

***Directional Antenna System
for
WBTP, Clearwater, Florida***

October 22, 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 WBTP.

The antenna is the ERI model SHP-5E-DA-HW configuration. The circular polarized system consists of 5 half-wavelength spaced bays using one driven circular polarized radiating element per bay and one horizontal parasitic element per bay. The antenna was mounted on the North 269 degrees East tower leg with bracketry to provide an antenna orientation of North 251 degrees East. The antenna was tested on a 7' face tower, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 95.7 megahertz, which is the center of the FM broadcast channel assigned to WBTP.

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 WBTP, Clearwater, Florida

(Continued)

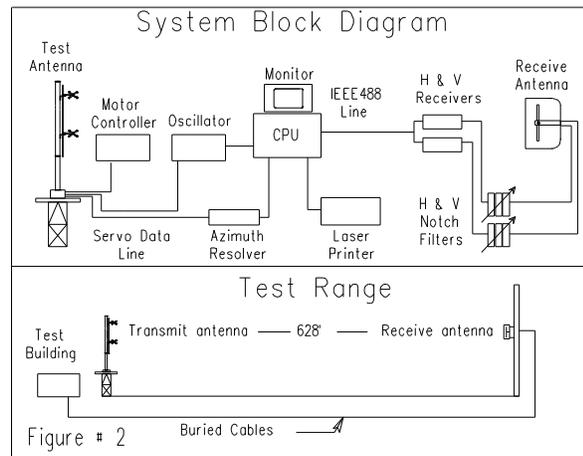
DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of two bay levels of the circular polarized system with the associated horizontal 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 7' 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.

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



Directional Antenna System For WBTP, Clearwater, Florida

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

CONCLUSIONS

The circular polarized system consists of 5 half-wavelength spaced bays using one driven circular polarized radiating element per bay and one horizontal parasitic element 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 SHP-5E-DA-HW array is to be mounted on the North 269 degrees East tower leg of the 7' face tower at a bearing of North 251 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. A calculated vertical plane relative field pattern is shown on Figure #3 attached. The power in the maximum will reach 40 kilowatts (16.021 dBk).

The power at North 50-90 degrees East does not exceed 10 kilowatts (10 dBk).

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For
WBTP, Clearwater, Florida

(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 40 feet 6 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 written in a cursive style with a large initial "T" and a long, sweeping underline.

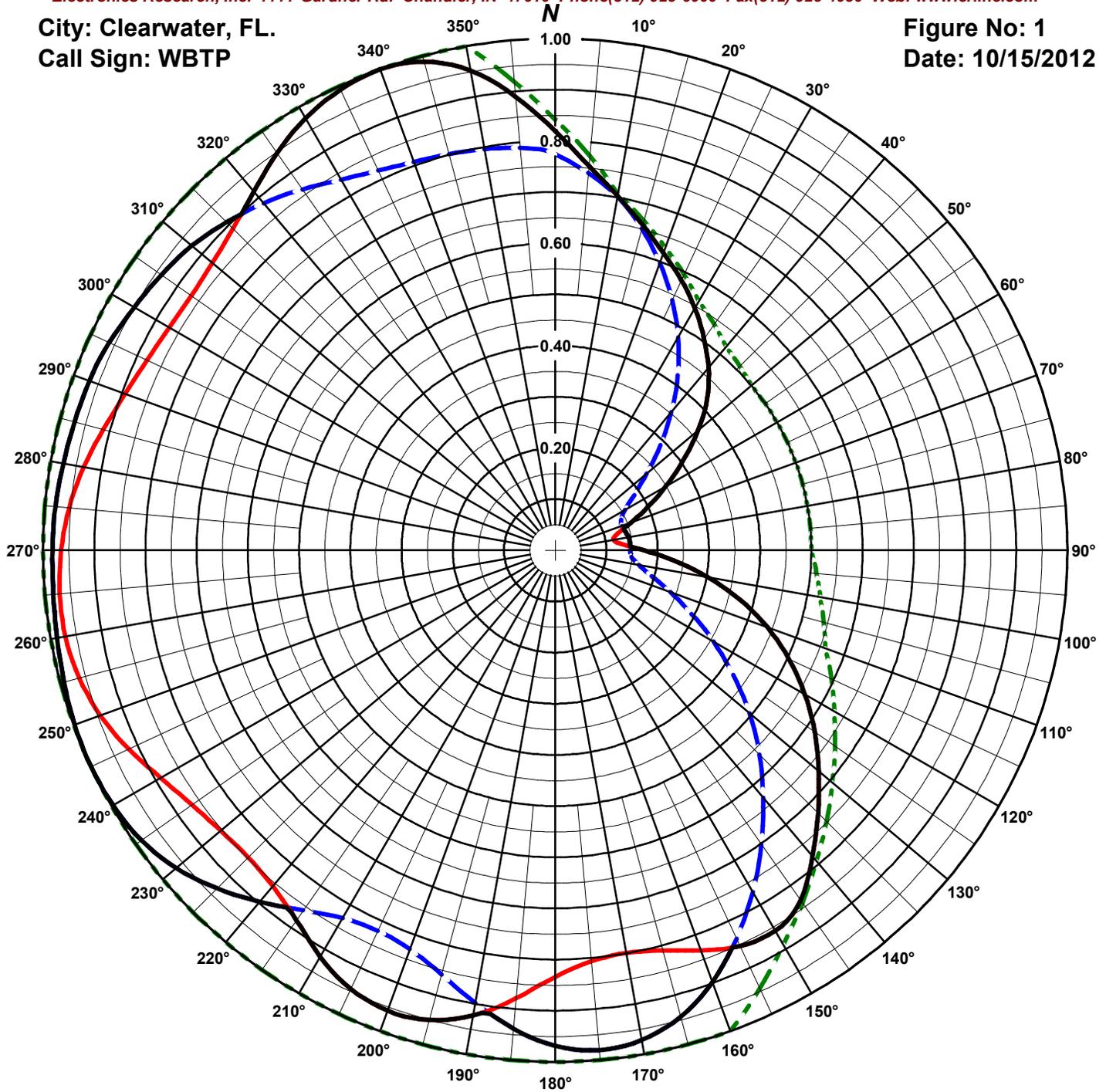
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ERI[®] Horizontal Plane Relative Field Pattern

Electronics Research, Inc. 7777 Gardner Rd. Chandler, IN 47610 Phone(812) 925-6000 Fax(812) 925-4030 Web: www.eriinc.com

City: Clearwater, FL.
Call Sign: WBTP

Figure No: 1
Date: 10/15/2012



Antenna Orientation: 251° True

Frequency: 95.7 MHz

Antenna Type: SHP-5E-DA-HW

Antenna Mounting: Custom

Tower Type: 7' Face

HORIZONTAL

RMS: .769

Maximum: 1 @ 340°

Minimum: .116 @ 80°

VERTICAL

RMS: .752

Maximum: 1 @ 246°

Minimum: .139 @ 70°

COMPOSITE

RMS: .8

Maximum: 1 @ 246°

Minimum: .14 @ 73°

FCC ENVELOPE

RMS: .855

Maximum: 1 @ 160°

Minimum: .5 @ 50°

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 BXPB-20120504AAU.

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: 10/15/2012

Station: WBTP

Antenna: SHP-5E-DA-HW

Location: Clearwater, FL.

Antenna Orientation: 251° True

Frequency: 95.7 MHz

Number of Bays: 5

Azimuth	Envelope			Polarization Maximum	Azimuth	Envelope			Polarization Maximum
	Field	kW	dBk			Field	kW	dBk	
0°	0.819	26.828	14.286	Horizontal	180°	0.969	37.533	15.744	Vertical
5°	0.754	22.736	13.567	Horizontal	185°	0.938	35.224	15.468	Vertical
10°	0.703	19.753	12.956	Horizontal	190°	0.923	34.097	15.327	Horizontal
15°	0.658	17.338	12.390	Horizontal	195°	0.950	36.132	15.579	Horizontal
20°	0.618	15.269	11.838	Horizontal	200°	0.957	36.669	15.643	Horizontal
25°	0.583	13.574	11.327	Horizontal	205°	0.945	35.754	15.533	Horizontal
30°	0.546	11.919	10.762	Horizontal	210°	0.917	33.654	15.270	Horizontal
35°	0.506	10.245	10.105	Horizontal	215°	0.882	31.121	14.930	Horizontal
40°	0.466	8.680	9.385	Horizontal	220°	0.897	32.179	15.076	Vertical
45°	0.419	7.036	8.473	Horizontal	225°	0.934	34.916	15.430	Vertical
50°	0.364	5.287	7.232	Horizontal	230°	0.966	37.341	15.722	Vertical
55°	0.304	3.698	5.679	Horizontal	235°	0.987	38.964	15.907	Vertical
60°	0.249	2.476	3.937	Horizontal	240°	0.997	39.750	15.993	Vertical
65°	0.199	1.584	1.999	Horizontal	245°	1.000	39.989	16.019	Vertical
70°	0.156	0.977	-0.102	Horizontal	250°	0.998	39.874	16.007	Vertical
75°	0.141	0.797	-0.983	Vertical	255°	0.993	39.431	15.958	Vertical
80°	0.146	0.848	-0.717	Vertical	260°	0.988	39.016	15.912	Vertical
85°	0.147	0.860	-0.656	Vertical	265°	0.984	38.699	15.877	Vertical
90°	0.173	1.192	0.763	Horizontal	270°	0.982	38.549	15.860	Vertical
95°	0.233	2.165	3.354	Horizontal	275°	0.980	38.380	15.841	Vertical
100°	0.302	3.654	5.628	Horizontal	280°	0.975	38.026	15.801	Vertical
105°	0.373	5.575	7.462	Horizontal	285°	0.972	37.753	15.770	Vertical
110°	0.441	7.777	8.908	Horizontal	290°	0.968	37.474	15.737	Vertical
115°	0.504	10.144	10.062	Horizontal	295°	0.961	36.905	15.671	Vertical
120°	0.562	12.653	11.022	Horizontal	300°	0.949	36.049	15.569	Vertical
125°	0.618	15.288	11.844	Horizontal	305°	0.938	35.211	15.467	Vertical
130°	0.671	18.023	12.558	Horizontal	310°	0.926	34.288	15.351	Vertical
135°	0.726	21.086	13.240	Horizontal	315°	0.907	32.892	15.171	Vertical
140°	0.781	24.413	13.876	Horizontal	320°	0.915	33.504	15.251	Horizontal
145°	0.835	27.882	14.453	Horizontal	325°	0.948	35.912	15.552	Horizontal
150°	0.859	29.514	14.700	Horizontal	330°	0.975	38.008	15.799	Horizontal
155°	0.854	29.139	14.645	Horizontal	335°	0.993	39.411	15.956	Horizontal
160°	0.898	32.223	15.082	Vertical	340°	1.000	40.000	16.021	Horizontal
165°	0.944	35.659	15.522	Vertical	345°	0.989	39.088	15.920	Horizontal
170°	0.972	37.784	15.773	Vertical	350°	0.952	36.227	15.590	Horizontal
175°	0.980	38.455	15.850	Vertical	355°	0.890	31.678	15.008	Horizontal

Horizontal Polarization:

Maximum: 2.650 (4.233 dB)

Horizontal Plane: 2.650 (4.233 dB)

Maximum ERP: 40.000 kW

Vertical Polarization:

Maximum: 2.650 (4.233 dB)

Horizontal Plane: 2.650 (4.233 dB)

Maximum ERP: 40.000 kW

Total Input Power: 15.093 kW

Reference: WBTP1M.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: 10/15/2012

Station: WBTP

Antenna: SHP-5E-DA-HW

Location: Clearwater, FL.

Antenna Orientation: 251° True

Frequency: 95.7 MHz

Number of Bays: 5

Azimuth	Horizontal			Vertical			Azimuth	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.819	26.828	14.286	0.774	23.952	13.793	180°	0.834	27.815	14.443	0.969	37.533	15.744
5°	0.754	22.736	13.567	0.741	21.935	13.411	185°	0.879	30.919	14.902	0.938	35.224	15.468
10°	0.703	19.753	12.956	0.701	19.657	12.935	190°	0.923	34.097	15.327	0.898	32.270	15.088
15°	0.658	17.338	12.390	0.652	16.983	12.300	195°	0.950	36.132	15.579	0.858	29.458	14.692
20°	0.618	15.269	11.838	0.597	14.256	11.540	200°	0.957	36.669	15.643	0.830	27.535	14.399
25°	0.583	13.574	11.327	0.540	11.658	10.666	205°	0.945	35.754	15.533	0.820	26.920	14.301
30°	0.546	11.919	10.762	0.480	9.233	9.654	210°	0.917	33.654	15.270	0.830	27.574	14.405
35°	0.506	10.245	10.105	0.417	6.972	8.433	215°	0.882	31.121	14.930	0.859	29.504	14.699
40°	0.466	8.680	9.385	0.353	4.978	6.971	220°	0.857	29.405	14.684	0.897	32.179	15.076
45°	0.419	7.036	8.473	0.290	3.372	5.279	225°	0.848	28.776	14.590	0.934	34.916	15.430
50°	0.364	5.287	7.232	0.234	2.185	3.394	230°	0.853	29.072	14.635	0.966	37.341	15.722
55°	0.304	3.698	5.679	0.188	1.418	1.516	235°	0.867	30.035	14.776	0.987	38.964	15.907
60°	0.249	2.476	3.937	0.157	0.987	-0.055	240°	0.889	31.643	15.003	0.997	39.750	15.993
65°	0.199	1.584	1.999	0.142	0.805	-0.941	245°	0.919	33.773	15.286	1.000	39.989	16.019
70°	0.156	0.977	-1.102	0.139	0.770	-1.137	250°	0.945	35.695	15.526	0.998	39.874	16.007
75°	0.126	0.633	-1.985	0.141	0.797	-0.983	255°	0.962	37.035	15.686	0.993	39.431	15.958
80°	0.116	0.535	-2.719	0.146	0.848	-0.717	260°	0.971	37.714	15.765	0.988	39.016	15.912
85°	0.131	0.691	-1.606	0.147	0.860	-0.656	265°	0.971	37.716	15.765	0.984	38.699	15.877
90°	0.173	1.192	0.763	0.146	0.856	-0.676	270°	0.965	37.212	15.707	0.982	38.549	15.860
95°	0.233	2.165	3.354	0.150	0.898	-0.466	275°	0.952	36.282	15.597	0.980	38.380	15.841
100°	0.302	3.654	5.628	0.165	1.095	0.396	280°	0.935	34.949	15.434	0.975	38.026	15.801
105°	0.373	5.575	7.462	0.195	1.513	1.799	285°	0.913	33.341	15.230	0.972	37.753	15.770
110°	0.441	7.777	8.908	0.239	2.280	3.579	290°	0.893	31.933	15.042	0.968	37.474	15.737
115°	0.504	10.144	10.062	0.294	3.453	5.382	295°	0.879	30.918	14.902	0.961	36.905	15.671
120°	0.562	12.653	11.022	0.357	5.096	7.073	300°	0.870	30.300	14.814	0.949	36.049	15.569
125°	0.618	15.288	11.844	0.424	7.194	8.570	305°	0.868	30.103	14.786	0.938	35.211	15.467
130°	0.671	18.023	12.558	0.495	9.797	9.911	310°	0.874	30.522	14.846	0.926	34.288	15.351
135°	0.726	21.086	13.240	0.564	12.724	11.046	315°	0.889	31.641	15.003	0.907	32.892	15.171
140°	0.781	24.413	13.876	0.631	15.943	12.026	320°	0.915	33.504	15.251	0.886	31.380	14.967
145°	0.835	27.882	14.453	0.702	19.712	12.947	325°	0.948	35.912	15.552	0.861	29.649	14.720
150°	0.859	29.514	14.700	0.771	23.796	13.765	330°	0.975	38.008	15.799	0.836	27.971	14.467
155°	0.854	29.139	14.645	0.837	28.046	14.479	335°	0.993	39.411	15.956	0.819	26.812	14.283
160°	0.832	27.695	14.424	0.898	32.223	15.082	340°	1.000	40.000	16.021	0.807	26.075	14.162
165°	0.810	26.214	14.185	0.944	35.659	15.522	345°	0.989	39.088	15.920	0.802	25.704	14.100
170°	0.799	25.532	14.071	0.972	37.784	15.773	350°	0.952	36.227	15.590	0.796	25.348	14.039
175°	0.807	26.021	14.153	0.980	38.455	15.850	355°	0.890	31.678	15.008	0.789	24.899	13.962

Horizontal Polarization:

Maximum: 2.650 (4.233 dB)

Horizontal Plane: 2.650 (4.233 dB)

Maximum ERP: 40.000 kW

Vertical Polarization:

Maximum: 2.650 (4.233 dB)

Horizontal Plane: 2.650 (4.233 dB)

Maximum ERP: 40.000 kW

Total Input Power: 15.093 kW

Reference: WBTP1M.FIG

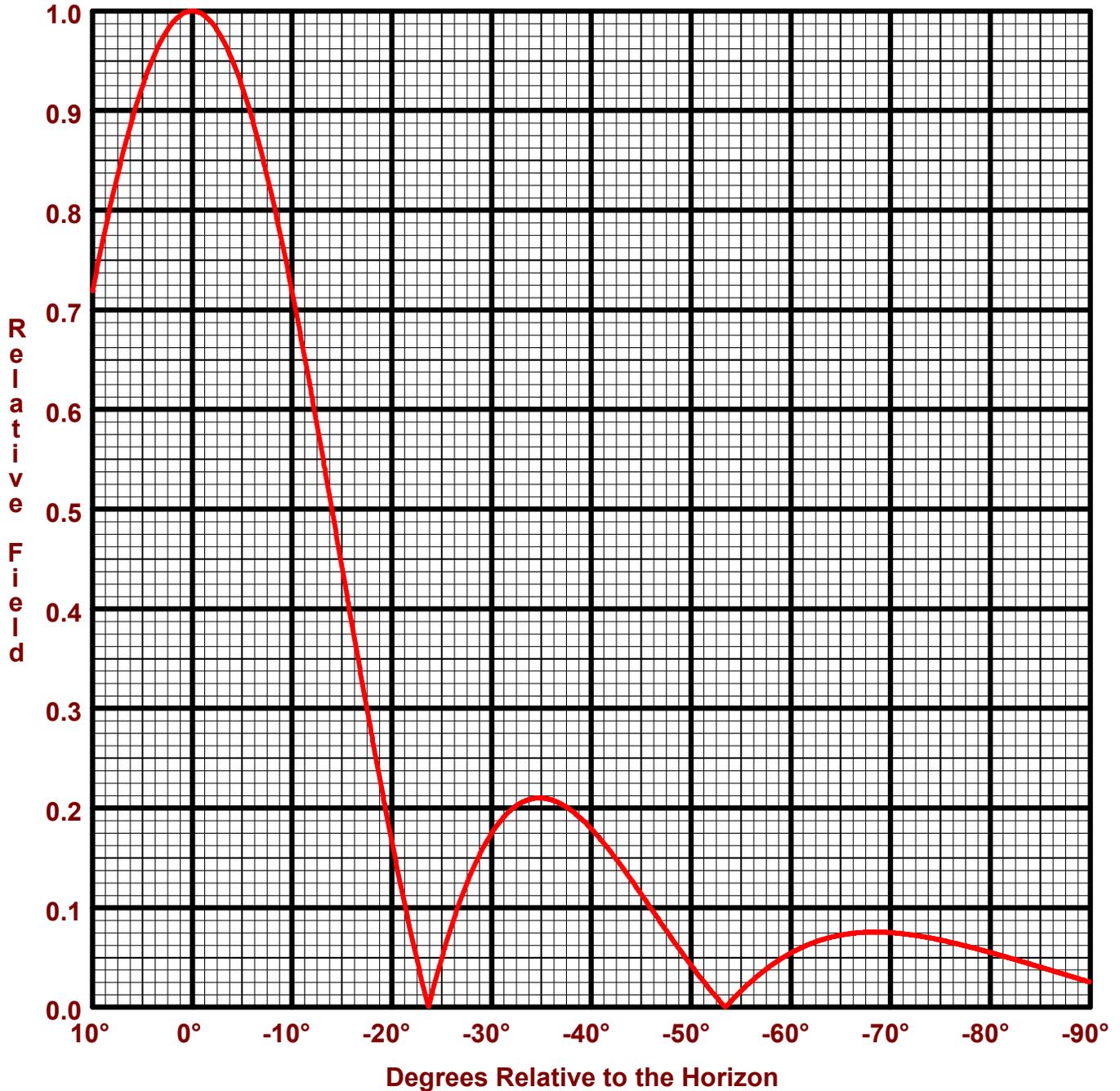
This list shows the azimuth values for the horizontal and vertical components.

ERI[®] Vertical Plane Relative Field Pattern

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Figure No: 3
Call Sign: WBTP
Location: Clearwater, FL.
Frequency: 95.7 MHz
5 bay SHP-5E-DA-HW antenna

Date: 10/15/2012
H/V Power Ratio: 1
.5 Wave-length Spacing
0° Beam Tilt
0% First Null Fill



Horizontal Polarization:
Maximum: 2.650 (4.233 dB)
Horizontal Plane: 2.650 (4.233 dB)
Maximum ERP: 40.000 kW

Vertical Polarization:
Maximum: 2.650 (4.233 dB)
Horizontal Plane: 2.650 (4.233 dB)
Maximum ERP: 40.000 kW

Directional Antenna System for WBTP, Clearwater, Florida

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type: SHP-5E-DA-HW
Frequency: 95.7 MHz
Number of Bays: Five

MECHANICAL SPECIFICATIONS

Mounting: Custom
System length: 24 ft 5 in
Aperture length required: 40 ft 6 in
Orientation: 251 ° true
Input flange to the antenna 3 1/8" female.

ELECTRICAL SPECIFICATIONS

(For directional use)

Maximum horizontal ERP: 40.000 kW (16.021 dBk)
Horizontal maximum power gain: 2.650 (4.233 dB)
Maximum vertical ERP: 40.000 kW (16.021 dBk)
Vertical maximum power gain: 2.650 (4.233 dB)
Total input power: 15.093 kW (11.788 dBk)

