, 1 wave-length spaced LP-4C-DA directional antenna with 0° beam tilt, 0% null fill and a H/V maximum power ratio of 1.000



Vertical Polarization Gain:	Horizontal Polarization Gain:
Maximum: 3.120 (4.942 dB)	Maximum: 3.120 (4.942 dB)
Horizontal Plane: 3.120 (1.942 dB)	Horizontal Plane: 3.1208 (4.942 dB)

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Directional Antenna System
for
WTZB, Englewood, Florida

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	LP-4C-DA
Frequency:	105.9 MHz
Number of Bays:	Four

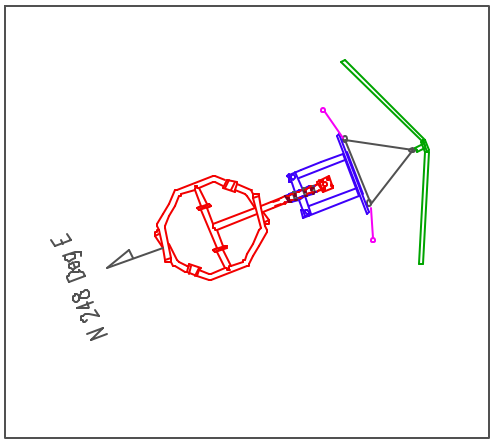
MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	31 ft 4 in
Aperture length required:	42 ft 9 in
Orientation:	248° true

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

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	25.000 kW (13.979 dBk)
Horizontal maximum power gain:	3.120 (4.942 dB)
Maximum vertical ERP:	25.000 kW (13.979 dBk)
Vertical maximum power gain:	3.120 (4.942 dB)
Total input power:	8.013 kW (9.038 dBk)



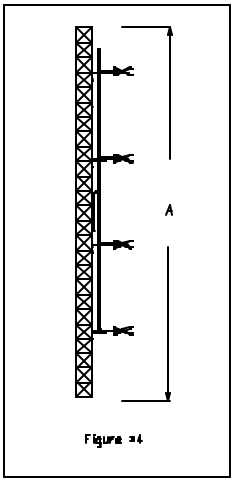


Figure 4