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 KBYS, Lake Charles, Louisiana

December 4, 2015

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 KBYS.

The antenna is the ERI model LP-4E-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 one vertical parasitic element per bay. The antenna was mounted on the North 90 degrees East tower face with bracketry to provide an antenna orientation of North 90 degrees East. The antenna was tested on a 10' square tower, 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 KBYS.

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
KBYS, Lake Charles, Louisiana

(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 10' square 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.

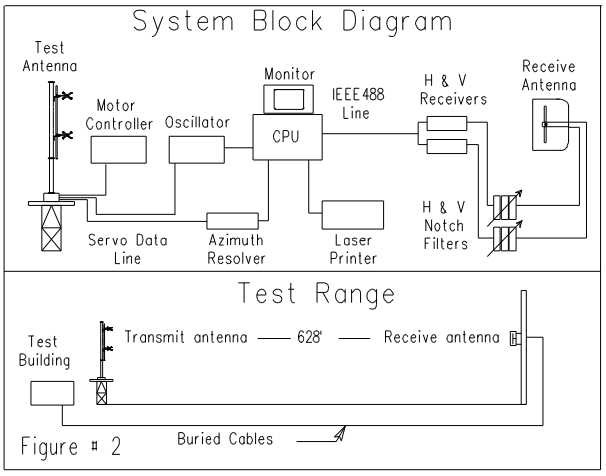

Figure # 2

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 88.3 MHz and was constantly monitored by a Rohde & Schwarz ESVD measuring receiver.

Directional Antenna System
For
KBYS, Lake Charles, Louisiana

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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 one vertical parasitic element per bay. The power distribution and phase relationship will be fixed when the antenna is manufactured. Proper maintenance of the elements should be all that is required to maintain the pattern in adjustment.

The LP-4E-DA array is to be mounted on the North 90 degrees East tower face of the 10' square tower at a bearing of North 90 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. A calculated vertical plane relative field pattern is shown on Figure #3 attached. The power in the maximum will reach 4 kilowatts (6.021 dBk).

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The power at North 240-270 degrees East does not exceed 0.130 kilowatts (-8.861 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 48 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.

ERI® Horizontal Plane Relative Field Pattern

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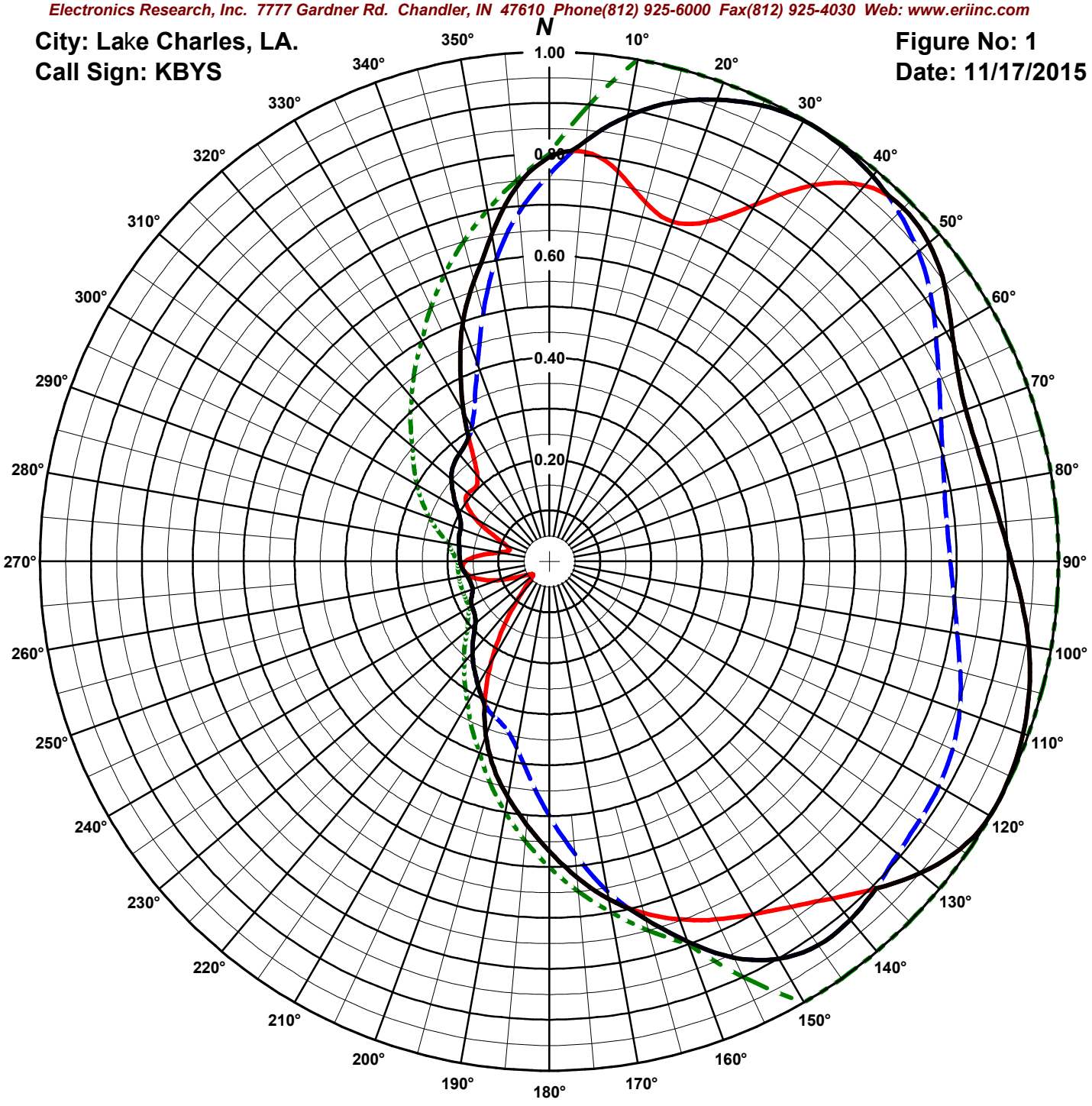
City: Lake Charles, LA.
Call Sign: KBYS

Figure No: 1
Date: 11/17/2015



Antenna Orientation: 90° True

Frequency: 88.3 MHz
Antenna Type: LP-4E-DA

Antenna Mounting: Custom
Tower Type: 10' SquareTower

HORIZONTAL	VERTICAL	COMPOSITE	FCC ENVELOPE
RMS: .653	RMS: .65	RMS: .686	RMS: .735
Maximum: 1 @ 118°	Maximum: 1 @ 31°	Maximum: 1 @ 31°	Maximum: 1 @ 10°
Minimum: .041 @ 231°	Minimum: .159 @ 253°	Minimum: .159 @ 253°	Minimum: .18 @ 240°

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 BPED-20150226ABQ.

ERI® Horizontal Plane Relative Field Pattern

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Figure# 1 **Date: 11/17/2015**
Station: KBYS **Antenna: LP-4E-DA**
Location: Lake Charles, LA. **Antenna Orientation: 90° True**
Frequency: 88.3 MHz **Number of Bays: 4**

Azimuth	Envelope			Polarization	Azimuth	Envelope			Polarization
	Field	kW	dBk	Maximum		Field	kW	dBk	Maximum
0°	0.794	2.521	4.015	Horizontal	180°	0.569	1.296	1.125	Horizontal
5°	0.829	2.752	4.396	Vertical	185°	0.518	1.073	0.305	Horizontal
10°	0.888	3.152	4.985	Vertical	190°	0.470	0.883	-0.539	Horizontal
15°	0.933	3.481	5.417	Vertical	195°	0.421	0.707	-1.504	Horizontal
20°	0.964	3.719	5.704	Vertical	200°	0.364	0.530	-2.758	Horizontal
25°	0.987	3.900	5.911	Vertical	205°	0.304	0.371	-4.309	Vertical
30°	0.999	3.995	6.016	Vertical	210°	0.280	0.314	-5.035	Vertical
35°	0.997	3.977	5.996	Vertical	215°	0.257	0.264	-5.778	Vertical
40°	0.987	3.898	5.908	Vertical	220°	0.235	0.220	-6.568	Vertical
45°	0.982	3.857	5.863	Horizontal	225°	0.211	0.178	-7.498	Vertical
50°	0.973	3.784	5.780	Horizontal	230°	0.189	0.144	-8.431	Vertical
55°	0.947	3.589	5.549	Horizontal	235°	0.179	0.129	-8.900	Vertical
60°	0.912	3.328	5.222	Horizontal	240°	0.176	0.124	-9.082	Vertical
65°	0.884	3.129	4.954	Horizontal	245°	0.168	0.113	-9.450	Vertical
70°	0.870	3.030	4.814	Horizontal	250°	0.160	0.103	-9.875	Vertical
75°	0.869	3.022	4.803	Horizontal	255°	0.160	0.102	-9.914	Vertical
80°	0.876	3.069	4.871	Horizontal	260°	0.164	0.108	-9.679	Vertical
85°	0.889	3.160	4.997	Horizontal	265°	0.171	0.117	-9.335	Vertical
90°	0.907	3.294	5.177	Horizontal	270°	0.175	0.123	-9.115	Vertical
95°	0.932	3.471	5.405	Horizontal	275°	0.177	0.125	-9.023	Vertical
100°	0.956	3.657	5.631	Horizontal	280°	0.180	0.130	-8.872	Vertical
105°	0.976	3.809	5.808	Horizontal	285°	0.184	0.135	-8.705	Vertical
110°	0.990	3.919	5.932	Horizontal	290°	0.185	0.138	-8.615	Vertical
115°	0.998	3.984	6.003	Horizontal	295°	0.193	0.149	-8.282	Vertical
120°	0.999	3.994	6.015	Horizontal	300°	0.209	0.175	-7.571	Vertical
125°	0.985	3.877	5.885	Horizontal	305°	0.230	0.212	-6.740	Vertical
130°	0.952	3.624	5.592	Horizontal	310°	0.251	0.252	-5.992	Vertical
135°	0.908	3.300	5.185	Horizontal	315°	0.266	0.284	-5.467	Vertical
140°	0.919	3.378	5.286	Vertical	320°	0.275	0.303	-5.192	Vertical
145°	0.920	3.387	5.298	Vertical	325°	0.284	0.323	-4.903	Vertical
150°	0.901	3.247	5.115	Vertical	330°	0.336	0.452	-3.450	Horizontal
155°	0.858	2.947	4.694	Vertical	335°	0.414	0.684	-1.648	Horizontal
160°	0.794	2.525	4.022	Vertical	340°	0.497	0.989	-0.048	Horizontal
165°	0.726	2.110	3.242	Vertical	345°	0.570	1.299	1.138	Horizontal
170°	0.674	1.814	2.587	Horizontal	350°	0.651	1.696	2.294	Horizontal
175°	0.622	1.550	1.903	Horizontal	355°	0.738	2.177	3.378	Horizontal

Horizontal Polarization:
Maximum: 4.775 (6.789 dB)
Horizontal Plane: 4.775 (6.789 dB)
Maximum ERP: 4.000 kW

Vertical Polarization:
Maximum: 4.775 (6.789 dB)
Horizontal Plane: 4.775 (6.789 dB)
Maximum ERP: 4.000 kW

Total Input Power: 0.838 kW
Reference: KBYS1M.FIG
This list shows the the maximum azimuth values of either the horizontal or vertical components.

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

Figure# 1A **Date: 11/17/2015**
Station: KBYS **Antenna: LP-4E-DA**
Location: Lake Charles, LA. **Antenna Orientation: 90° True**
Frequency: 88.3 MHz **Number of Bays: 4**

Azimuth	Horizontal			Vertical			Azimuth	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.794	2.521	4.015	0.759	2.307	3.631	180°	0.569	1.296	1.125	0.499	0.998	-0.009
5°	0.807	2.604	4.156	0.829	2.752	4.396	185°	0.518	1.073	0.305	0.429	0.737	-1.328
10°	0.777	2.415	3.830	0.888	3.152	4.985	190°	0.470	0.883	-0.539	0.371	0.550	-2.594
15°	0.730	2.129	3.281	0.933	3.481	5.417	195°	0.421	0.707	-1.504	0.337	0.454	-3.425
20°	0.710	2.014	3.040	0.964	3.719	5.704	200°	0.364	0.530	-2.758	0.322	0.416	-3.812
25°	0.736	2.166	3.357	0.987	3.900	5.911	205°	0.299	0.358	-4.461	0.304	0.371	-4.309
30°	0.808	2.613	4.172	0.999	3.995	6.016	210°	0.228	0.207	-6.834	0.280	0.314	-5.035
35°	0.901	3.246	5.114	0.997	3.977	5.996	215°	0.155	0.097	-10.151	0.257	0.264	-5.778
40°	0.963	3.709	5.693	0.987	3.898	5.908	220°	0.094	0.035	-14.558	0.235	0.220	-6.568
45°	0.982	3.857	5.863	0.970	3.764	5.756	225°	0.055	0.012	-19.128	0.211	0.178	-7.498
50°	0.973	3.784	5.780	0.946	3.577	5.536	230°	0.041	0.007	-21.691	0.189	0.144	-8.431
55°	0.947	3.589	5.549	0.914	3.343	5.242	235°	0.044	0.008	-21.089	0.179	0.129	-8.900
60°	0.912	3.328	5.222	0.877	3.075	4.879	240°	0.055	0.012	-19.110	0.176	0.124	-9.082
65°	0.884	3.129	4.954	0.844	2.849	4.547	245°	0.077	0.024	-16.267	0.168	0.113	-9.450
70°	0.870	3.030	4.814	0.818	2.678	4.278	250°	0.108	0.047	-13.305	0.160	0.103	-9.875
75°	0.869	3.022	4.803	0.800	2.558	4.078	255°	0.139	0.077	-11.143	0.160	0.102	-9.914
80°	0.876	3.069	4.871	0.788	2.485	3.953	260°	0.160	0.102	-9.902	0.164	0.108	-9.679
85°	0.889	3.160	4.997	0.784	2.458	3.906	265°	0.170	0.116	-9.346	0.171	0.117	-9.335
90°	0.907	3.294	5.177	0.788	2.481	3.947	270°	0.165	0.108	-9.651	0.175	0.123	-9.115
95°	0.932	3.471	5.405	0.797	2.543	4.054	275°	0.136	0.074	-11.308	0.177	0.125	-9.023
100°	0.956	3.657	5.631	0.813	2.646	4.226	280°	0.100	0.040	-14.001	0.180	0.130	-8.872
105°	0.976	3.809	5.808	0.835	2.792	4.459	285°	0.082	0.027	-15.753	0.184	0.135	-8.705
110°	0.990	3.919	5.932	0.858	2.941	4.686	290°	0.090	0.032	-14.939	0.185	0.138	-8.615
115°	0.998	3.984	6.003	0.873	3.052	4.846	295°	0.122	0.059	-12.256	0.193	0.149	-8.282
120°	0.999	3.994	6.015	0.883	3.121	4.943	300°	0.167	0.112	-9.503	0.209	0.175	-7.571
125°	0.985	3.877	5.885	0.887	3.147	4.979	305°	0.199	0.158	-8.002	0.230	0.212	-6.740
130°	0.952	3.624	5.592	0.894	3.194	5.043	310°	0.208	0.173	-7.613	0.251	0.252	-5.992
135°	0.908	3.300	5.185	0.907	3.292	5.174	315°	0.205	0.168	-7.734	0.266	0.284	-5.467
140°	0.864	2.986	4.750	0.919	3.378	5.286	320°	0.220	0.193	-7.140	0.275	0.303	-5.192
145°	0.828	2.742	4.381	0.920	3.387	5.298	325°	0.265	0.280	-5.522	0.284	0.323	-4.903
150°	0.800	2.563	4.087	0.901	3.247	5.115	330°	0.336	0.452	-3.450	0.304	0.370	-4.314
155°	0.776	2.407	3.814	0.858	2.947	4.694	335°	0.414	0.684	-1.648	0.346	0.480	-3.187
160°	0.748	2.238	3.498	0.794	2.525	4.022	340°	0.497	0.989	-0.048	0.412	0.680	-1.677
165°	0.715	2.044	3.104	0.726	2.110	3.242	345°	0.570	1.299	1.138	0.502	1.010	0.043
170°	0.674	1.814	2.587	0.658	1.730	2.381	350°	0.651	1.696	2.294	0.601	1.444	1.597
175°	0.622	1.550	1.903	0.577	1.333	1.247	355°	0.738	2.177	3.378	0.688	1.891	2.768

Horizontal Polarization:
Maximum: 4.775 (6.789 dB)
Horizontal Plane: 4.775 (6.789 dB)
Maximum ERP: 4.000 kW

Vertical Polarization:
Maximum: 4.775 (6.789 dB)
Horizontal Plane: 4.775 (6.789 dB)
Maximum ERP: 4.000 kW

Total Input Power: 0.838 kW
Reference: KBYS1M.FIG
This list shows the azimuth values for the horizontal and vertical components.

Vertical Plane Relative Field Pattern

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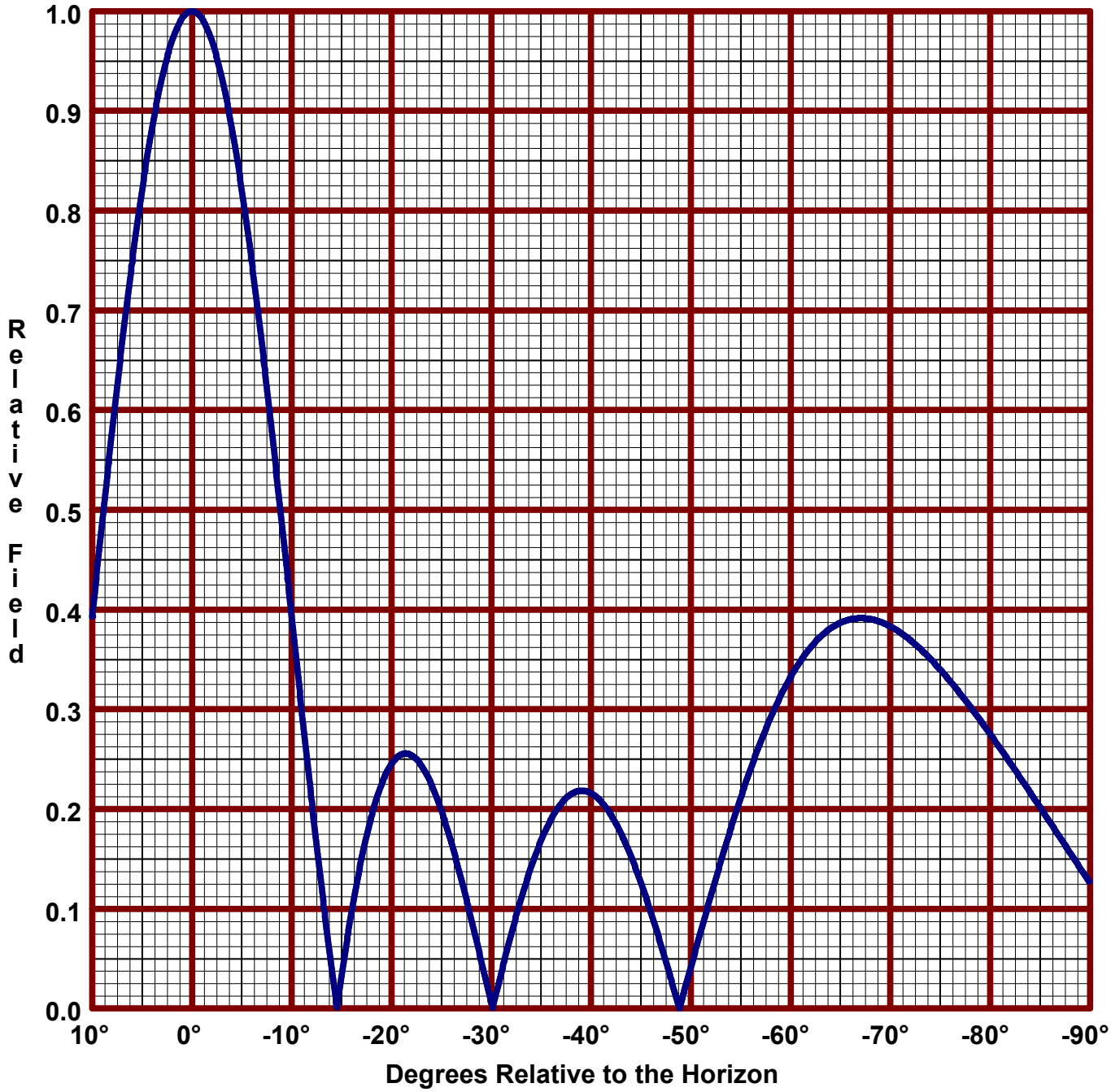
Figure No: 3
Call Sign: KBYS
Location: Lake Charles, LA.
Frequency: 88.3 MHz
Antenna: 4 bay LP-4E-DA

Date: 11/17/2015
H/V Power Ratio: 1
1 Wave-length Spacing
0° Beam Tilt
0% First Null Fill



Horizontal Polarization:
Maximum: 4.775 (6.789 dB)
Horizontal Plane: 4.775 (6.789 dB)
Maximum ERP: 4.000 kW

Vertical Polarization:
Maximum: 4.775 (6.789 dB)
Horizontal Plane: 4.775 (6.789 dB)
Maximum ERP: 4.000 kW

Directional Antenna System
for
KBYS, Lake Charles, Louisiana

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	LP-4E-DA
Frequency:	88.3 MHz
Number of Bays:	Four

MECHANICAL SPECIFICATIONS

Mounting:	Custom
System length:	42 ft 2 in
Aperture length required:	48 ft 4 in
Orientation:	90° true

Input flange to the antenna 1 5/8” female.

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	4.000 kW (6.021 dBk)
Horizontal maximum power gain:	4.775 (6.789 dB)
Maximum vertical ERP:	4.000 kW (6.021 dBk)
Vertical maximum power gain:	4.775 (6.789 dB)
Total input power:	0.838 kW (-0.767 dBk)