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 WGPS, Elizabeth City, North Carolina

June 3, 2002

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 WGPS.

The antenna is the ERI model LP-7C-DA configuration. The circular polarized system consists of 7 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 188 degrees East tower face with bracketry to provide an antenna orientation of North 188 degrees East. The antenna was tested on a 24" ***ERI® λ MOUNTING SYSTEM,*** which is the structure the station plans to use to support the array. All tests were performed on a frequency of 88.3 megahertz, which is the center of the FM broadcast channel assigned to WGPS.

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
WGPS, Elizabeth City, North Carolina

(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 24" ***ERI® λ MOUNTING SYSTEM,*** 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.

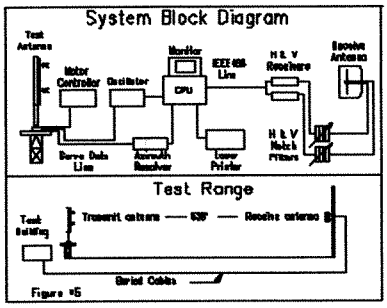


Figure #5

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 88.3 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 7 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-7C-DA array is to be mounted on the North 188 degrees East tower face of the 24" ***ERI® λ MOUNTING SYSTEM,*** at a bearing of North 188 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 50 kilowatts (16.99 dBk).

The power at North 10 degrees East does not exceed 7.7 kilowatts (8.865 dBk).

The power at North 180 degrees East does not exceed 19 kilowatts (12.788 dBk).

The power at North 280 degrees East does not exceed 45 kilowatts (16.532 dBk).

Directional Antenna System
For
WGPS, Elizabeth City, North Carolina

(Continued)

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 82 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.

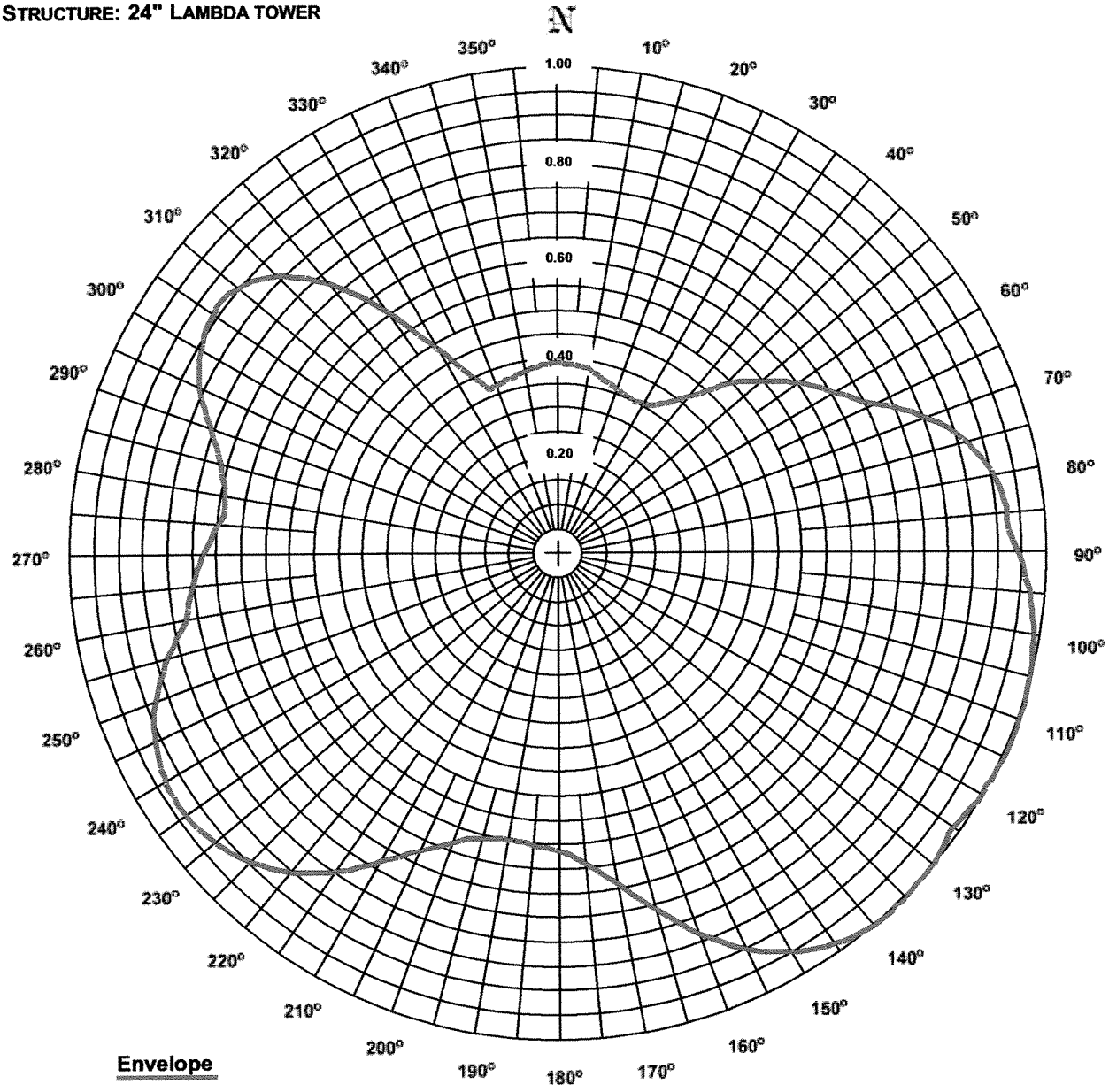
ELECTRONICS RESEARCH, INC.

ERI® Horizontal Plane Relative Field Pattern

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

FIGURE: 1
STATION: WGPS
LOCATION: ELIZABETH CITY, NC
ANTENNA TYPE: LP-7C-DA
STRUCTURE: 24" LAMBDA TOWER

DATE: 6/3/02
FREQUENCY: 88.3 MHz
ORIENTATION: 188° TRUE
MOUNTING: STANDARD



Envelope

RMS: 0.753
Maximum: 1.000 @ 109° True
Minimum: 0.355 @ 28° 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: WGPS
Location: Elizabeth City, NC
Frequency: 88.3 MHz

Antenna: LP-7C-DA
Orientation: 188° True
Tower: 24" Lambda tower

Figure: 1
Date: 6/3/02
Reference: wgps1m.fig

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.396	7.83	8.94	Vertical	180°	0.609	18.51	12.67	Vertical
5°	0.393	7.72	8.88	Horizontal	185°	0.597	17.83	12.51	Vertical
10°	0.387	7.50	8.75	Horizontal	190°	0.593	17.58	12.45	Vertical
15°	0.373	6.94	8.41	Vertical	195°	0.601	18.07	12.57	Vertical
20°	0.362	6.55	8.16	Vertical	200°	0.626	19.59	12.92	Horizontal
25°	0.356	6.34	8.02	Vertical	205°	0.668	22.32	13.49	Horizontal
30°	0.358	6.40	8.06	Vertical	210°	0.724	26.23	14.19	Horizontal
35°	0.382	7.28	8.62	Vertical	215°	0.791	31.29	14.95	Horizontal
40°	0.429	9.22	9.65	Vertical	220°	0.847	35.89	15.55	Horizontal
45°	0.498	12.40	10.93	Vertical	225°	0.889	39.55	15.97	Horizontal
50°	0.555	15.39	11.87	Vertical	230°	0.918	42.09	16.24	Horizontal
55°	0.612	18.72	12.72	Vertical	235°	0.932	43.39	16.37	Horizontal
60°	0.663	22.01	13.43	Vertical	240°	0.930	43.22	16.36	Horizontal
65°	0.729	26.57	14.24	Horizontal	245°	0.912	41.62	16.19	Horizontal
70°	0.812	32.96	15.18	Horizontal	250°	0.880	38.76	15.88	Horizontal
75°	0.872	38.01	15.80	Horizontal	255°	0.834	34.79	15.41	Horizontal
80°	0.909	41.29	16.16	Horizontal	260°	0.778	30.30	14.81	Horizontal
85°	0.923	42.56	16.29	Horizontal	265°	0.755	28.49	14.55	Vertical
90°	0.942	44.38	16.47	Vertical	270°	0.731	26.72	14.27	Vertical
95°	0.968	46.85	16.71	Vertical	275°	0.703	24.71	13.93	Vertical
100°	0.986	48.64	16.87	Vertical	280°	0.694	24.09	13.82	Horizontal
105°	0.997	49.70	16.96	Vertical	285°	0.716	25.65	14.09	Horizontal
110°	1.000	50.00	16.99	Vertical	290°	0.757	28.65	14.57	Horizontal
115°	1.000	50.00	16.99	Vertical	295°	0.809	32.75	15.15	Horizontal
120°	0.996	49.58	16.95	Vertical	300°	0.846	35.81	15.54	Horizontal
125°	0.984	48.46	16.85	Vertical	305°	0.865	37.39	15.73	Horizontal
130°	0.996	49.63	16.96	Horizontal	310°	0.858	36.83	15.66	Horizontal
135°	1.000	50.00	16.99	Horizontal	315°	0.814	33.15	15.21	Horizontal
140°	0.996	49.63	16.96	Horizontal	320°	0.734	26.92	14.30	Horizontal
145°	0.978	47.80	16.79	Horizontal	325°	0.617	19.01	12.79	Horizontal
150°	0.944	44.53	16.49	Horizontal	330°	0.493	12.13	10.84	Horizontal
155°	0.894	39.98	16.02	Horizontal	335°	0.405	8.19	9.13	Horizontal
160°	0.829	34.39	15.36	Horizontal	340°	0.371	6.89	8.38	Vertical
165°	0.753	28.33	14.52	Horizontal	345°	0.377	7.11	8.52	Vertical
170°	0.688	23.66	13.74	Horizontal	350°	0.386	7.47	8.73	Vertical
175°	0.638	20.38	13.09	Horizontal	355°	0.393	7.73	8.88	Vertical

Polarization: **Envelope**
Maximum Field: **1.000 @ 109° True**
Minimum Field: **0.355 @ 28° True**
RMS: **0.753**
Maximum ERP: **50.000 kW**
Maximum Power Gain: **7.210 (8.579 dB)**

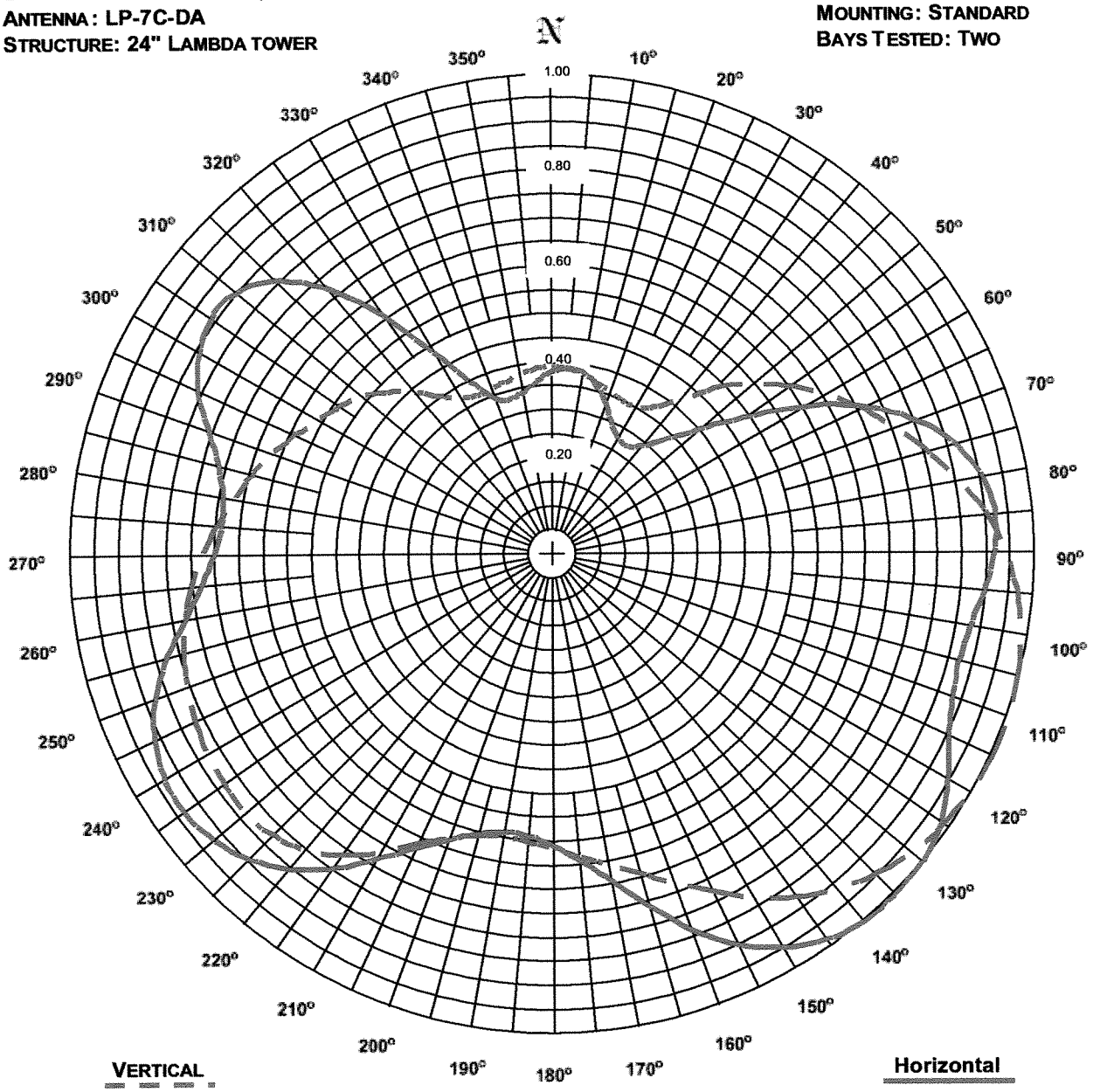
Total Input Power: 6.935 kW

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: WGPS
LOCATION: ELIZABETH CITY, NC
ANTENNA: LP-7C-DA
STRUCTURE: 24" LAMBDA TOWER

DATE: 6/3/02
FREQUENCY: 88.3 MHz
ORIENTATION: 188° TRUE
MOUNTING: STANDARD
BAYS TESTED: TWO



VERTICAL

RMS: 0.698
MAXIMUM: 1.000 @ 109° TRUE
MINIMUM: 0.355 @ 28° TRUE

Horizontal

RMS: 0.734
Maximum: 1.000 @ 133° True
Minimum: 0.275 @ 33° 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: WGPS
Location: Elizabeth City, NC
Frequency: 88.3 MHz

Antenna: LP-7C-DA
Orientation: 188° True
Tower: 24" Lambda tower

Figure: 2
Date: 6/3/02
Reference: wgps1m.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.385	7.40	8.69	0.396	7.83	8.94	180°	0.604	18.26	12.62	0.609	18.51	12.67
5°	0.393	7.72	8.88	0.393	7.71	8.87	185°	0.586	17.16	12.34	0.597	17.83	12.51
10°	0.387	7.50	8.75	0.385	7.41	8.70	190°	0.584	17.04	12.31	0.593	17.58	12.45
15°	0.366	6.71	8.27	0.373	6.94	8.41	195°	0.598	17.87	12.52	0.601	18.07	12.57
20°	0.330	5.45	7.37	0.362	6.55	8.16	200°	0.626	19.59	12.92	0.623	19.39	12.88
25°	0.297	4.41	6.45	0.356	6.34	8.02	205°	0.668	22.32	13.49	0.658	21.65	13.35
30°	0.279	3.89	5.90	0.358	6.40	8.06	210°	0.724	26.23	14.19	0.707	24.97	13.97
35°	0.278	3.87	5.88	0.382	7.28	8.62	215°	0.791	31.29	14.95	0.758	28.73	14.58
40°	0.301	4.54	6.57	0.429	9.22	9.65	220°	0.847	35.89	15.55	0.796	31.67	15.01
45°	0.347	6.03	7.80	0.498	12.40	10.93	225°	0.889	39.55	15.97	0.820	33.64	15.27
50°	0.416	8.67	9.38	0.555	15.39	11.87	230°	0.918	42.09	16.24	0.831	34.53	15.38
55°	0.509	12.94	11.12	0.612	18.72	12.72	235°	0.932	43.39	16.37	0.830	34.47	15.37
60°	0.623	19.40	12.88	0.663	22.01	13.43	240°	0.930	43.22	16.36	0.826	34.10	15.33
65°	0.729	26.57	14.24	0.717	25.70	14.10	245°	0.912	41.62	16.19	0.818	33.46	15.25
70°	0.812	32.96	15.18	0.764	29.15	14.65	250°	0.880	38.76	15.88	0.807	32.57	15.13
75°	0.872	38.01	15.80	0.812	32.99	15.18	255°	0.834	34.79	15.41	0.793	31.43	14.97
80°	0.909	41.29	16.16	0.860	37.02	15.68	260°	0.778	30.30	14.81	0.775	30.07	14.78
85°	0.923	42.56	16.29	0.909	41.28	16.16	265°	0.735	27.01	14.31	0.755	28.49	14.55
90°	0.916	41.91	16.22	0.942	44.38	16.47	270°	0.706	24.92	13.97	0.731	26.72	14.27
95°	0.897	40.21	16.04	0.968	46.85	16.71	275°	0.691	23.90	13.78	0.703	24.71	13.93
100°	0.878	38.54	15.86	0.986	48.64	16.87	280°	0.694	24.09	13.82	0.676	22.85	13.59
105°	0.871	37.93	15.79	0.997	49.70	16.96	285°	0.716	25.65	14.09	0.649	21.09	13.24
110°	0.880	38.74	15.88	1.000	50.00	16.99	290°	0.757	28.65	14.57	0.624	19.47	12.89
115°	0.905	40.93	16.12	1.000	50.00	16.99	295°	0.809	32.75	15.15	0.595	17.73	12.49
120°	0.944	44.56	16.49	0.996	49.58	16.95	300°	0.846	35.81	15.54	0.568	16.15	12.08
125°	0.978	47.81	16.80	0.984	48.46	16.85	305°	0.865	37.39	15.73	0.545	14.86	11.72
130°	0.996	49.63	16.96	0.966	46.67	16.69	310°	0.858	36.83	15.66	0.520	13.50	11.30
135°	1.000	50.00	16.99	0.941	44.26	16.46	315°	0.814	33.15	15.21	0.486	11.79	10.72
140°	0.996	49.63	16.96	0.908	41.26	16.16	320°	0.734	26.92	14.30	0.448	10.05	10.02
145°	0.978	47.80	16.79	0.869	37.75	15.77	325°	0.617	19.01	12.79	0.409	8.36	9.22
150°	0.944	44.53	16.49	0.822	33.82	15.29	330°	0.493	12.13	10.84	0.382	7.30	8.63
155°	0.894	39.98	16.02	0.771	29.69	14.73	335°	0.405	8.19	9.13	0.370	6.85	8.35
160°	0.829	34.39	15.36	0.724	26.22	14.19	340°	0.353	6.25	7.96	0.371	6.89	8.38
165°	0.753	28.33	14.52	0.685	23.44	13.70	345°	0.339	5.75	7.60	0.377	7.11	8.52
170°	0.688	23.66	13.74	0.652	21.27	13.28	350°	0.347	6.04	7.81	0.386	7.47	8.73
175°	0.638	20.38	13.09	0.627	19.65	12.93	355°	0.366	6.70	8.26	0.393	7.73	8.88

Polarization:	**Horizontal**	**Vertical**
Maximum Field:	**1.000 @ 133° True**	**1.000 @ 109° True**
Minimum Field:	**0.275 @ 33° True**	**0.355 @ 28° True**
RMS:	**0.734**	**0.698**
Maximum ERP:	**50.000 kW**	**50.000 kW**
Maximum Power Gain:	**7.210 (8.579 dB)**	**7.210 (8.579 dB)**

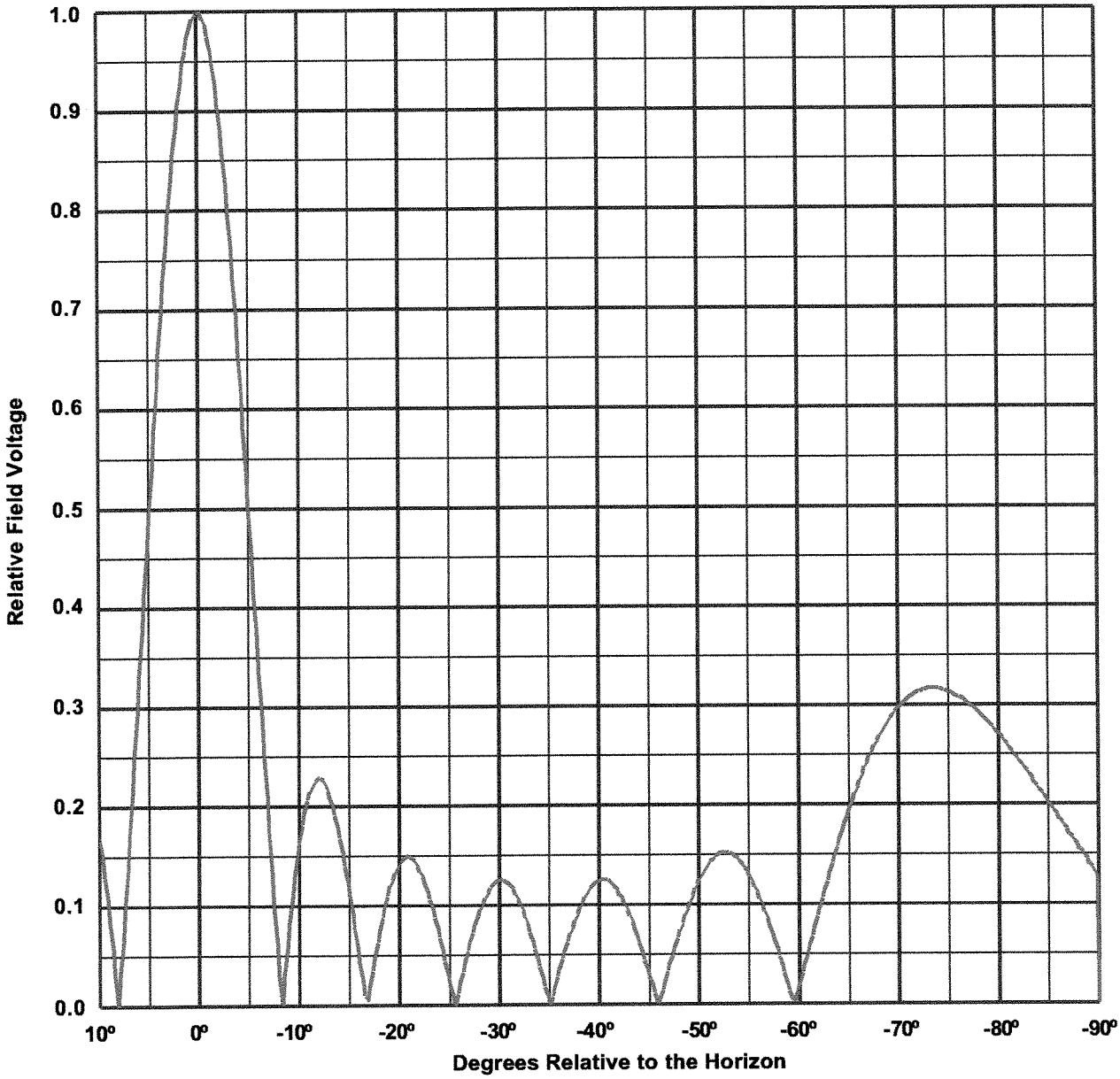
Total Input Power: 6.935 kW

ERI® Vertical Plane Relative Field Pattern

WGPS, Elizabeth City, NC, 88.3 MHz

Figure#: 3 **Date: 6/3/02**

A 7 level, 1 wave-length spaced LP-7C-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: 7.210 (8.579 dB)	Maximum: 7.210 (8.579 dB)
Horizontal Plane: 7.210 (8.579 dB)	Horizontal Plane: 7.210 (8.579 dB)

Electronics Research, Inc. 7777 Gardner Rd. Chandler, IN 47601 Phone: (812) 925-6000 Fax: (812) 925-4030 http://www.eriinc.com/

Directional Antenna System
for
WGPS, Elizabeth City, North Carolina

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	LP-7C-DA
Frequency:	88.3 MHz
Number of Bays:	7

MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	62 ft 10 in
Aperture length required:	82 ft.
Orientation:	188° true

Input flange to the antenna 1 5/8 inch female

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	50 kW (16.99 dBk)
Horizontal maximum power gain:	7.210 (8.579 dB)
Maximum vertical ERP:	50 kW (16.99 dBk)
Vertical maximum power gain:	7.210 (8.579 dB)
Total input power:	6.935 kW (8.41 dBk)

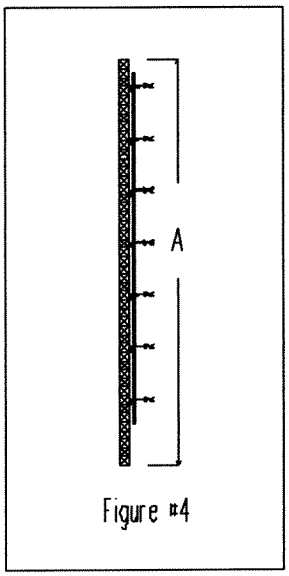
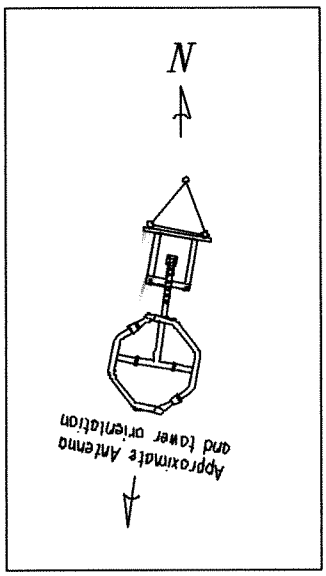


Figure #4



McKIM & CREED

September 23, 2002

CSN Eastern Office
Rob Branch
1460 Pine Bluff Drive
Lynchburg, VA 24503

Rob,

I, Katherine Marchello, do hereby certify that on September 17, 2002, I personally verified the alignment of the subject antenna to an Azimuth of 188 degrees with respect to True North per the request of Electronics Research, Inc. and CSN International. The antenna is on the radio tower located at Wellfield Road, Elizabeth City, in Pasquotank County, North Carolina. The margin for error is less than .49 degrees for the given reading.

Katherine C. Marchello
License – NC # 4373

504 E. Elizabeth St., Suite 1, Elizabeth City, North Carolina 27909
Tel 252.338.2929 Fax 252.338.1117 www.mckimcreed.com

Affidavit Certification and Qualifications of Supervising Engineer
In support of FCC Form 302
WGPS, Elizabeth City, NC, FCC File Number BPED-19970418MN

The proposed facility in construction permit is constructed as permitted in the current construction permit FCC File Number BPED-19970418MN. I have overseen all aspects of the WGPS site and directional antenna assembly and installation. I certify that the station is built as permitted. The directional antenna system was installed exactly as the manufacturer (Electronic Research, Inc.) specified and the antenna orientation as specified by FCC permit and the manufacturer was measured and verified by a Licensed Professional Surveyor in the State of North Carolina. The surveyor's certification is attached in an exhibit.

I certify, under penalty of perjury that I am a Broadcast Engineer and am familiar with all aspects of the FCC regulations that concern this project. I hold a dual certification which is the Certified Broadcast Radio and Television Engineer (CBRTE) certification (#3786) from the Society of Broadcast Engineers, which require a five year verified service requirement in radio and television broadcast engineering for qualification and have recently renewed by experience credits.

12-16-02

Robert H. Branch, Jr.
Director of Engineering
CSN International

Date