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 WLZL, College Park, Maryland

January 6, 2014

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 WLZL.

The antenna is the ERI model 1183-6CP-COG-DA configuration. The circular polarized system consists of six 92" spaced bays using three driven circular polarized radiating elements per bay. The antenna was tested on a 20" o.d. pole, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 107.9 megahertz, which is the center of the FM broadcast channel assigned to WLZL. The antenna system is diplexed with station WNEW, Bowie, Maryland at 99.1 MHz as non-directional.

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
WLZL, College Park, Maryland

(Continued)

DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of one bay level of the circular polarized system. The elements and brackets that were used in this test are electrically equivalent to those that will be supplied with the 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 20" o.d. pole 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.

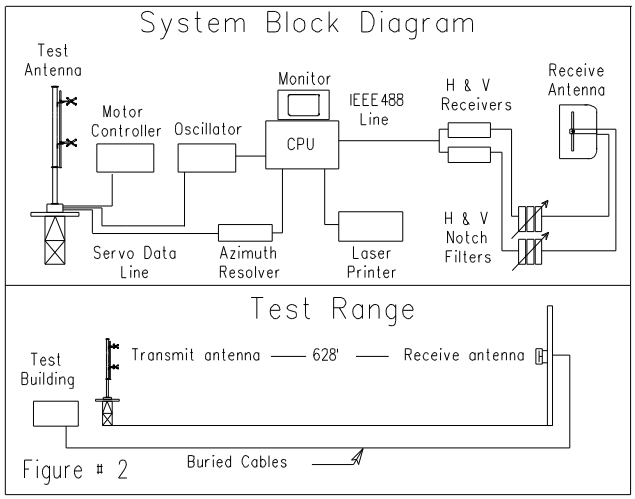

Figure # 2

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 107.9 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. The dipole system was mounted at the same height above terrain as the center of the antenna under test.

Directional Antenna System
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(Continued)

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 six 92" spaced bays using three driven circular polarized radiating 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 1183-6CP-COG-DA array is to be mounted on the 20" o.d. pole at a bearing of North 130 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 49 kilowatts (16.902 dBk).

The power at North 310-330 degrees East does not exceed 19 kilowatts (12.788 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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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 53 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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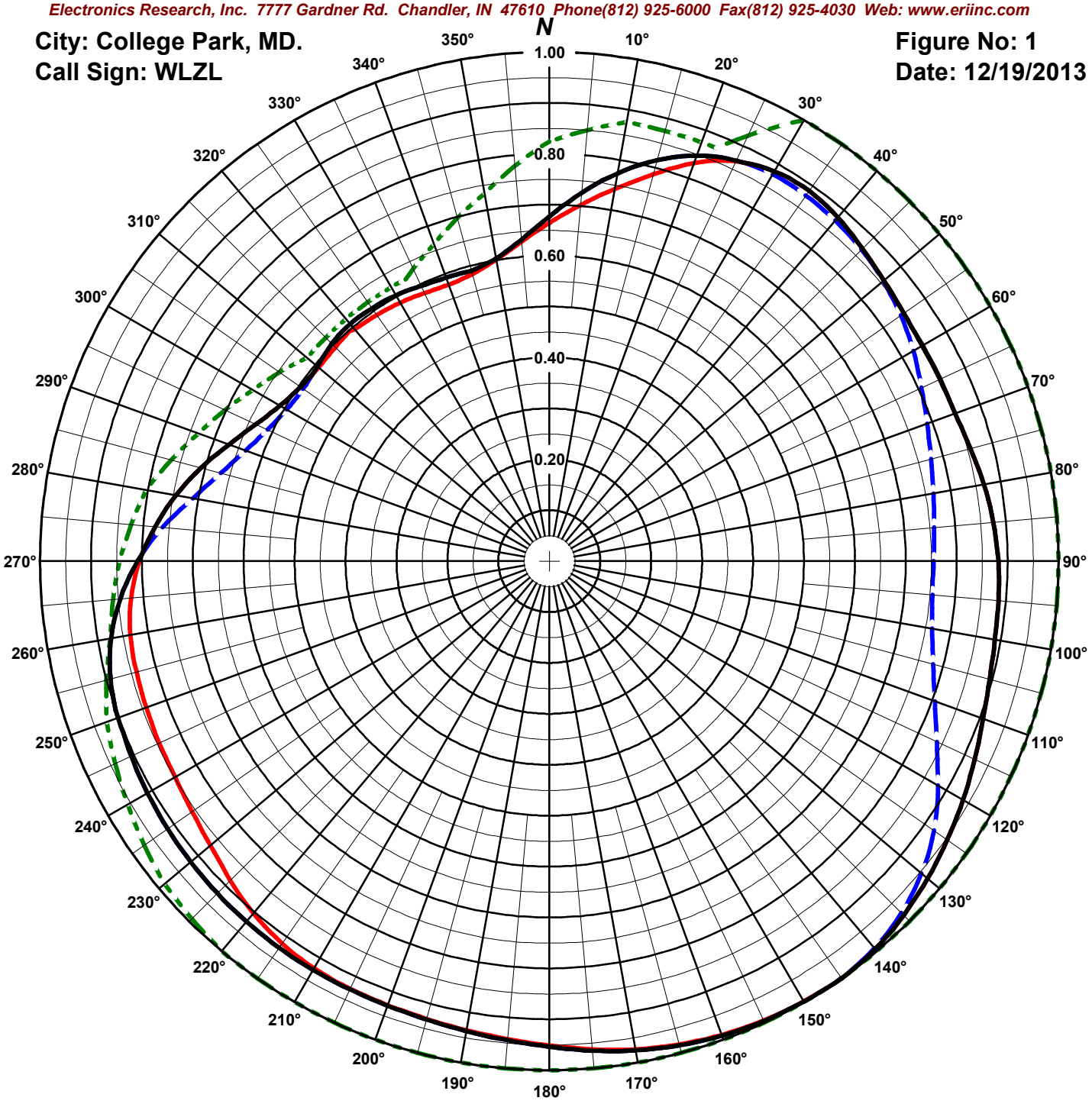
City: College Park, MD.
Call Sign: WLZL

Figure No: 1
Date: 12/19/2013



Antenna Orientation: 130° True

Frequency: 107.9 MHz
Antenna Type: 1183-6CP-COG-DA

Antenna Mounting: Custom
Tower Type: 20" Cogwheel

HORIZONTAL	VERTICAL	COMPOSITE	FCC ENVELOPE
RMS: .837	RMS: .828	RMS: .847	RMS: .915
Maximum: 1 @ 145°	Maximum: 1 @ 146°	Maximum: 1 @ 145°	Maximum: 1 @ 30°
Minimum: .578 @ 340°	Minimum: .59 @ 305°	Minimum: .591 @ 345°	Minimum: .621 @ 310°

Measured patterns of the horizontal and vertical components, with the composite maximum of either the the H or V components and the filed FCC envelope pattern BMPH-20131022ALD.

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# 1 **Date: 12/19/2013**
Station: WLZL **Antenna: 1183-6CP-COG-DA**
Location: College Park, MD. **Antenna Orientation: 130° True**
Frequency: 107.9 MHz **Number of Bays: 6**

Azimuth	Envelope			Polarization	Azimuth	Envelope			Polarization
	Field	kW	dBk	Maximum		Field	kW	dBk	Maximum
0°	0.677	22.443	13.511	Vertical	180°	0.954	44.581	16.492	Vertical
5°	0.726	25.827	14.121	Vertical	185°	0.945	43.722	16.407	Vertical
10°	0.774	29.327	14.673	Vertical	190°	0.937	43.055	16.340	Vertical
15°	0.815	32.565	15.128	Vertical	195°	0.932	42.577	16.292	Vertical
20°	0.847	35.192	15.464	Vertical	200°	0.929	42.284	16.262	Vertical
25°	0.868	36.927	15.673	Vertical	205°	0.928	42.175	16.251	Vertical
30°	0.884	38.298	15.832	Horizontal	210°	0.927	42.138	16.247	Vertical
35°	0.888	38.650	15.871	Horizontal	215°	0.926	42.041	16.237	Vertical
40°	0.881	38.065	15.805	Horizontal	220°	0.925	41.883	16.220	Vertical
45°	0.869	36.983	15.680	Horizontal	225°	0.922	41.664	16.198	Vertical
50°	0.858	36.033	15.567	Horizontal	230°	0.919	41.386	16.169	Vertical
55°	0.849	35.349	15.484	Horizontal	235°	0.915	41.049	16.133	Vertical
60°	0.846	35.047	15.446	Horizontal	240°	0.911	40.653	16.091	Vertical
65°	0.846	35.081	15.451	Horizontal	245°	0.906	40.199	16.042	Vertical
70°	0.848	35.270	15.474	Horizontal	250°	0.901	39.801	15.999	Vertical
75°	0.856	35.891	15.550	Horizontal	255°	0.892	38.985	15.909	Vertical
80°	0.867	36.794	15.658	Horizontal	260°	0.873	37.379	15.726	Vertical
85°	0.875	37.535	15.744	Horizontal	265°	0.846	35.032	15.445	Vertical
90°	0.882	38.097	15.809	Horizontal	270°	0.808	32.022	15.054	Vertical
95°	0.885	38.403	15.844	Horizontal	275°	0.777	29.562	14.707	Horizontal
100°	0.888	38.680	15.875	Horizontal	280°	0.745	27.161	14.339	Horizontal
105°	0.895	39.262	15.940	Horizontal	285°	0.708	24.538	13.898	Horizontal
110°	0.906	40.247	16.047	Horizontal	290°	0.670	21.971	13.418	Horizontal
115°	0.922	41.610	16.192	Horizontal	295°	0.635	19.787	12.964	Horizontal
120°	0.938	43.118	16.347	Horizontal	300°	0.611	18.267	12.617	Horizontal
125°	0.954	44.614	16.495	Horizontal	305°	0.596	17.423	12.411	Horizontal
130°	0.970	46.072	16.634	Horizontal	310°	0.594	17.308	12.382	Vertical
135°	0.984	47.404	16.758	Horizontal	315°	0.604	17.867	12.521	Vertical
140°	0.995	48.529	16.860	Horizontal	320°	0.608	18.118	12.581	Vertical
145°	1.000	49.000	16.902	Horizontal	325°	0.607	18.027	12.559	Vertical
150°	0.999	48.921	16.895	Vertical	330°	0.602	17.784	12.500	Vertical
155°	0.996	48.646	16.871	Vertical	335°	0.596	17.429	12.413	Vertical
160°	0.992	48.177	16.828	Vertical	340°	0.592	17.190	12.353	Vertical
165°	0.985	47.516	16.768	Vertical	345°	0.591	17.101	12.330	Vertical
170°	0.976	46.667	16.690	Vertical	350°	0.604	17.849	12.516	Vertical
175°	0.965	45.636	16.593	Vertical	355°	0.634	19.665	12.937	Vertical

Horizontal Polarization:
Maximum: 4.176 (6.208 dB)
Horizontal Plane: 4.176 (6.208 dB)
Maximum ERP: 49.000 kW

Vertical Polarization:
Maximum: 4.176 (6.208 dB)
Horizontal Plane: 4.176 (6.208 dB)
Maximum ERP: 49.000 kW

Total Input Power: 11.733 kW
Reference: WLZL1M.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: 12/19/2013**
Station: WLZL **Antenna: 1183-6CP-COG-DA**
Location: College Park, MD. **Antenna Orientation: 130° True**
Frequency: 107.9 MHz **Number of Bays: 6**

Azimuth	Horizontal			Vertical			Azimuth	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.664	21.623	13.349	0.677	22.443	13.511	180°	0.951	44.354	16.469	0.954	44.581	16.492
5°	0.702	24.159	13.831	0.726	25.827	14.121	185°	0.942	43.527	16.388	0.945	43.722	16.407
10°	0.742	26.998	14.313	0.774	29.327	14.673	190°	0.936	42.893	16.324	0.937	43.055	16.340
15°	0.786	30.267	14.810	0.815	32.565	15.128	195°	0.931	42.448	16.279	0.932	42.577	16.292
20°	0.832	33.932	15.306	0.847	35.192	15.464	200°	0.928	42.190	16.252	0.929	42.284	16.262
25°	0.866	36.777	15.656	0.868	36.927	15.673	205°	0.926	42.058	16.239	0.928	42.175	16.251
30°	0.884	38.298	15.832	0.877	37.700	15.763	210°	0.924	41.797	16.211	0.927	42.138	16.247
35°	0.888	38.650	15.871	0.877	37.701	15.764	215°	0.916	41.103	16.139	0.926	42.041	16.237
40°	0.881	38.065	15.805	0.873	37.369	15.725	220°	0.903	39.989	16.019	0.925	41.883	16.220
45°	0.869	36.983	15.680	0.866	36.765	15.654	225°	0.886	38.471	15.851	0.922	41.664	16.198
50°	0.858	36.033	15.567	0.856	35.894	15.550	230°	0.869	36.983	15.680	0.919	41.386	16.169
55°	0.849	35.349	15.484	0.842	34.767	15.412	235°	0.856	35.926	15.554	0.915	41.049	16.133
60°	0.846	35.047	15.446	0.826	33.397	15.237	240°	0.849	35.283	15.476	0.911	40.653	16.091
65°	0.846	35.081	15.451	0.806	31.863	15.033	245°	0.846	35.044	15.446	0.906	40.199	16.042
70°	0.848	35.270	15.474	0.790	30.551	14.850	250°	0.842	34.734	15.408	0.901	39.801	15.999
75°	0.856	35.891	15.550	0.776	29.512	14.700	255°	0.839	34.513	15.380	0.892	38.985	15.909
80°	0.867	36.794	15.658	0.766	28.733	14.584	260°	0.835	34.178	15.338	0.873	37.379	15.726
85°	0.875	37.535	15.744	0.759	28.203	14.503	265°	0.824	33.297	15.224	0.846	35.032	15.445
90°	0.882	38.097	15.809	0.755	27.916	14.459	270°	0.805	31.714	15.013	0.808	32.022	15.054
95°	0.885	38.403	15.844	0.755	27.934	14.461	275°	0.777	29.562	14.707	0.762	28.449	14.541
100°	0.888	38.680	15.875	0.763	28.561	14.558	280°	0.745	27.161	14.339	0.711	24.757	13.937
105°	0.895	39.262	15.940	0.780	29.838	14.748	285°	0.708	24.538	13.898	0.668	21.871	13.399
110°	0.906	40.247	16.047	0.806	31.806	15.025	290°	0.670	21.971	13.418	0.635	19.737	12.953
115°	0.922	41.610	16.192	0.839	34.526	15.382	295°	0.635	19.787	12.964	0.611	18.264	12.616
120°	0.938	43.118	16.347	0.882	38.077	15.807	300°	0.611	18.267	12.617	0.596	17.386	12.402
125°	0.954	44.614	16.495	0.922	41.657	16.197	305°	0.596	17.423	12.411	0.590	17.062	12.320
130°	0.970	46.072	16.634	0.954	44.605	16.494	310°	0.592	17.151	12.343	0.594	17.308	12.382
135°	0.984	47.404	16.758	0.978	46.841	16.706	315°	0.594	17.292	12.378	0.604	17.867	12.521
140°	0.995	48.529	16.860	0.993	48.308	16.840	320°	0.594	17.281	12.376	0.608	18.118	12.581
145°	1.000	49.000	16.902	1.000	48.967	16.899	325°	0.590	17.070	12.322	0.607	18.027	12.559
150°	0.999	48.881	16.891	0.999	48.921	16.895	330°	0.586	16.815	12.257	0.602	17.784	12.500
155°	0.996	48.564	16.863	0.996	48.646	16.871	335°	0.581	16.521	12.180	0.596	17.429	12.413
160°	0.990	48.052	16.817	0.992	48.177	16.828	340°	0.578	16.349	12.135	0.592	17.190	12.353
165°	0.983	47.347	16.753	0.985	47.516	16.768	345°	0.584	16.691	12.225	0.591	17.101	12.330
170°	0.974	46.453	16.670	0.976	46.667	16.690	350°	0.601	17.694	12.478	0.604	17.849	12.516
175°	0.962	45.379	16.569	0.965	45.636	16.593	355°	0.629	19.403	12.879	0.634	19.665	12.937

Horizontal Polarization:
Maximum: 4.176 (6.208 dB)
Horizontal Plane: 4.176 (6.208 dB)
Maximum ERP: 49.000 kW

Vertical Polarization:
Maximum: 4.176 (6.208 dB)
Horizontal Plane: 4.176 (6.208 dB)
Maximum ERP: 49.000 kW

Total Input Power: 11.733 kW
Reference: WLZL1M.FIG

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

ERI® Vertical Plane Relative Field Pattern

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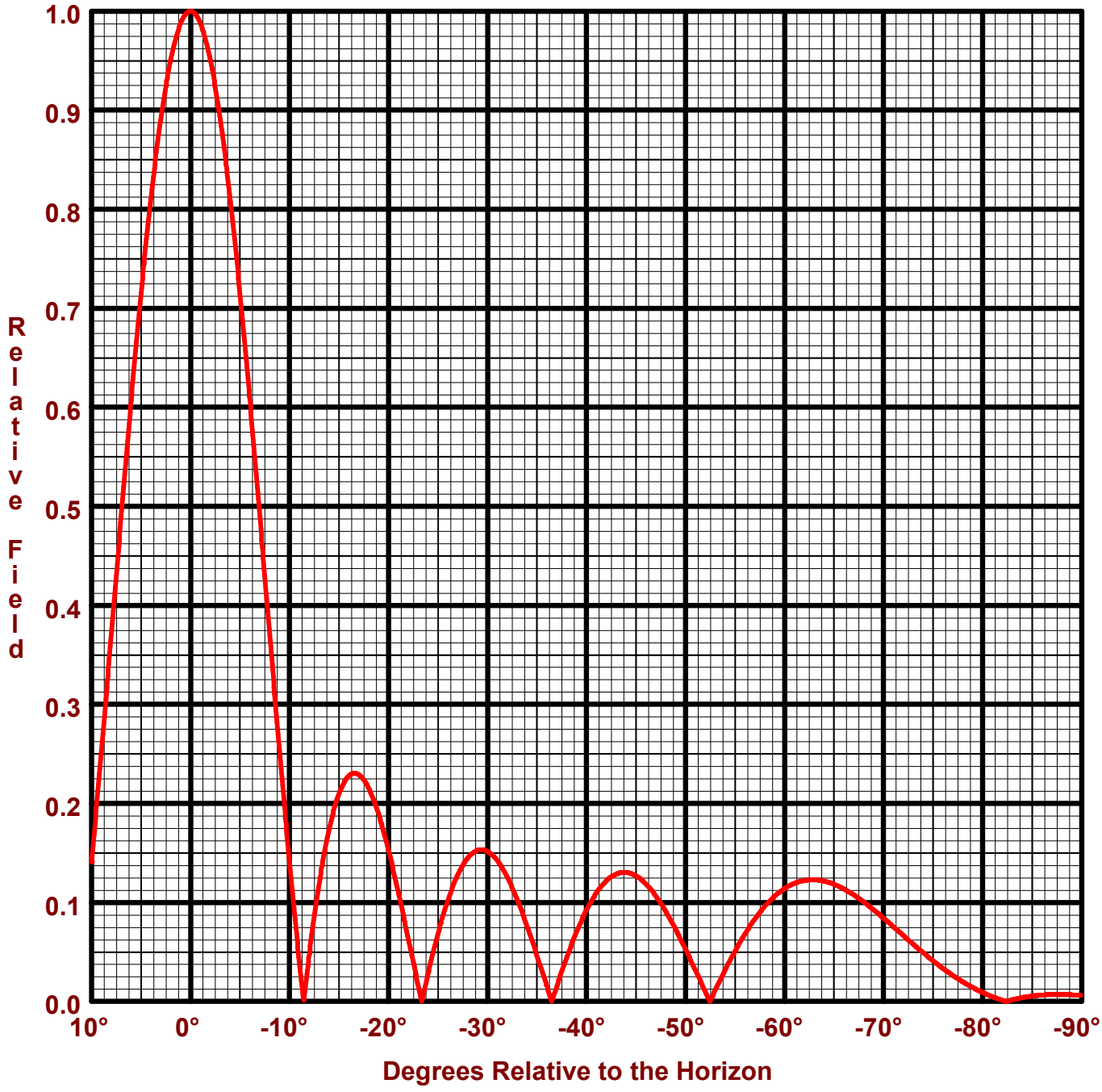
Figure No: 3
Call Sign: WLZL
Location: College Park, MD
Frequency: 107.9 MHz
6 bay 1183-6CP-COG-DA antenna

Date: 12/19/2013
H/V Power Ratio: 1
.844 Wave-length Spacing
0° Beam Tilt
0% First Null Fill



Horizontal Polarization:
Maximum: 4.176 (6.208 dB)
Horizontal Plane: 4.176 (6.208 dB)
Maximum ERP: 49.000 kW

Vertical Polarization:
Maximum: 4.176 (6.208 dB)
Horizontal Plane: 4.176 (6.208 dB)
Maximum ERP: 49.000 kW

Directional Antenna System
for
WLZL, College Park, Maryland

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	1183-6CP-COG-DA
Frequency:	107.9 MHz
Number of Bays:	Six

MECHANICAL SPECIFICATIONS

Mounting:	Custom
System length:	46 ft
Aperture length required:	53 ft 4 in
Orientation:	130° true

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

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	49.000 kW (16.901 dBk)
Horizontal maximum power gain:	4.176 (6.208 dB)
Maximum vertical ERP:	49.000 kW (16.901 dBk)
Vertical maximum power gain:	4.176 (6.208 dB)
Total input power:	11.733 kW (10.691 dBk)