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 KYLF, Adrian, Missouri

March 5, 2012

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 KYLF.

The antenna is the ERI model MP-4C-DA configuration. The circular polarized system consists of 4 full-wavelength spaced bays using one driven circular polarized radiating element, two horizontal parasitic elements placed one quarter wave above and below each bay and four vertical parasitic elements per bay. The antenna was mounted on the North 122 degrees East tower leg with bracketry to provide an antenna orientation of North 107 degrees East. The antenna was tested on a 36" face tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 88.9 megahertz, which is the center of the FM broadcast channel assigned to KYLF.

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
KYLF, Adrian, Missouri

(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" 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.

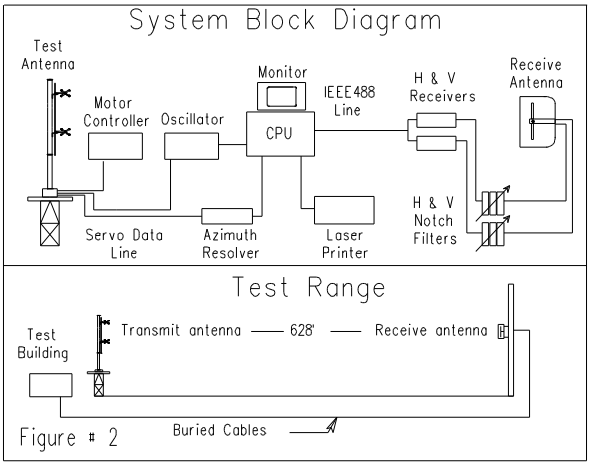

Figure # 2

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 88.9 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, two horizontal parasitic elements placed one quarter wave above and below each bay and four 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-4C-DA array is to be mounted on the North 122 degrees East tower leg of the 36" face tower at a bearing of North 107 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 30 kilowatts (14.771 dBk).

Directional Antenna System
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(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 49 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.

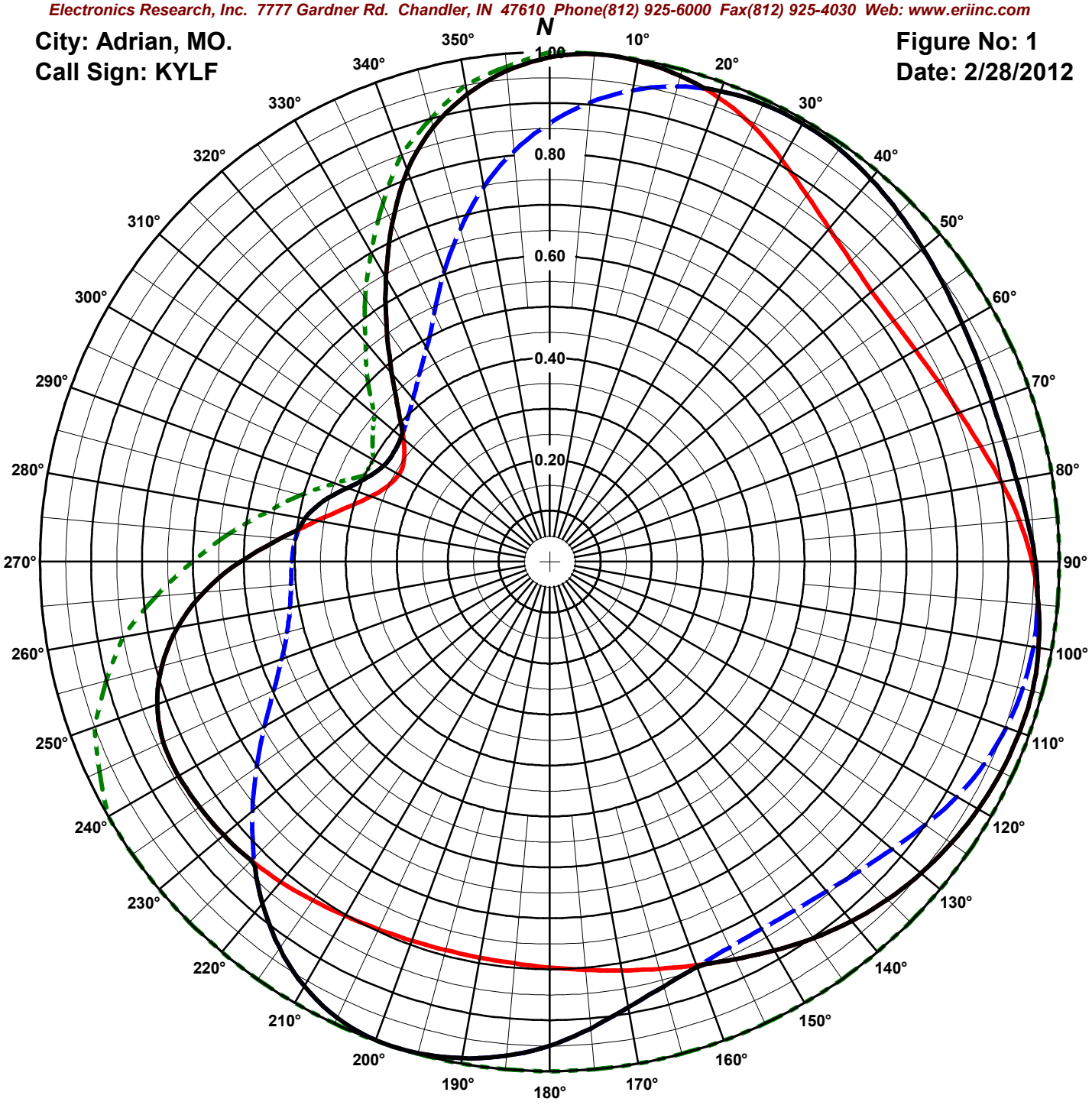
The Microsoft Word document on file electronically at Electronic Research, Inc. governs the specifications, scope, and configuration of the product described. All other representations whether verbal, printed, or electronic are subordinate to the master copy of this document on file at ERI.

ERI® 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: Adrian, MO.
Call Sign: KYLF

Figure No: 1
Date: 2/28/2012



Antenna Orientation: 107° True

Frequency: 88.9 MHz
Antenna Type: MP-4C-DA

Antenna Mounting: Standard
Tower Type: 36" Pirod

HORIZONTAL	VERTICAL	COMPOSITE	FCC ENVELOPE
RMS: .817	RMS: .812	RMS: .86	RMS: .919
Maximum: 1 @ 6°	Maximum: 1 @ 198°	Maximum: 1 @ 6°	Maximum: 1 @ 0°
Minimum: .342 @ 300°	Minimum: .373 @ 304°	Minimum: .373 @ 304°	Minimum: .4 @ 295°

Measured patterns of the horizontal and vertical components. The composite pattern shows the maximum of either the H or V azimuth values. This patterns is greater than 85% of the FCC filed composite pattern BMPED-20120117AEC.

ERI® Horizontal Plane Relative Field Pattern

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Figure# 1 **Date: 2/28/2012**
Station: KYLF **Antenna: MP-4C-DA**
Location: Adrian, MO. **Antenna Orientation: 107° True**
Frequency: 88.9 MHz **Number of Bays: 4**

Azimuth	Envelope			Polarization	Azimuth	Envelope			Polarization
	Field	kW	dBk	Maximum		Field	kW	dBk	Maximum
0°	0.990	29.390	14.682	Horizontal	180°	0.950	27.062	14.324	Vertical
5°	1.000	29.974	14.767	Horizontal	185°	0.973	28.419	14.536	Vertical
10°	0.998	29.859	14.751	Horizontal	190°	0.990	29.374	14.680	Vertical
15°	0.987	29.237	14.659	Horizontal	195°	0.998	29.902	14.757	Vertical
20°	0.982	28.949	14.616	Vertical	200°	0.999	29.945	14.763	Vertical
25°	0.991	29.463	14.693	Vertical	205°	0.988	29.262	14.663	Vertical
30°	0.993	29.564	14.708	Vertical	210°	0.962	27.784	14.438	Vertical
35°	0.989	29.337	14.674	Vertical	215°	0.925	25.652	14.091	Vertical
40°	0.980	28.836	14.599	Vertical	220°	0.877	23.063	13.629	Vertical
45°	0.969	28.144	14.494	Vertical	225°	0.829	20.608	13.140	Horizontal
50°	0.956	27.407	14.379	Vertical	230°	0.835	20.915	13.205	Horizontal
55°	0.944	26.747	14.273	Vertical	235°	0.839	21.121	13.247	Horizontal
60°	0.935	26.205	14.184	Vertical	240°	0.841	21.220	13.268	Horizontal
65°	0.928	25.811	14.118	Vertical	245°	0.837	20.995	13.221	Horizontal
70°	0.923	25.582	14.079	Vertical	250°	0.819	20.129	13.038	Horizontal
75°	0.924	25.616	14.085	Vertical	255°	0.787	18.601	12.695	Horizontal
80°	0.930	25.950	14.141	Vertical	260°	0.741	16.487	12.171	Horizontal
85°	0.941	26.566	14.243	Vertical	265°	0.681	13.905	11.432	Horizontal
90°	0.953	27.244	14.353	Vertical	270°	0.606	11.027	10.425	Horizontal
95°	0.963	27.801	14.441	Horizontal	275°	0.529	8.394	9.239	Horizontal
100°	0.974	28.471	14.544	Horizontal	280°	0.487	7.119	8.524	Vertical
105°	0.981	28.849	14.601	Horizontal	285°	0.459	6.331	8.015	Vertical
110°	0.981	28.859	14.603	Horizontal	290°	0.423	5.356	7.288	Vertical
115°	0.977	28.655	14.572	Horizontal	295°	0.393	4.628	6.654	Vertical
120°	0.971	28.296	14.517	Horizontal	300°	0.376	4.246	6.279	Vertical
125°	0.962	27.791	14.439	Horizontal	305°	0.373	4.181	6.213	Vertical
130°	0.951	27.143	14.337	Horizontal	310°	0.380	4.340	6.374	Vertical
135°	0.937	26.359	14.209	Horizontal	315°	0.420	5.283	7.228	Horizontal
140°	0.921	25.445	14.056	Horizontal	320°	0.482	6.964	8.429	Horizontal
145°	0.902	24.408	13.875	Horizontal	325°	0.558	9.331	9.699	Horizontal
150°	0.881	23.282	13.670	Horizontal	330°	0.643	12.390	10.931	Horizontal
155°	0.861	22.222	13.468	Horizontal	335°	0.731	16.029	12.049	Horizontal
160°	0.845	21.441	13.312	Vertical	340°	0.816	19.980	13.006	Horizontal
165°	0.863	22.347	13.492	Vertical	345°	0.883	23.366	13.686	Horizontal
170°	0.888	23.664	13.741	Vertical	350°	0.931	26.018	14.153	Horizontal
175°	0.920	25.373	14.044	Vertical	355°	0.967	28.038	14.477	Horizontal

Horizontal Polarization:
Maximum: 3.054 (4.849 dB)
Horizontal Plane: 3.054 (4.849 dB)
Maximum ERP: 30.000 kW

Vertical Polarization:
Maximum: 3.054 (4.849 dB)
Horizontal Plane: 3.054 (4.849 dB)
Maximum ERP: 30.000 kW

Total Input Power: 9.823 kW
Reference: KYLF1M.FIG

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

ERI® Horizontal Plane Relative Field Pattern

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Figure# 1A **Date: 2/28/2012**
Station: KYLF **Antenna: MP-4C-DA**
Location: Adrian, MO. **Antenna Orientation: 107° True**
Frequency: 88.9 MHz **Number of Bays: 4**

Azimuth	Horizontal			Vertical			Azimuth	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.990	29.390	14.682	0.860	22.209	13.465	180°	0.797	19.038	12.796	0.950	27.062	14.324
5°	1.000	29.974	14.767	0.904	24.531	13.897	185°	0.791	18.794	12.740	0.973	28.419	14.536
10°	0.998	29.859	14.751	0.939	26.469	14.227	190°	0.789	18.673	12.712	0.990	29.374	14.680
15°	0.987	29.237	14.659	0.965	27.957	14.465	195°	0.789	18.679	12.714	0.998	29.902	14.757
20°	0.969	28.176	14.499	0.982	28.949	14.616	200°	0.792	18.795	12.740	0.999	29.945	14.763
25°	0.944	26.706	14.266	0.991	29.463	14.693	205°	0.796	19.009	12.790	0.988	29.262	14.663
30°	0.911	24.897	13.961	0.993	29.564	14.708	210°	0.803	19.324	12.861	0.962	27.784	14.438
35°	0.879	23.176	13.650	0.989	29.337	14.674	215°	0.811	19.740	12.954	0.925	25.652	14.091
40°	0.853	21.849	13.394	0.980	28.836	14.599	220°	0.821	20.206	13.055	0.877	23.063	13.629
45°	0.835	20.933	13.208	0.969	28.144	14.494	225°	0.829	20.608	13.140	0.821	20.230	13.060
50°	0.825	20.413	13.099	0.956	27.407	14.379	230°	0.835	20.915	13.205	0.761	17.392	12.404
55°	0.824	20.356	13.087	0.944	26.747	14.273	235°	0.839	21.121	13.247	0.702	14.773	11.695
60°	0.829	20.631	13.145	0.935	26.205	14.184	240°	0.841	21.220	13.268	0.646	12.517	10.975
65°	0.840	21.160	13.255	0.928	25.811	14.118	245°	0.837	20.995	13.221	0.597	10.709	10.298
70°	0.855	21.942	13.413	0.923	25.582	14.079	250°	0.819	20.129	13.038	0.560	9.393	9.728
75°	0.875	22.990	13.615	0.924	25.616	14.085	255°	0.787	18.601	12.695	0.533	8.532	9.311
80°	0.900	24.309	13.858	0.930	25.950	14.141	260°	0.741	16.487	12.171	0.517	8.033	9.049
85°	0.925	25.681	14.096	0.941	26.566	14.243	265°	0.681	13.905	11.432	0.509	7.784	8.912
90°	0.946	26.865	14.292	0.953	27.244	14.353	270°	0.606	11.027	10.425	0.506	7.675	8.851
95°	0.963	27.801	14.441	0.961	27.703	14.425	275°	0.529	8.394	9.239	0.501	7.543	8.776
100°	0.974	28.471	14.544	0.964	27.867	14.451	280°	0.463	6.430	8.082	0.487	7.119	8.524
105°	0.981	28.849	14.601	0.961	27.706	14.426	285°	0.411	5.070	7.050	0.459	6.331	8.015
110°	0.981	28.859	14.603	0.953	27.254	14.354	290°	0.374	4.188	6.220	0.423	5.356	7.288
115°	0.977	28.655	14.572	0.940	26.525	14.237	295°	0.351	3.687	5.667	0.393	4.628	6.654
120°	0.971	28.296	14.517	0.923	25.533	14.071	300°	0.342	3.505	5.447	0.376	4.246	6.279
125°	0.962	27.791	14.439	0.900	24.305	13.857	305°	0.349	3.650	5.623	0.373	4.181	6.213
130°	0.951	27.143	14.337	0.877	23.092	13.635	310°	0.375	4.211	6.243	0.380	4.340	6.374
135°	0.937	26.359	14.209	0.859	22.119	13.448	315°	0.420	5.283	7.228	0.395	4.681	6.703
140°	0.921	25.445	14.056	0.845	21.413	13.307	320°	0.482	6.964	8.429	0.417	5.217	7.174
145°	0.902	24.408	13.875	0.836	20.966	13.215	325°	0.558	9.331	9.699	0.446	5.978	7.766
150°	0.881	23.282	13.670	0.832	20.775	13.175	330°	0.643	12.390	10.931	0.483	7.002	8.452
155°	0.861	22.222	13.468	0.835	20.921	13.206	335°	0.731	16.029	12.049	0.537	8.647	9.369
160°	0.843	21.307	13.285	0.845	21.441	13.312	340°	0.816	19.980	13.006	0.605	10.992	10.411
165°	0.827	20.536	13.125	0.863	22.347	13.492	345°	0.883	23.366	13.686	0.676	13.719	11.373
170°	0.815	19.905	12.990	0.888	23.664	13.741	350°	0.931	26.018	14.153	0.746	16.702	12.228
175°	0.804	19.407	12.880	0.920	25.373	14.044	355°	0.967	28.038	14.477	0.808	19.583	12.919

Horizontal Polarization:
Maximum: 3.054 (4.849 dB)
Horizontal Plane: 3.054 (4.849 dB)
Maximum ERP: 30.000 kW

Vertical Polarization:
Maximum: 3.054 (4.849 dB)
Horizontal Plane: 3.054 (4.849 dB)
Maximum ERP: 30.000 kW

Total Input Power: 9.823 kW
Reference: KYLF1M.FIG

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

ERI® Vertical Plane Relative Field Pattern

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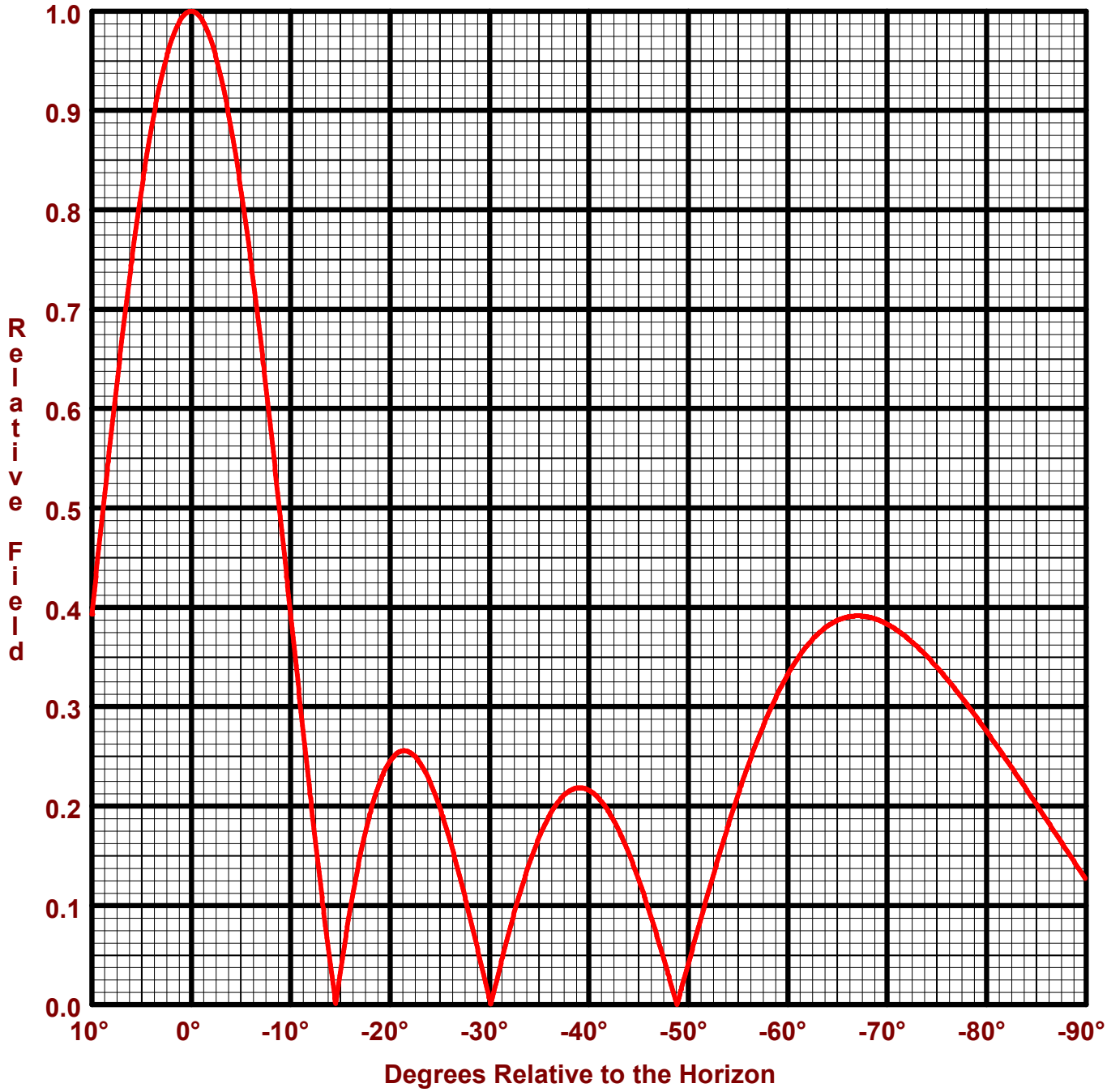
Figure No: 3
Call Sign: KYLF
Location: Adrian, MO.
Frequency: 88.9 MHz
4 bay MP-4C-DA antenna

Date: 2/28/2012
H/V Power Ratio: 1
1 Wave-length Spacing
0° Beam Tilt
0% First Null Fill



Horizontal Polarization:
Maximum: 3.054 (4.849 dB)
Horizontal Plane: 3.054 (4.849 dB)
Maximum ERP: 30.000 kW

Vertical Polarization:
Maximum: 3.054 (4.849 dB)
Horizontal Plane: 3.054 (4.849 dB)
Maximum ERP: 30.000 kW

Directional Antenna System
for
KYLF, Adrian, Missouri

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	MP-4C-DA
Frequency:	88.9 MHz
Number of Bays:	Four

MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	37 ft 2 in
Aperture length required:	53 ft
Orientation:	107° true

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

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	30.000 kW (14.771 dBk)
Horizontal maximum power gain:	3.054 (4.849 dB)
Maximum vertical ERP:	30.000 kW (14.771 dBk)
Vertical maximum power gain:	3.054 (4.849 dB)
Total input power:	9.823 kW (9.922 dBk)