

Directional Antenna System for KVST, Huntsville, Texas

November 2, 2016

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 KVST.

The antenna is the ERI model LP-6E-DA-HW configuration. The circular polarized system consists of 6 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 250 degrees East tower leg with bracketry to provide an antenna orientation of North 250 degrees East. The antenna was tested on a 24" **ERI**[®] **MOUNTING SYSTEM**, tower, which is the structure the station, plans to use to support the array. All tests were performed on a frequency of 99.7 megahertz, which is the center of the FM broadcast channel assigned to KVST.

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 KVST, Huntsville, Texas

(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.

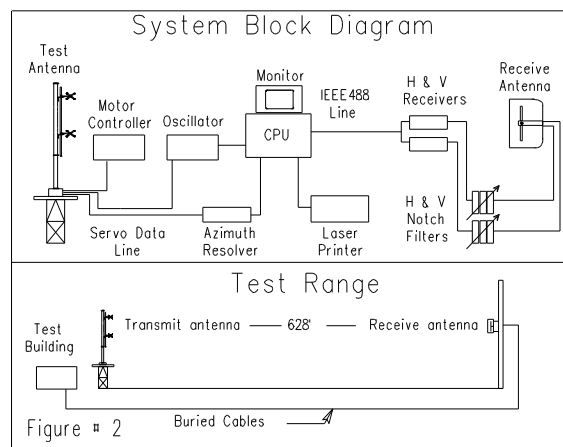
The power distribution and phase relationship to the antenna elements was adjusted in order to achieve the directional radiation patterns for both horizontal and vertical polarization components.

The proof-of-performance was accomplished using a 24" **ERI[®] λ MOUNTING SYSTEM**, 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 99.7 MHz and was constantly monitored by a Rohde & Schwarz ESVD measuring receiver.

A broadband horizontal and vertical dipole system, located approximately 628 feet from the test antenna, was used to receive the emitted test signals.



Directional Antenna System For KVST, Huntsville, Texas

(Continued)

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 6 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 the antenna is manufactured. Proper maintenance of the elements should be all that is required to maintain the pattern in adjustment.

The LP-6E-DA-HW array is to be mounted on the North 250 degrees East tower leg of the 24" **ERI**[®] **λ MOUNTING SYSTEM**, tower at a bearing of North 250 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 10.5 kilowatts (10.212 dBk).

Directional Antenna System
For
KVST, Huntsville, Texas

(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 than 85% of the filed composite pattern.

The clear vertical length of the structure required to support the antenna is 39 feet 7 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.

A handwritten signature in black ink, appearing to read "Tom Schaefer". The signature is fluid and cursive, with the first name "Tom" and last name "Schaefer" clearly distinguishable.

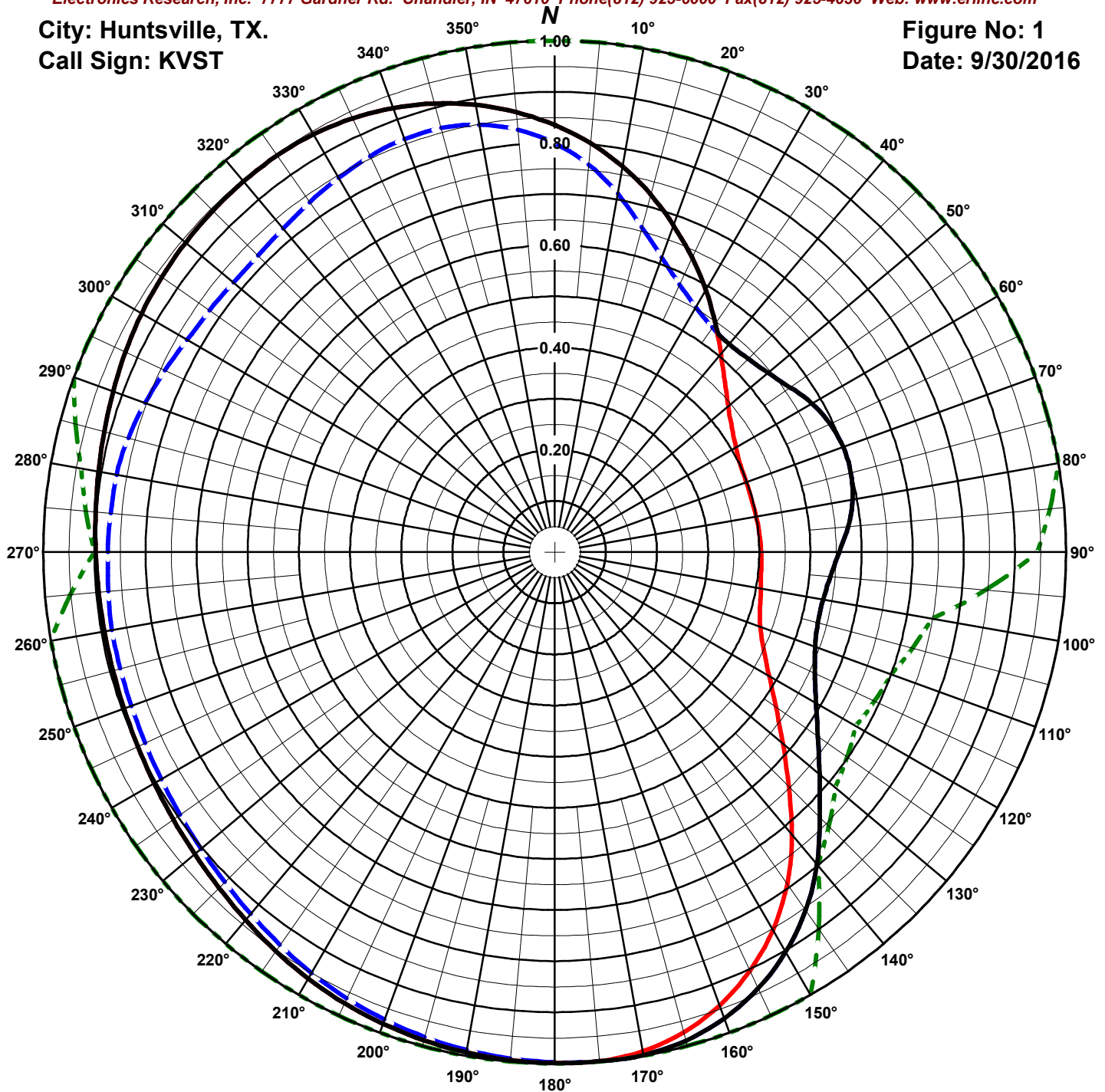
The Microsoft Word document on file electronically at Electronic Research, Inc. governs the specifications, scope, and configuration of the product described. All other representations whether verbal, printed, or electronic are subordinate to the master copy of this document on file at ERI.

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: Huntsville, TX.
Call Sign: KVST

Figure No: 1
Date: 9/30/2016



Antenna Orientation: 250° True

Frequency: 99.7 MHz

Antenna Type: LP-6E-DA-HW

Antenna Mounting: Custom

Tower Type: 24" Lambda

HORIZONTAL

RMS: .798

Maximum: 1 @ 176°

Minimum: .399 @ 71°

VERTICAL

RMS: .796

Maximum: 1 @ 172°

Minimum: .531 @ 40°

COMPOSITE

RMS: .825

Maximum: 1 @ 172°

Minimum: .531 @ 40°

FCC ENVELOPE

RMS: .961

Maximum: 1 @ 0°

Minimum: .68 @ 120°

Measured patterns of the horizontal and vertical components. The composite pattern shows the maximum of either the H or V azimuth values. This pattern is greater than 85% of the FCC filed composite pattern BMPH-20161021ABL

ERI® Horizontal Plane Relative Field Pattern

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Figure# 1

Date: 9/30/2016

Station: KVST

Antenna: LP-6E-DA-HW

Location: Huntsville, TX.

Antenna Orientation: 250° True

Frequency: 99.7 MHz

Number of Bays: 6

Azimuth	Envelope			Polarization	Azimuth	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.835	7.321	8.646	Horizontal	180°	0.999	10.487	10.207	Horizontal
5°	0.802	6.760	8.299	Horizontal	185°	0.997	10.442	10.188	Horizontal
10°	0.765	6.153	7.891	Horizontal	190°	0.994	10.364	10.155	Horizontal
15°	0.724	5.510	7.412	Horizontal	195°	0.988	10.255	10.109	Horizontal
20°	0.679	4.843	6.852	Horizontal	200°	0.981	10.115	10.050	Horizontal
25°	0.636	4.244	6.277	Horizontal	205°	0.973	9.944	9.975	Horizontal
30°	0.591	3.674	5.651	Horizontal	210°	0.963	9.743	9.887	Horizontal
35°	0.547	3.143	4.973	Horizontal	215°	0.952	9.513	9.783	Horizontal
40°	0.531	2.960	4.712	Vertical	220°	0.939	9.267	9.669	Horizontal
45°	0.535	3.003	4.775	Vertical	225°	0.928	9.049	9.566	Horizontal
50°	0.545	3.120	4.941	Vertical	230°	0.919	8.863	9.476	Horizontal
55°	0.562	3.315	5.205	Vertical	235°	0.911	8.709	9.400	Horizontal
60°	0.581	3.544	5.495	Vertical	240°	0.904	8.586	9.338	Horizontal
65°	0.594	3.703	5.686	Vertical	245°	0.899	8.492	9.290	Horizontal
70°	0.600	3.784	5.779	Vertical	250°	0.896	8.428	9.257	Horizontal
75°	0.599	3.773	5.767	Vertical	255°	0.894	8.393	9.239	Horizontal
80°	0.591	3.671	5.648	Vertical	260°	0.894	8.389	9.237	Horizontal
85°	0.576	3.488	5.426	Vertical	265°	0.895	8.411	9.249	Horizontal
90°	0.556	3.250	5.118	Vertical	270°	0.897	8.455	9.271	Horizontal
95°	0.541	3.077	4.882	Vertical	275°	0.901	8.522	9.306	Horizontal
100°	0.533	2.985	4.750	Vertical	280°	0.906	8.612	9.351	Horizontal
105°	0.533	2.980	4.742	Vertical	285°	0.912	8.724	9.407	Horizontal
110°	0.542	3.088	4.897	Vertical	290°	0.919	8.860	9.475	Horizontal
115°	0.561	3.310	5.198	Vertical	295°	0.926	9.006	9.545	Horizontal
120°	0.590	3.656	5.630	Vertical	300°	0.932	9.130	9.605	Horizontal
125°	0.628	4.146	6.176	Vertical	305°	0.938	9.232	9.653	Horizontal
130°	0.676	4.800	6.813	Vertical	310°	0.942	9.311	9.690	Horizontal
135°	0.734	5.650	7.520	Vertical	315°	0.945	9.367	9.716	Horizontal
140°	0.798	6.688	8.253	Vertical	320°	0.946	9.400	9.731	Horizontal
145°	0.855	7.684	8.856	Vertical	325°	0.946	9.406	9.734	Horizontal
150°	0.903	8.566	9.328	Vertical	330°	0.943	9.340	9.703	Horizontal
155°	0.941	9.307	9.688	Vertical	335°	0.936	9.191	9.634	Horizontal
160°	0.970	9.883	9.949	Vertical	340°	0.924	8.962	9.524	Horizontal
165°	0.989	10.276	10.118	Vertical	345°	0.908	8.656	9.373	Horizontal
170°	0.999	10.476	10.202	Vertical	350°	0.888	8.276	9.178	Horizontal
175°	1.000	10.492	10.208	Vertical	355°	0.864	7.830	8.937	Horizontal

Horizontal Polarization:

Maximum: 2.860 (4.564 dB)

Horizontal Plane: 2.860 (4.564 dB)

Maximum ERP: 10.500 kW

Vertical Polarization:

Maximum: 2.860 (4.564 dB)

Horizontal Plane: 2.860 (4.564 dB)

Maximum ERP: 10.500 kW

Total Input Power: 3.671 kW

Reference: KVST2M.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: 9/30/2016

Station: KVST

Antenna: LP-6E-DA-HW

Location: Huntsville, TX.

Antenna Orientation: 250° True

Frequency: 99.7 MHz

Number of Bays: 6

Azimuth	Horizontal			Vertical			Azimuth	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.835	7.321	8.646	0.800	6.717	8.272	180°	0.999	10.487	10.207	0.998	10.450	10.191
5°	0.802	6.760	8.299	0.761	6.076	7.836	185°	0.997	10.442	10.188	0.994	10.373	10.159
10°	0.765	6.153	7.891	0.712	5.320	7.259	190°	0.994	10.364	10.155	0.989	10.261	10.112
15°	0.724	5.510	7.412	0.658	4.546	6.576	195°	0.988	10.255	10.109	0.982	10.116	10.050
20°	0.679	4.843	6.852	0.613	3.946	5.961	200°	0.981	10.115	10.050	0.973	9.938	9.973
25°	0.636	4.244	6.277	0.578	3.506	5.448	205°	0.973	9.944	9.975	0.962	9.727	9.880
30°	0.591	3.674	5.651	0.552	3.204	5.057	210°	0.963	9.743	9.887	0.950	9.485	9.771
35°	0.547	3.143	4.973	0.537	3.025	4.808	215°	0.952	9.513	9.783	0.937	9.215	9.645
40°	0.506	2.686	4.291	0.531	2.960	4.712	220°	0.939	9.267	9.669	0.924	8.960	9.523
45°	0.471	2.327	3.667	0.535	3.003	4.775	225°	0.928	9.049	9.566	0.912	8.741	9.416
50°	0.443	2.061	3.141	0.545	3.120	4.941	230°	0.919	8.863	9.476	0.903	8.556	9.323
55°	0.423	1.881	2.743	0.562	3.315	5.205	235°	0.911	8.709	9.400	0.895	8.405	9.245
60°	0.409	1.757	2.449	0.581	3.544	5.495	240°	0.904	8.586	9.338	0.888	8.286	9.184
65°	0.401	1.690	2.278	0.594	3.703	5.686	245°	0.899	8.492	9.290	0.884	8.199	9.138
70°	0.399	1.670	2.226	0.600	3.784	5.779	250°	0.896	8.428	9.257	0.881	8.143	9.108
75°	0.399	1.671	2.230	0.599	3.773	5.767	255°	0.894	8.393	9.239	0.879	8.119	9.095
80°	0.400	1.681	2.255	0.591	3.671	5.648	260°	0.894	8.389	9.237	0.879	8.115	9.093
85°	0.402	1.698	2.298	0.576	3.488	5.426	265°	0.895	8.411	9.249	0.876	8.060	9.063
90°	0.404	1.712	2.334	0.556	3.250	5.118	270°	0.897	8.455	9.271	0.873	8.011	9.037
95°	0.405	1.725	2.369	0.541	3.077	4.882	275°	0.901	8.522	9.306	0.872	7.976	9.018
100°	0.409	1.760	2.456	0.533	2.985	4.750	280°	0.906	8.612	9.351	0.870	7.945	9.001
105°	0.415	1.812	2.581	0.533	2.980	4.742	285°	0.912	8.724	9.407	0.863	7.815	8.929
110°	0.428	1.923	2.839	0.542	3.088	4.897	290°	0.919	8.860	9.475	0.852	7.628	8.824
115°	0.451	2.135	3.293	0.561	3.310	5.198	295°	0.926	9.006	9.545	0.841	7.422	8.705
120°	0.484	2.463	3.914	0.590	3.656	5.630	300°	0.932	9.130	9.605	0.830	7.233	8.593
125°	0.528	2.929	4.667	0.628	4.146	6.176	305°	0.938	9.232	9.653	0.823	7.119	8.524
130°	0.582	3.562	5.517	0.676	4.800	6.813	310°	0.942	9.311	9.690	0.820	7.060	8.488
135°	0.647	4.398	6.432	0.734	5.650	7.520	315°	0.945	9.367	9.716	0.820	7.068	8.493
140°	0.722	5.472	7.381	0.798	6.688	8.253	320°	0.946	9.400	9.731	0.826	7.160	8.549
145°	0.793	6.601	8.196	0.855	7.684	8.856	325°	0.946	9.406	9.734	0.835	7.319	8.645
150°	0.853	7.648	8.835	0.903	8.566	9.328	330°	0.943	9.340	9.703	0.845	7.491	8.746
155°	0.904	8.572	9.331	0.941	9.307	9.688	335°	0.936	9.191	9.634	0.854	7.661	8.843
160°	0.943	9.341	9.704	0.970	9.883	9.949	340°	0.924	8.962	9.524	0.859	7.748	8.892
165°	0.972	9.929	9.969	0.989	10.276	10.118	345°	0.908	8.656	9.373	0.858	7.738	8.886
170°	0.991	10.317	10.135	0.999	10.476	10.202	350°	0.888	8.276	9.178	0.849	7.563	8.787
175°	1.000	10.491	10.208	1.000	10.492	10.208	355°	0.864	7.830	8.937	0.829	7.218	8.584

Horizontal Polarization:

Maximum: 2.860 (4.564 dB)

Horizontal Plane: 2.860 (4.564 dB)

Maximum ERP: 10.500 kW

Vertical Polarization:

Maximum: 2.860 (4.564 dB)

Horizontal Plane: 2.860 (4.564 dB)

Maximum ERP: 10.500 kW

Total Input Power: 3.671 kW

Reference: KVST2M.FIG

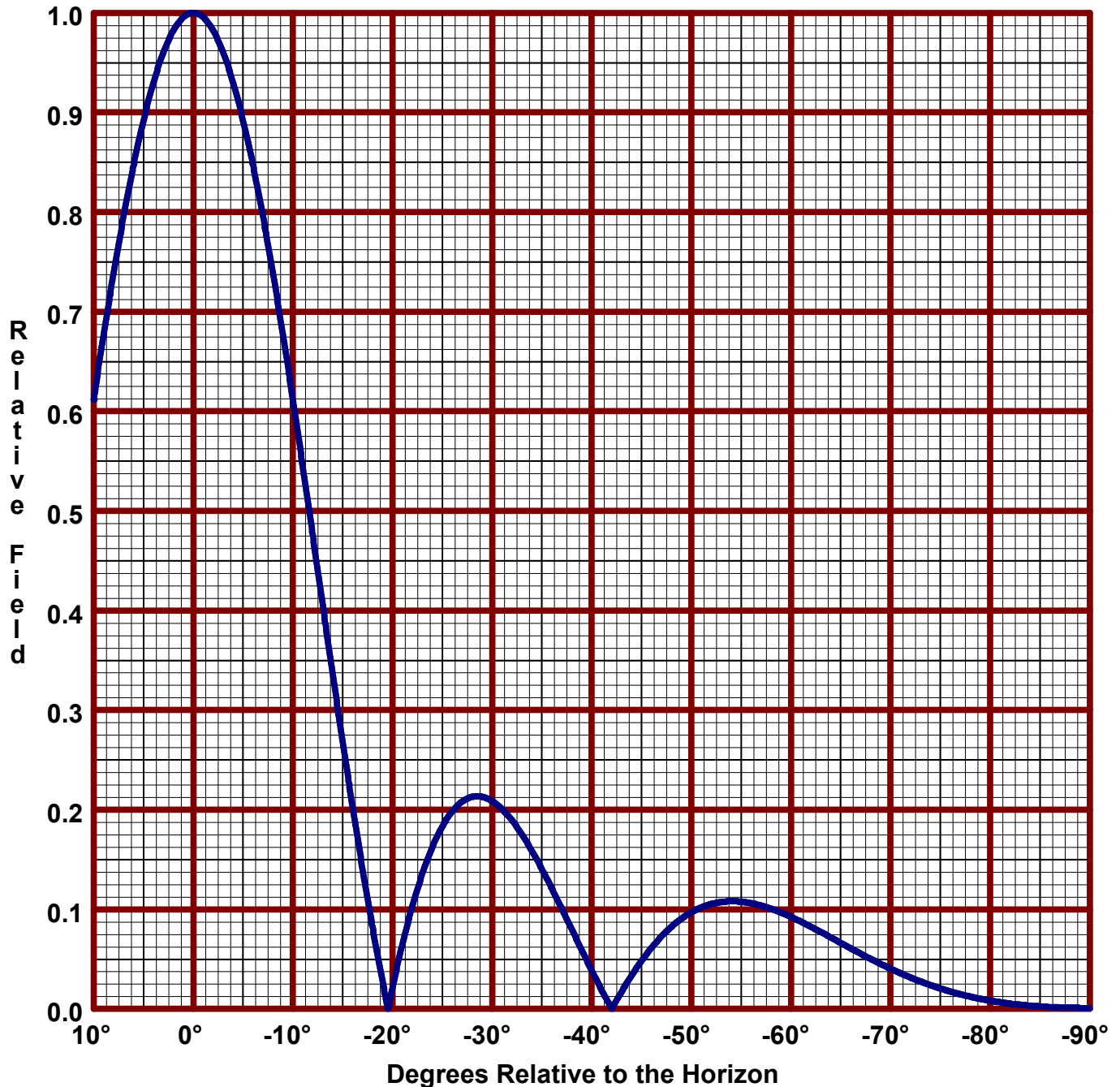
This list shows the azimuth values for the horizontal and vertical components.

ERI[®] Vertical Plane Relative Field Pattern

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Figure No: 3
Call Sign: KVST
Location: Huntsville, TX.
Frequency: 99.7 MHz
Antenna: 6 bay LP-6E-DA-HW

Date: 9/30/2016
H/V Power Ratio: 1
.5 Wave-length Spacing
0° Beam Tilt
0% First Null Fill



Horizontal Polarization:
Maximum: 2.860 (4.564 dB)
Horizontal Plane: 2.860 (4.564 dB)
Maximum ERP: 10.500 kW

Vertical Polarization:
Maximum: 2.860 (4.564 dB)
Horizontal Plane: 2.860 (4.564 dB)
Maximum ERP: 10.500 kW

Directional Antenna System for KVST, Huntsville, Texas

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type: LP-6E-DA-HW
Frequency: 99.7 MHz
Number of Bays: Six

MECHANICAL SPECIFICATIONS

Mounting: Custom
System length: 33 ft 2 in
Aperture length required: 39 ft 7 in
Orientation: 250° true
Input flange to the antenna 1 5/8" female.

ELECTRICAL SPECIFICATIONS (For directional use)

Maximum horizontal ERP: 10.500 kW (10.212 dBk)
Horizontal maximum power gain: 2.860 (4.564 dB)
Maximum vertical ERP: 10.500 kW (10.212 dBk)
Vertical maximum power gain: 2.860 (4.564 dB)
Total input power: 3.671 kW (5.648 dBk)

