

***Directional Antenna System
for
WKXB, Burgaw, North Carolina***

June 21, 2006

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 WKXB.

The antenna is the ERI model MP-12AC-DA-HW configuration. The circular polarized system consists of 12 half-wavelength spaced bays using one driven circular polarized radiating element per bay, two horizontal parasitic elements per bay and four vertical parasitic elements interleaved between alternate bay pairs. The antenna was mounted on the North 147 degrees East tower face with bracketry to provide an antenna orientation of North 147 degrees East. The antenna was tested on a 36" **ERI[®] λ MOUNTING SYSTEM**, tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 99.9 megahertz, which is the center of the FM broadcast channel assigned to WKXB.

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.

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(Continued)

DESCRIPTION OF THE TEST PROCEDURE

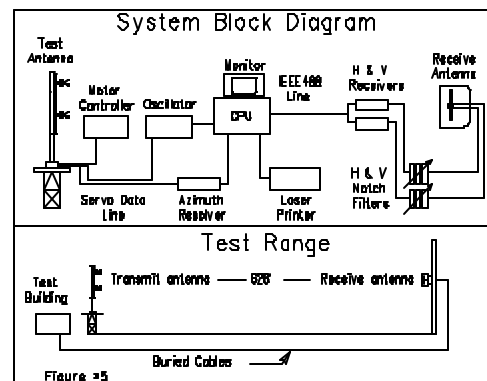
The test antenna consisted of two bay levels of the circular polarized system with the associated horizontal and vertical parasitic elements. The elements and brackets that were used in this test are electrically equivalent to those that will be supplied with the antenna. A section of 3 1/8 inch o.d. 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 36" **ERI[®] MOUNTING SYSTEM**, 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 North Atlantic Model 8500 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 calibrated 1-05. The frequency of the signal source was set at 99.9 MHz and was constantly monitored by an Anritsu Model ML521B measuring receiver calibrated 6-05.

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.



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

CONCLUSIONS

The circular polarized system consists of 12 half-wavelength spaced bays using one driven circular polarized radiating element per bay, two horizontal parasitic elements per bay and four vertical parasitic elements interleaved between alternate bay pairs. 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-12AC-DA-HW array is to be mounted on the North 147 degrees East tower face of the 36" **ERI[®] MOUNTING SYSTEM**, tower at a bearing of North 147 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 (20.00 dBk).

The RMS of the vertically polarized horizontal plane component does not exceed the RMS of the horizontally polarized horizontal plane component.

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(Continued)

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 69 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.



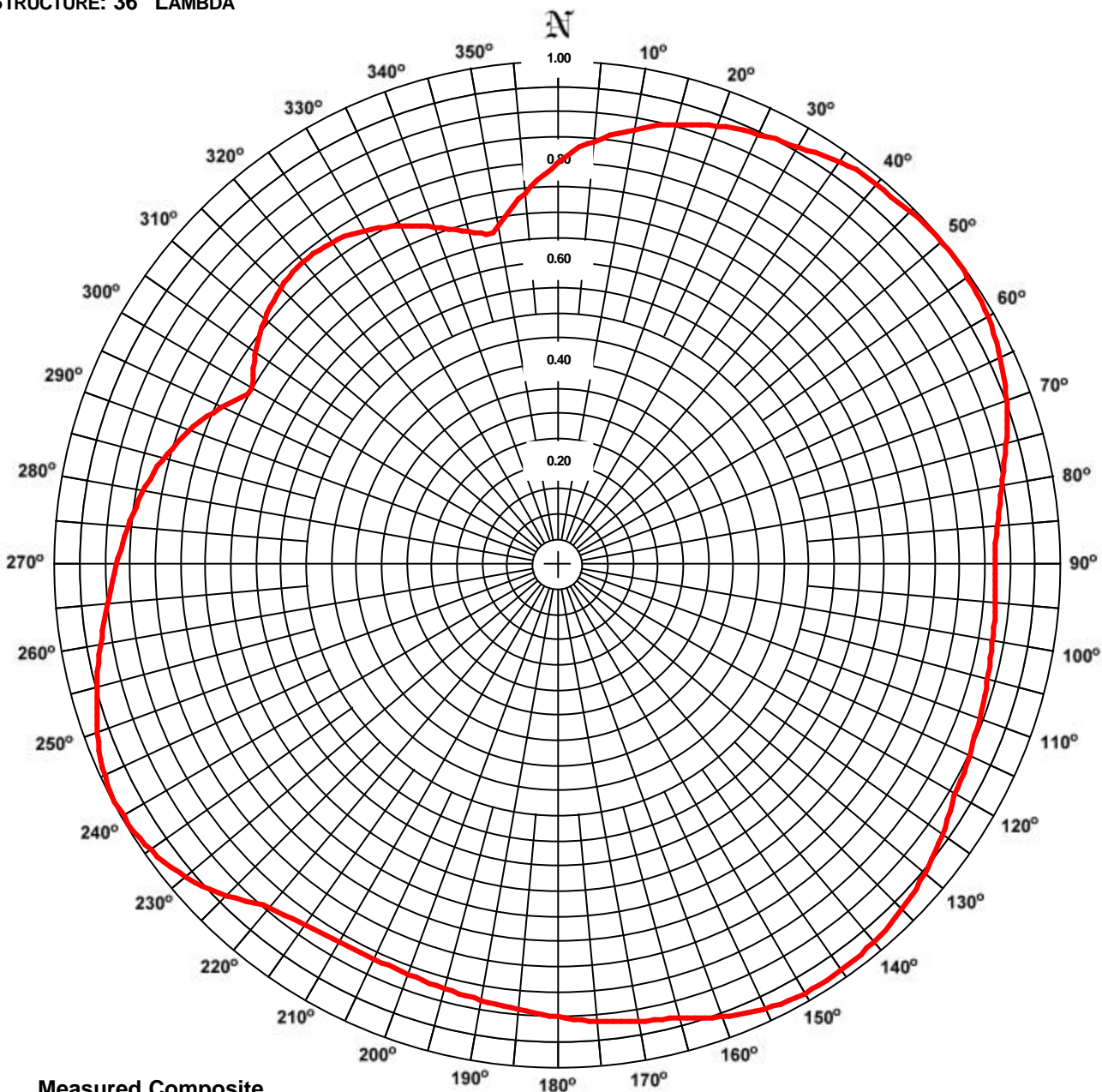
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ERI® *Horizontal Plane Relative Field Pattern*

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

FIGURE: 1
STATION: WKXB
LOCATION: BURGAW, NC.
ANTENNA TYPE: MP-12AC-DA-HW
STRUCTURE: 36" LAMBDA

DATE: 6/16/2006
FREQUENCY: 99.9 MHz
ORIENTATION: 147° TRUE
MOUNTING: CUSTOM



Measured Composite

RMS: 0.891
Maximum: 1.000 @ 51° True
Minimum: 0.674 @ 349° True

COMMENTS: COMPOSITE PATTERN: THIS PATTERN SHOWS THE MAXIMUM OF EITHER THE H OR V AZIMUTH VALUES.

ERI[®] *Horizontal Plane Relative Field List*

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Station: WKXB
Location: Burgaw, NC.
Frequency: 99.9 MHz

Antenna: MP-12AC-DA-HW
Orientation: 147° True
Tower: 36" Lambda

Figure: 1
Date: 6/16/2006
Reference: wkxb1m.fig

Angle	Envelope			Polarization	Angle	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.801	64.22	18.08	Horizontal	180°	0.897	80.44	19.05	Vertical
5°	0.848	71.88	18.57	Horizontal	185°	0.886	78.41	18.94	Vertical
10°	0.882	77.74	18.91	Horizontal	190°	0.876	76.81	18.85	Vertical
15°	0.909	82.67	19.17	Horizontal	195°	0.870	75.62	18.79	Vertical
20°	0.931	86.75	19.38	Horizontal	200°	0.865	74.83	18.74	Vertical
25°	0.947	89.69	19.53	Horizontal	205°	0.863	74.44	18.72	Vertical
30°	0.960	92.18	19.65	Horizontal	210°	0.864	74.70	18.73	Vertical
35°	0.981	96.32	19.84	Vertical	215°	0.873	76.22	18.82	Vertical
40°	0.989	97.84	19.90	Vertical	220°	0.889	79.05	18.98	Vertical
45°	0.994	98.85	19.95	Horizontal	225°	0.928	86.09	19.35	Horizontal
50°	1.000	99.95	20.00	Horizontal	230°	0.963	92.82	19.68	Horizontal
55°	0.997	99.49	19.98	Horizontal	235°	0.986	97.29	19.88	Horizontal
60°	0.988	97.70	19.90	Horizontal	240°	0.997	99.30	19.97	Horizontal
65°	0.973	94.67	19.76	Horizontal	245°	0.992	98.48	19.93	Horizontal
70°	0.951	90.46	19.56	Horizontal	250°	0.974	94.79	19.77	Horizontal
75°	0.923	85.21	19.30	Horizontal	255°	0.949	89.99	19.54	Horizontal
80°	0.897	80.53	19.06	Horizontal	260°	0.923	85.19	19.30	Horizontal
85°	0.878	77.10	18.87	Horizontal	265°	0.900	80.99	19.08	Horizontal
90°	0.870	75.70	18.79	Vertical	270°	0.878	77.13	18.87	Horizontal
95°	0.874	76.31	18.83	Vertical	275°	0.859	73.79	18.68	Horizontal
100°	0.879	77.18	18.88	Vertical	280°	0.839	70.35	18.47	Horizontal
105°	0.885	78.32	18.94	Vertical	285°	0.814	66.25	18.21	Horizontal
110°	0.893	79.72	19.02	Vertical	290°	0.782	61.19	17.87	Horizontal
115°	0.902	81.39	19.11	Vertical	295°	0.741	54.96	17.40	Horizontal
120°	0.912	83.14	19.20	Vertical	300°	0.702	49.34	16.93	Vertical
125°	0.934	87.30	19.41	Horizontal	305°	0.734	53.81	17.31	Vertical
130°	0.954	90.93	19.59	Horizontal	310°	0.761	57.91	17.63	Vertical
135°	0.968	93.70	19.72	Horizontal	315°	0.780	60.82	17.84	Vertical
140°	0.978	95.57	19.80	Horizontal	320°	0.788	62.14	17.93	Vertical
145°	0.982	96.52	19.85	Horizontal	325°	0.785	61.66	17.90	Vertical
150°	0.981	96.26	19.83	Horizontal	330°	0.770	59.30	17.73	Vertical
155°	0.972	94.41	19.75	Horizontal	335°	0.746	55.66	17.46	Vertical
160°	0.954	91.08	19.59	Horizontal	340°	0.717	51.38	17.11	Vertical
165°	0.929	86.34	19.36	Horizontal	345°	0.689	47.46	16.76	Vertical
170°	0.920	84.61	19.27	Vertical	350°	0.686	47.09	16.73	Horizontal
175°	0.909	82.70	19.18	Vertical	355°	0.745	55.50	17.44	Horizontal

Polarization:
Maximum Field:
Minimum Field:
RMS:
Maximum ERP:
Maximum Power Gain:

Envelope
1.000 @ 51° True
0.674 @ 349° True
0.891
100.000 kW
4.775 (6.790 dB)

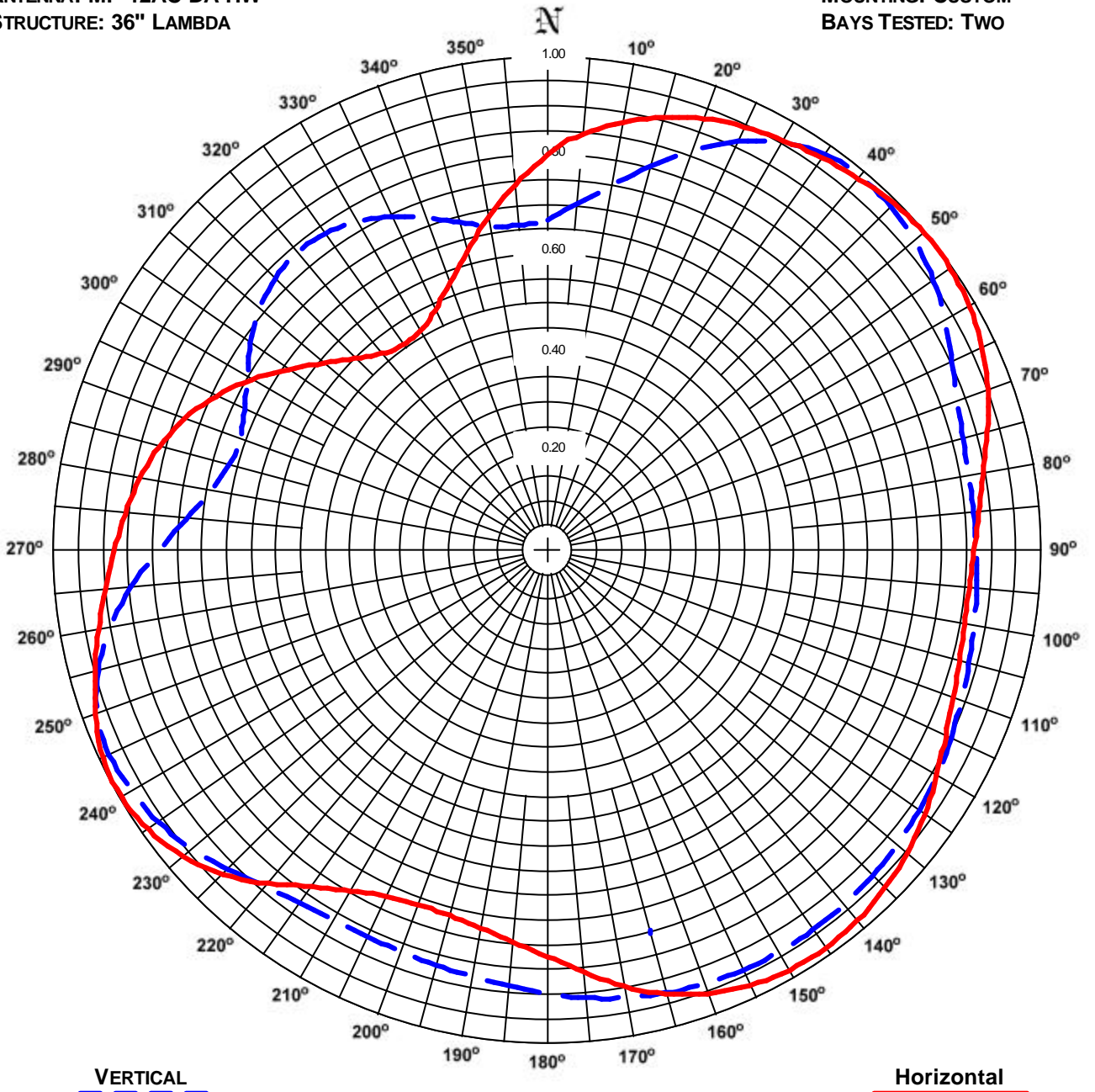
Total Input Power: 20.942 kW

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: WKXB
LOCATION: BURGAW, NC.
ANTENNA: MP-12AC-DA-HW
STRUCTURE: 36" LAMBDA

DATE: 6/16/2006
FREQUENCY: 99.9 MHZ
ORIENTATION: 147° TRUE
MOUNTING: CUSTOM
BAYS TESTED: TWO



RMS: 0.862
MAXIMUM: 0.989 @ 40° TRUE
MINIMUM: 0.662 @ 355° TRUE

RMS: 0.862
Maximum: 1.000 @ 51° True
Minimum: 0.509 @ 326° 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: WKXB
Location: Burgaw, NC.
Frequency: 99.9 MHz

Antenna: MP-12AC-DA-HW
Orientation: 147° True
Tower: 36" Lambda

Figure: 2
Date: 6/16/2006
Reference: wkxb1m.fig

Angle	Horizontal			Vertical			Angle	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.801	64.22	18.08	0.671	45.04	16.54	180°	0.822	67.54	18.30	0.897	80.44	19.05
5°	0.848	71.88	18.57	0.706	49.79	16.97	185°	0.795	63.21	18.01	0.886	78.41	18.94
10°	0.882	77.74	18.91	0.751	56.47	17.52	190°	0.776	60.24	17.80	0.876	76.81	18.85
15°	0.909	82.67	19.17	0.806	65.01	18.13	195°	0.765	58.55	17.67	0.870	75.62	18.79
20°	0.931	86.75	19.38	0.864	74.65	18.73	200°	0.763	58.14	17.64	0.865	74.83	18.74
25°	0.947	89.69	19.53	0.915	83.77	19.23	205°	0.773	59.70	17.76	0.863	74.44	18.72
30°	0.960	92.18	19.65	0.956	91.38	19.61	210°	0.796	63.29	18.01	0.864	74.70	18.73
35°	0.972	94.48	19.75	0.981	96.32	19.84	215°	0.831	69.09	18.39	0.873	76.22	18.82
40°	0.983	96.71	19.85	0.989	97.84	19.90	220°	0.880	77.35	18.88	0.889	79.05	18.98
45°	0.994	98.85	19.95	0.985	97.02	19.87	225°	0.928	86.09	19.35	0.912	83.26	19.20
50°	1.000	99.95	20.00	0.974	94.86	19.77	230°	0.963	92.82	19.68	0.940	88.28	19.46
55°	0.997	99.49	19.98	0.956	91.39	19.61	235°	0.986	97.29	19.88	0.960	92.17	19.65
60°	0.988	97.70	19.90	0.931	86.70	19.38	240°	0.997	99.30	19.97	0.973	94.71	19.76
65°	0.973	94.67	19.76	0.905	81.90	19.13	245°	0.992	98.48	19.93	0.979	95.85	19.82
70°	0.951	90.46	19.56	0.886	78.44	18.95	250°	0.974	94.79	19.77	0.971	94.19	19.74
75°	0.923	85.21	19.30	0.873	76.26	18.82	255°	0.949	89.99	19.54	0.943	88.89	19.49
80°	0.897	80.53	19.06	0.868	75.30	18.77	260°	0.923	85.19	19.30	0.901	81.11	19.09
85°	0.878	77.10	18.87	0.868	75.35	18.77	265°	0.900	80.99	19.08	0.847	71.77	18.56
90°	0.865	74.86	18.74	0.870	75.70	18.79	270°	0.878	77.13	18.87	0.789	62.23	17.94
95°	0.859	73.75	18.68	0.874	76.31	18.83	275°	0.859	73.79	18.68	0.735	54.03	17.33
100°	0.859	73.81	18.68	0.879	77.18	18.88	280°	0.839	70.35	18.47	0.694	48.23	16.83
105°	0.865	74.81	18.74	0.885	78.32	18.94	285°	0.814	66.25	18.21	0.668	44.67	16.50
110°	0.876	76.65	18.85	0.893	79.72	19.02	290°	0.782	61.19	17.87	0.663	43.91	16.43
115°	0.891	79.37	19.00	0.902	81.39	19.11	295°	0.741	54.96	17.40	0.677	45.81	16.61
120°	0.911	83.01	19.19	0.912	83.14	19.20	300°	0.692	47.93	16.81	0.702	49.34	16.93
125°	0.934	87.30	19.41	0.920	84.63	19.28	305°	0.641	41.06	16.13	0.734	53.81	17.31
130°	0.954	90.93	19.59	0.927	85.87	19.34	310°	0.592	35.07	15.45	0.761	57.91	17.63
135°	0.968	93.70	19.72	0.932	86.85	19.39	315°	0.551	30.31	14.82	0.780	60.82	17.84
140°	0.978	95.57	19.80	0.936	87.56	19.42	320°	0.522	27.21	14.35	0.788	62.14	17.93
145°	0.982	96.52	19.85	0.938	87.99	19.44	325°	0.509	25.90	14.13	0.785	61.66	17.90
150°	0.981	96.26	19.83	0.939	88.16	19.45	330°	0.514	26.43	14.22	0.770	59.30	17.73
155°	0.972	94.41	19.75	0.938	87.90	19.44	335°	0.538	28.90	14.61	0.746	55.66	17.46
160°	0.954	91.08	19.59	0.934	87.22	19.41	340°	0.577	33.34	15.23	0.717	51.38	17.11
165°	0.929	86.34	19.36	0.928	86.12	19.35	345°	0.628	39.44	15.96	0.689	47.46	16.76
170°	0.896	80.30	19.05	0.920	84.61	19.27	350°	0.686	47.09	16.73	0.668	44.67	16.50
175°	0.856	73.35	18.65	0.909	82.70	19.18	355°	0.745	55.50	17.44	0.662	43.82	16.42

Polarization:	Horizontal	Vertical
Maximum Field:	1.000 @ 51° True	0.989 @ 40° True
Minimum Field:	0.509 @ 326° True	0.662 @ 355° True
RMS:	0.862	0.862
Maximum ERP:	100.000 kW	97.835 kW
Maximum Power Gain:	4.775 (6.790 dB)	4.672 (6.695 dB)

Total Input Power: 20.942 kW



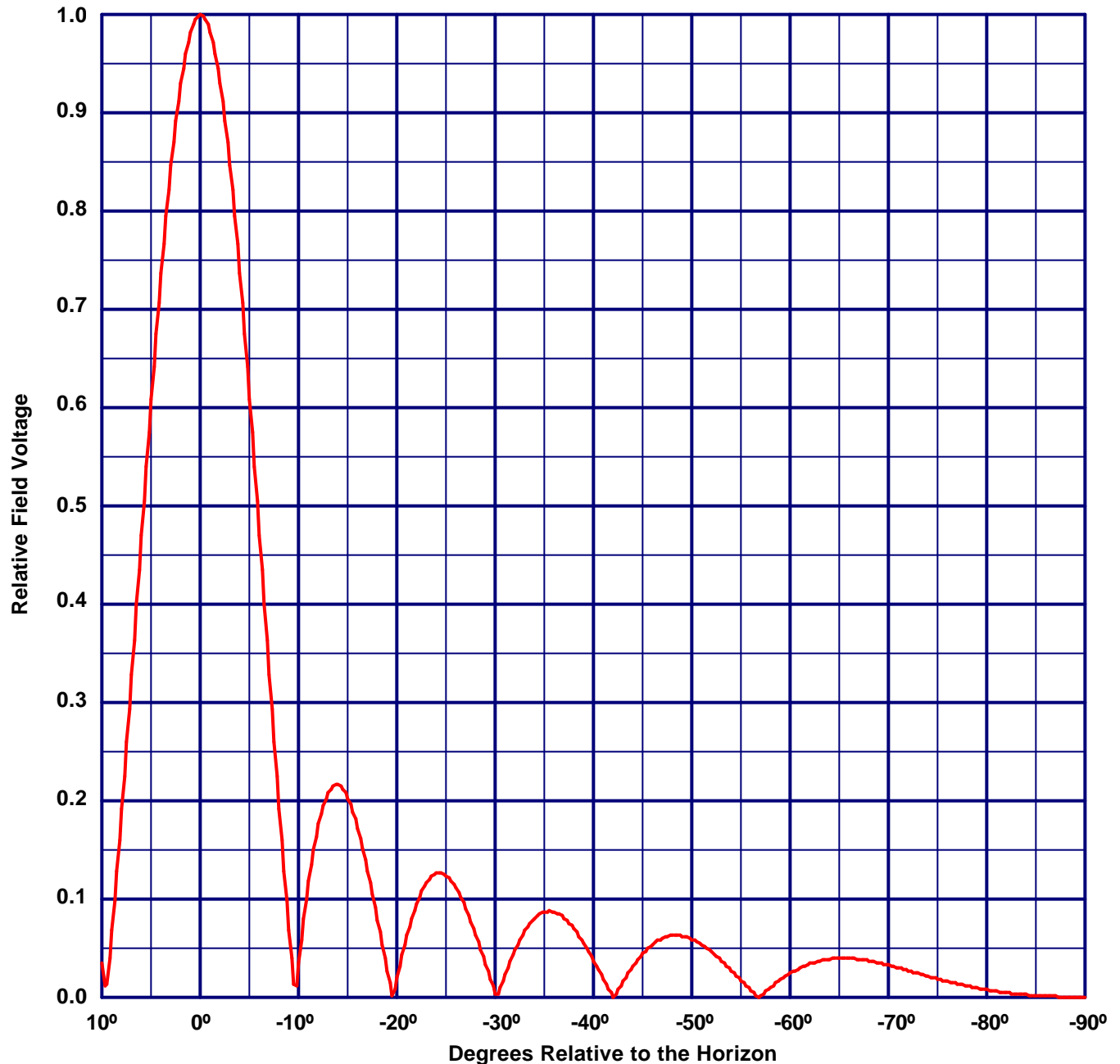
Vertical Plane Relative Field Pattern

WKXB, Burgaw, NC., 99.9 MHz

Figure#: 3

Date: 6/16/2006

A 12 level, .5 wave-length spaced MP-12AC-DA-HW directional antenna with 0° beam tilt, 0% null fill and a H/V maximum power ratio of 1.022



Vertical Polarization Gain:

Maximum: 4.672 (6.695 dB)

Horizontal Plane: 4.672 (6.695 dB)

Horizontal Polarization Gain:

Maximum: 4.775 (6.790 dB)

Horizontal Plane: 4.775 (6.790 dB)

Directional Antenna System for WKXB, Burgaw, North Carolina

(Continued)

ANTENNA SPECIFICATIONS

Frequency:	99.9 MHz
Antenna Type:	MP-12AC-DA-HW
Number of bays:	twelve

MECHANICAL SPECIFICATIONS

Structure:	36" face tower
Mounting:	Custom
System length	57.656 ft
Aperture length required:	68.954 ft
Input flange to the antenna	3 1/8" female

ELECTRICAL SPECIFICATIONS

(For directional use)

Maximum horizontal ERP:	100 kW (20.000 dBk)
Horizontal maximum power gain:	4.775 (6.790 dB)
Maximum vertical ERP:	97.835 kW (19.905 dBk)
Vertical maximum power gain:	4.672 (6.695 dB)
Total input power:	20.942 kW

