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 WPST, Trenton, New Jersey

November 6, 2013

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 WPST.

The antenna is the ERI model SHP-3E-DA configuration. The circular polarized system consists of 3 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 two vertical parasitic elements per bay. The antenna was tested on a 10.75" o.d. pole, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 94.5 megahertz, which is the center of the FM broadcast channel assigned to WPST.

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
WPST, Trenton, New Jersey

(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 10.75" 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.

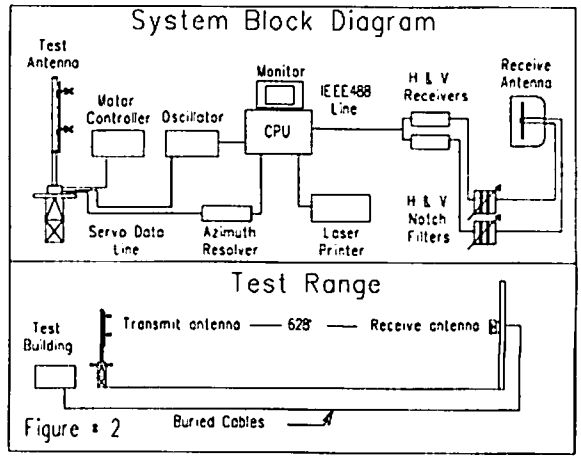


Figure # 2

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

Directional Antenna System
For
WPST, Trenton, New Jersey

(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 3 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 two 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 SHP-3E-DA array is to be mounted on the 10.75" o.d. pole at a bearing of North 258 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 50 kilowatts (16.99 dBk).

Directional Antenna System
For
WPST, Trenton, New Jersey

(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 36 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.

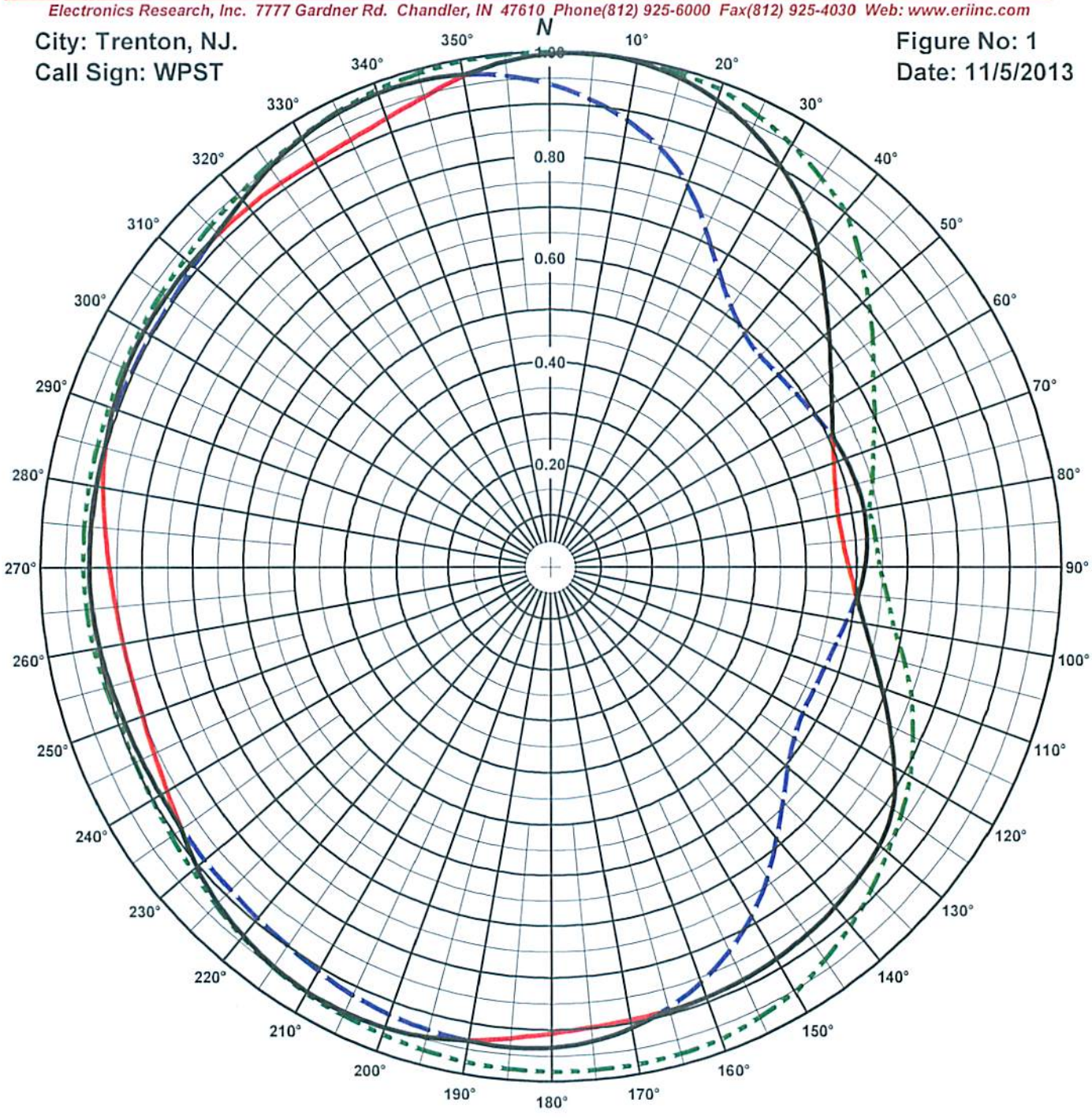
ELECTRONICS RESEARCH, INC.

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: Trenton, NJ.
Call Sign: WPST

Figure No: 1
Date: 11/5/2013



Antenna Orientation: 258° True

Frequency: 94.5 MHz
Antenna Type: SHP-3AE-DA

Antenna Mounting: Standard
Tower Type: 10 3\4" o.d. pole

HORIZONTAL	VERTICAL	COMPOSITE	FCC ENVELOPE
RMS: .859	RMS: .818	RMS: .87	RMS: .901
Maximum: 1 @ 5°	Maximum: .979 @ 342°	Maximum: 1 @ 5°	Maximum: 1 @ 0°
Minimum: .572 @ 81°	Minimum: .568 @ 117°	Minimum: .605 @ 95°	Minimum: .634 @ 80°

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 BLH-19910307KA.

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
Station: WPST
Location: Trenton, NJ.
Frequency: 94.5 MHz

Date: 11/5/2013
Antenna: SHP-3AE-DA
Antenna Orientation: 258° True
Number of Bays: 3

Azimuth	Envelope			Polarization	Azimuth	Envelope			Polarization
	Field	kW	dBk	Maximum		Field	kW	dBk	Maximum
0°	0.996	49.625	16.957	Horizontal	180°	0.934	43.599	16.395	Vertical
5°	1.000	50.000	16.990	Horizontal	185°	0.936	43.829	16.418	Vertical
10°	0.996	49.569	16.952	Horizontal	190°	0.935	43.679	16.403	Vertical
15°	0.984	48.399	16.848	Horizontal	195°	0.945	44.623	16.496	Horizontal
20°	0.965	46.527	16.677	Horizontal	200°	0.952	45.318	16.563	Horizontal
25°	0.938	43.996	16.434	Horizontal	205°	0.955	45.629	16.592	Horizontal
30°	0.904	40.864	16.113	Horizontal	210°	0.954	45.478	16.578	Horizontal
35°	0.863	37.209	15.706	Horizontal	215°	0.948	44.903	16.523	Horizontal
40°	0.814	33.120	15.201	Horizontal	220°	0.937	43.925	16.427	Horizontal
45°	0.760	28.911	14.611	Horizontal	225°	0.923	42.558	16.290	Horizontal
50°	0.712	25.378	14.045	Horizontal	230°	0.904	40.823	16.109	Horizontal
55°	0.671	22.543	13.530	Horizontal	235°	0.884	39.077	15.919	Horizontal
60°	0.638	20.325	13.080	Horizontal	240°	0.883	38.966	15.907	Vertical
65°	0.611	18.650	12.707	Horizontal	245°	0.885	39.145	15.927	Vertical
70°	0.616	18.959	12.778	Vertical	250°	0.888	39.436	15.959	Vertical
75°	0.621	19.295	12.854	Vertical	255°	0.893	39.840	16.003	Vertical
80°	0.624	19.445	12.888	Vertical	260°	0.897	40.247	16.047	Vertical
85°	0.622	19.340	12.865	Vertical	265°	0.900	40.542	16.079	Vertical
90°	0.616	18.948	12.776	Vertical	270°	0.902	40.724	16.099	Vertical
95°	0.605	18.285	12.621	Vertical	275°	0.903	40.792	16.106	Vertical
100°	0.624	19.479	12.896	Horizontal	280°	0.903	40.783	16.105	Vertical
105°	0.654	21.398	13.304	Horizontal	285°	0.903	40.773	16.104	Vertical
110°	0.691	23.877	13.780	Horizontal	290°	0.910	41.426	16.173	Horizontal
115°	0.733	26.851	14.290	Horizontal	295°	0.916	41.910	16.223	Horizontal
120°	0.777	30.209	14.801	Horizontal	300°	0.918	42.092	16.242	Horizontal
125°	0.817	33.368	15.233	Horizontal	305°	0.917	42.087	16.242	Horizontal
130°	0.839	35.197	15.465	Horizontal	310°	0.917	42.045	16.237	Horizontal
135°	0.853	36.338	15.604	Horizontal	315°	0.919	42.258	16.259	Vertical
140°	0.864	37.314	15.719	Horizontal	320°	0.934	43.599	16.395	Vertical
145°	0.873	38.142	15.814	Horizontal	325°	0.951	45.237	16.555	Vertical
150°	0.881	38.817	15.890	Horizontal	330°	0.965	46.537	16.678	Vertical
155°	0.887	39.336	15.948	Horizontal	335°	0.974	47.414	16.759	Vertical
160°	0.891	39.694	15.987	Horizontal	340°	0.978	47.855	16.799	Vertical
165°	0.893	39.890	16.009	Horizontal	345°	0.977	47.769	16.791	Vertical
170°	0.910	41.371	16.167	Vertical	350°	0.970	47.073	16.728	Vertical
175°	0.925	42.771	16.311	Vertical	355°	0.985	48.546	16.862	Horizontal

Horizontal Polarization:
Maximum: 2.104 (3.231 dB)
Horizontal Plane: 2.104 (3.231 dB)
Maximum ERP: 50.000 kW

Vertical Polarization:
Maximum: 2.016 (3.046 dB)
Horizontal Plane: 2.016 (3.046 dB)
Maximum ERP: 47.908 kW

Total Input Power: 23.761 kW
Reference: WPST1M.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
Station: WPST
Location: Trenton, NJ.
Frequency: 94.5 MHz

Date: 11/5/2013
Antenna: SHP-3AE-DA
Antenna Orientation: 258° True
Number of Bays: 3

Azimuth	Horizontal			Vertical			Azimuth	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.996	49.625	16.957	0.938	44.007	16.435	180°	0.907	41.095	16.138	0.934	43.599	16.395
5°	1.000	50.000	16.990	0.913	41.694	16.201	185°	0.919	42.210	16.254	0.936	43.829	16.418
10°	0.996	49.569	16.952	0.882	38.916	15.901	190°	0.933	43.555	16.390	0.935	43.679	16.403
15°	0.984	48.399	16.848	0.845	35.729	15.530	195°	0.945	44.623	16.496	0.931	43.341	16.369
20°	0.965	46.527	16.677	0.791	31.281	14.953	200°	0.952	45.318	16.563	0.925	42.819	16.316
25°	0.938	43.996	16.434	0.725	26.254	14.192	205°	0.955	45.629	16.592	0.918	42.116	16.244
30°	0.904	40.864	16.113	0.664	22.024	13.429	210°	0.954	45.478	16.578	0.908	41.237	16.153
35°	0.863	37.209	15.706	0.620	19.199	12.833	215°	0.948	44.903	16.523	0.899	40.402	16.064
40°	0.814	33.120	15.201	0.593	17.558	12.445	220°	0.937	43.925	16.427	0.892	39.755	15.994
45°	0.760	28.911	14.611	0.582	16.961	12.295	225°	0.923	42.558	16.290	0.886	39.290	15.943
50°	0.712	25.378	14.045	0.584	17.067	12.322	230°	0.904	40.823	16.109	0.883	39.006	15.911
55°	0.671	22.543	13.530	0.589	17.350	12.393	235°	0.884	39.077	15.919	0.882	38.900	15.899
60°	0.638	20.325	13.080	0.597	17.816	12.508	240°	0.868	37.714	15.765	0.883	38.966	15.907
65°	0.611	18.650	12.707	0.607	18.441	12.658	245°	0.857	36.744	15.652	0.885	39.145	15.927
70°	0.591	17.461	12.421	0.616	18.959	12.778	250°	0.850	36.154	15.582	0.888	39.436	15.959
75°	0.578	16.718	12.232	0.621	19.295	12.854	255°	0.848	35.939	15.556	0.893	39.840	16.003
80°	0.573	16.393	12.147	0.624	19.445	12.888	260°	0.850	36.099	15.575	0.897	40.247	16.047
85°	0.575	16.533	12.184	0.622	19.340	12.865	265°	0.855	36.551	15.629	0.900	40.542	16.079
90°	0.585	17.087	12.327	0.616	18.948	12.776	270°	0.864	37.291	15.716	0.902	40.724	16.099
95°	0.601	18.058	12.567	0.605	18.285	12.621	275°	0.876	38.328	15.835	0.903	40.792	16.106
100°	0.624	19.479	12.896	0.590	17.409	12.408	280°	0.890	39.580	15.975	0.903	40.783	16.105
105°	0.654	21.398	13.304	0.578	16.722	12.233	285°	0.902	40.646	16.090	0.903	40.773	16.104
110°	0.691	23.877	13.780	0.571	16.306	12.123	290°	0.910	41.426	16.173	0.903	40.765	16.103
115°	0.733	26.851	14.290	0.568	16.151	12.082	295°	0.916	41.910	16.223	0.903	40.760	16.102
120°	0.777	30.209	14.801	0.570	16.218	12.100	300°	0.918	42.092	16.242	0.903	40.758	16.102
125°	0.817	33.368	15.233	0.582	16.943	12.290	305°	0.917	42.087	16.242	0.904	40.856	16.113
130°	0.839	35.197	15.465	0.607	18.414	12.651	310°	0.917	42.045	16.237	0.909	41.348	16.165
135°	0.853	36.338	15.604	0.643	20.666	13.153	315°	0.916	41.977	16.230	0.919	42.258	16.259
140°	0.864	37.314	15.719	0.688	23.649	13.738	320°	0.915	41.882	16.220	0.934	43.599	16.395
145°	0.873	38.142	15.814	0.738	27.224	14.350	325°	0.914	41.784	16.210	0.951	45.237	16.555
150°	0.881	38.817	15.890	0.785	30.808	14.887	330°	0.914	41.728	16.204	0.965	46.537	16.678
155°	0.887	39.336	15.948	0.826	34.086	15.326	335°	0.918	42.103	16.243	0.974	47.414	16.759
160°	0.891	39.694	15.987	0.860	36.981	15.680	340°	0.928	43.096	16.344	0.978	47.855	16.799
165°	0.893	39.890	16.009	0.888	39.427	15.958	345°	0.946	44.735	16.506	0.977	47.769	16.791
170°	0.894	39.991	16.020	0.910	41.371	16.167	350°	0.968	46.845	16.707	0.970	47.073	16.728
175°	0.898	40.360	16.059	0.925	42.771	16.311	355°	0.985	48.546	16.862	0.957	45.812	16.610

Horizontal Polarization:
Maximum: 2.104 (3.231 dB)
Horizontal Plane: 2.104 (3.231 dB)
Maximum ERP: 50.000 kW

Vertical Polarization:
Maximum: 2.016 (3.046 dB)
Horizontal Plane: 2.016 (3.046 dB)
Maximum ERP: 47.908 kW

Total Input Power: 23.761 kW
Reference: WPST1M.FIG

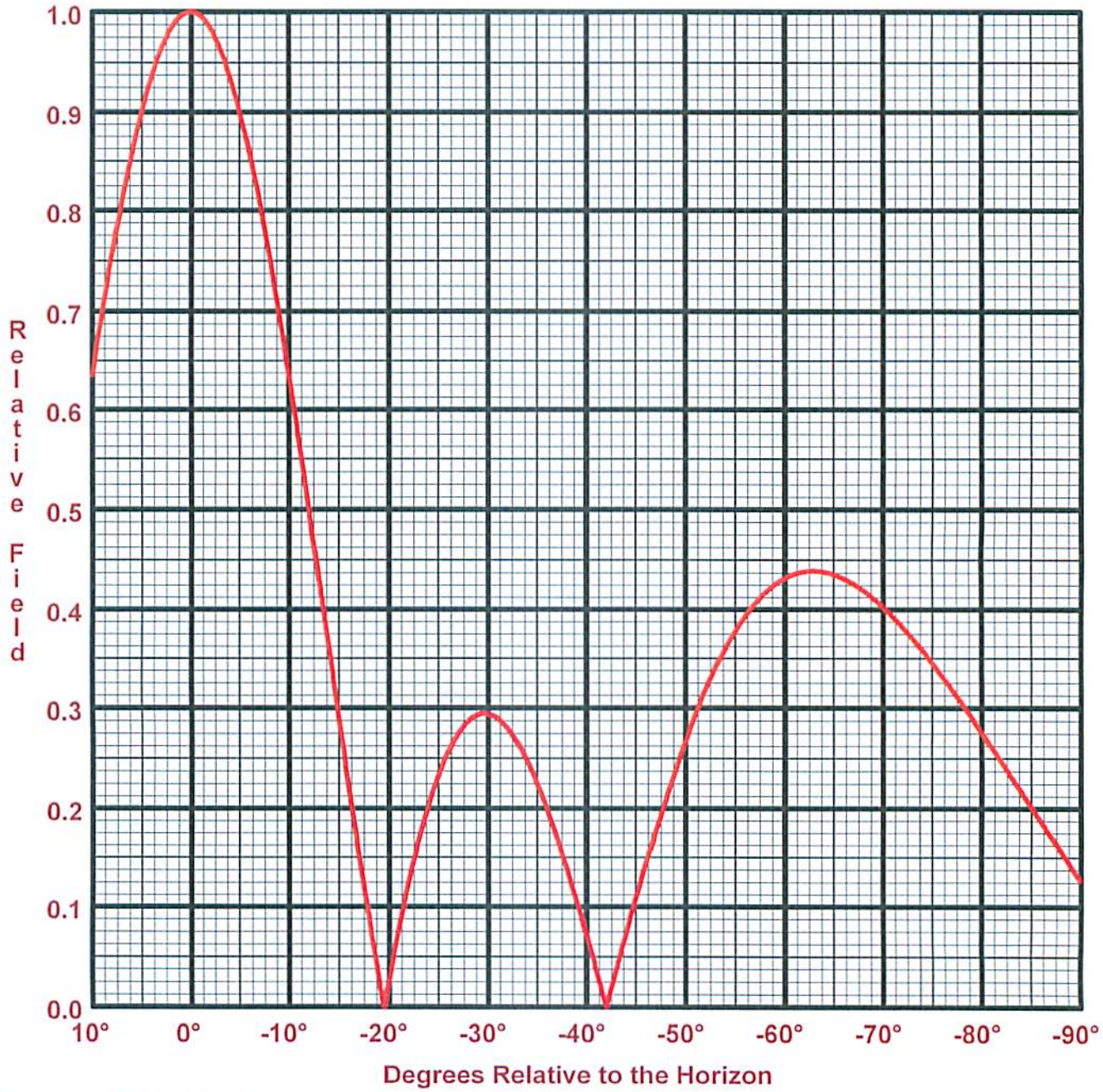
This list shows the azimuth values for the horizontal and vertical components.

ERI® Vertical 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 No: 3
Call Sign: WPST
Location: Trenton, NJ.
Frequency: 94.5 MHz
3 bay SHP-3AE-DA antenna

Date: 11/5/2013
H/V Power Ratio: 0.958
1 Wave-length Spacing
0° Beam Tilt
0% First Null Fill



Horizontal Polarization:
Maximum: 2.104 (3.231 dB)
Horizontal Plane: 2.104 (3.231 dB)
Maximum ERP: 50.000 kW

Vertical Polarization:
Maximum: 2.016 (3.046 dB)
Horizontal Plane: 2.016 (3.046 dB)
Maximum ERP: 47.908 kW

Directional Antenna System
for
WPST, Trenton, New Jersey

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	SHP-3E-DA
Frequency:	94.5 MHz
Number of Bays:	Three

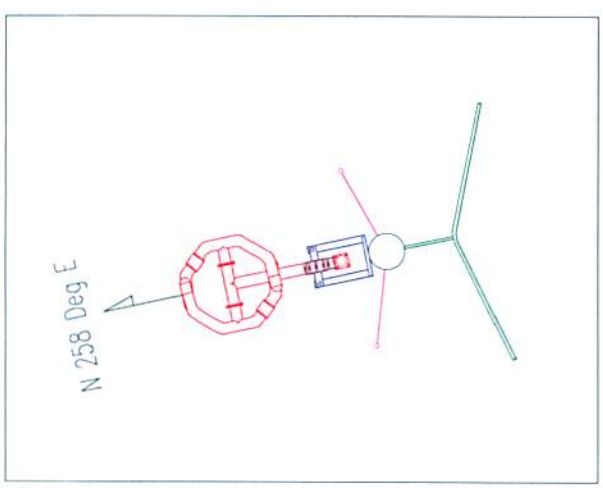
MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	29 ft 6 in
Aperture length required:	35 ft 8 in
Orientation:	258° true

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

ELECTRICAL SPECIFICATIONS
(For directional use)

Maximum horizontal ERP:	50.000 kW (16.99 dBk)
Horizontal maximum power gain:	2.104 (3.231 dB)
Maximum vertical ERP:	47.908 kW (16.804 dBk)
Vertical maximum power gain:	2.104 (3.231 dB)
Total input power:	23.761 kW (13.759 dBk)



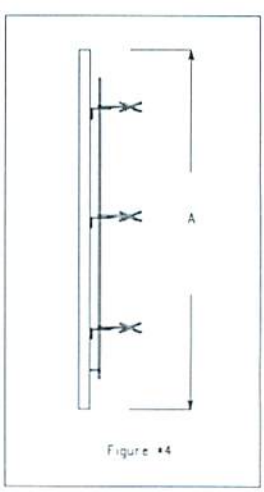
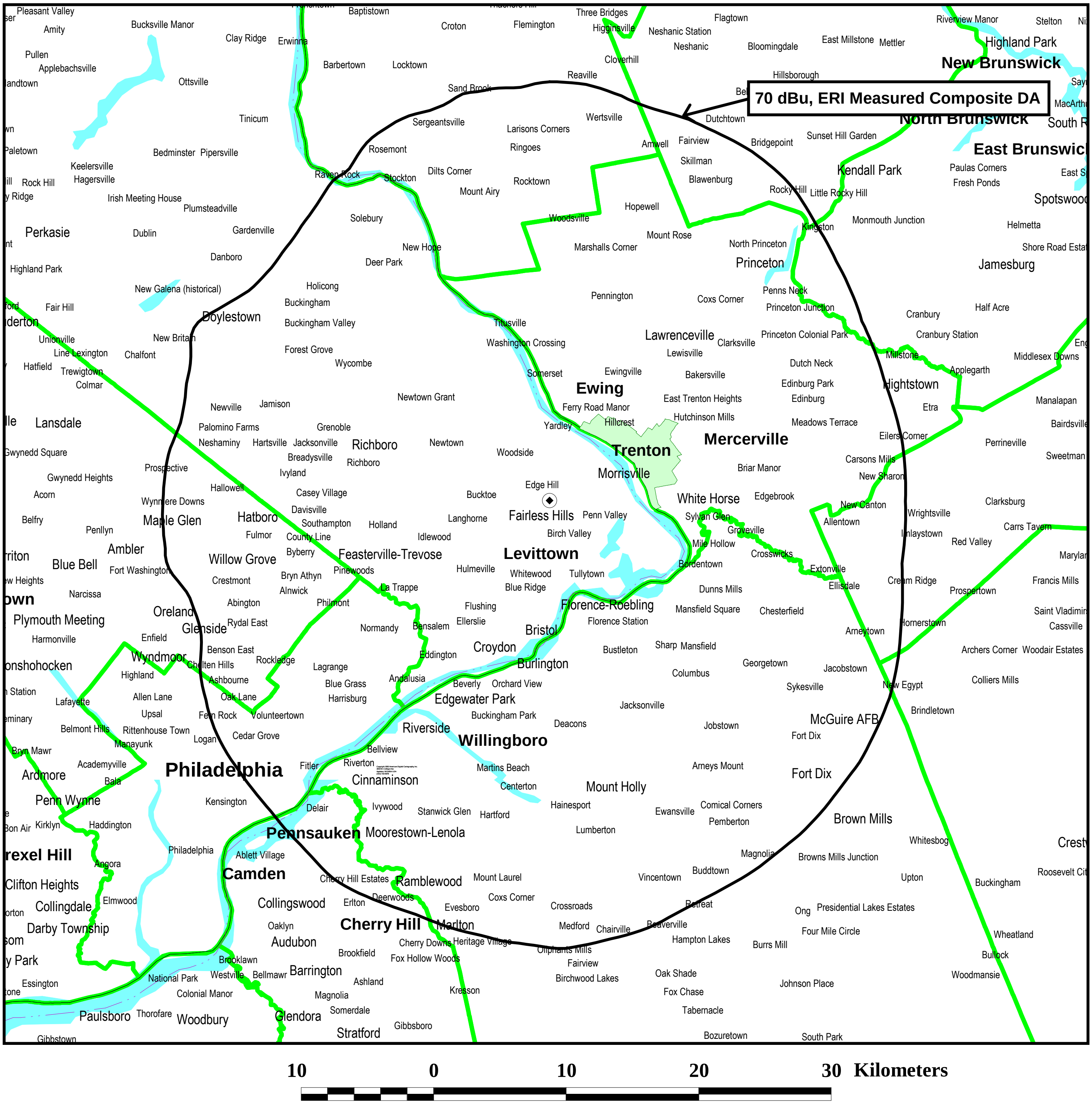


Figure #4

Figure 1



COMPLIANCE WITH SECTION 73.315

STATION WPST
TRENTON, NEW JERSEY
CH 233B   50 KW (MAX-DA)   150 M

du Treil, Lundin & Rackley, Inc. Sarasota, Florida

BUCHART HORN, INC.
Strengthening Communities®

Date: November 26, 2013

To: Charles Lelievre
Connoisseur Media, LLC
136 Main Street
Westport, Conneticut 06880

RE: WPST (FM)
Lincoln Highway Antenna Survey
Fairless Hills, PA
BH Project No. 77002-00

SURVEYORS CERTIFICATION

To whom it may concern:

On November 22, 2013, Buchart Horn, Inc. performed a field survey at 275 Lincoln Highway, Fairless Hills, PA for Connoisseur Media, LLC station WPST (FM), Trenton, NJ. The survey was performed to align the antenna, an Electronics Research, Inc. model SHP-3AE-DA. The equipment used to perform this survey included the following:

Leica Viva GNSS GS15 RTK GPS Receiver paired with a Leica Viva GS15 Controller linked with the Leica Smartnet GPS network with an accuracy of plus or minus one centimeter.

Sokkia SRX3 Robotic Total Station with an accuracy (ISO 17123-4) as follows:

Reflectorless:(fine mode) From 0.3m to 200m: (3+2ppm x D)mm.
Over 200m to 350m: (5+10ppm x D)mm.
Over 350m to 500m: (10+10ppm x D)mm.
With Prism: (2 + 2ppm x D)mm.

This letter certifies that the orientation of the antenna is 258 degrees (plus or minus 1 degree) from True North.

Sincerely,

David L. Anderson, PLS

David L. Anderson, PLS
Chief of Surveys
Buchart Horn, Incorporated
445 West Philadelphia Street
P. O. Box 15040
York, PA 17405-7040

Affidavit certifying the installation of directional antenna system for WPST FM

My name is Fred A. Francis Jr. Owner of Xenirad Broadcast Engineering. I was hired by Connoisseur Media to supervise the installation of the ERI SHP-3E-DA antenna for WPST FM in Fairless Hills, PA.

The antenna was assembled with strict adherence to manufacturer directions and specifications and I supervised the installing tower crew from Trains Towers in the proper installation of the antenna.

A surveyor was on site and I worked with him to verify that the antenna was orientated properly at an azimuth of 258 degrees true north.

All parasitic elements were placed at the proper intervals and orientation on the tower based upon the measurements provided by ERI in the installation documentation.

I am a broadcast engineer with over 20 years of experience in both radio and television engineering. My experience includes the installation of numerous directional antenna systems for both radio and television as well as countless non directional antenna systems. I specialize in RF systems with an emphasis on antenna systems.

I do hereby certify that to the best of my knowledge and ability the antenna for WPST FM was assembled and installed correctly. As the installation was being performed I worked with the tower crew to verify measurements of the parasitic elements therefore I make no reservations in certifying that the antenna meets FCC requirements for the pattern specified.

I make these statements freely and with the understanding that if I were to provide false information I could face punishment by law.

Fred A. Francis Jr.
Owner, Xenirad Broadcast Engineering

Xenirad Inc.
1226 Lower Gragston Creek Road
Prichard, WV 25555
304-416-3269
Fred@Xenirad.com

Field Engineering Report

The following documentation details the nature of the services provided combined with images captured from instrument measurements.

Power Calculations for new antenna system.

This new antenna has a different gain from the original therefore new TPO calculations are needed.

ERP Horizontal 50KW or 76.990 dBm
Antenna Gain Horizontal 3.231dB
Coax Loss 0.14046dB/100 feet X 483.7 feet = .679dB coax loss.

76.990
-03.231
73.759
+0.679
=74.438dBm or 27.784KW

ERP Vertical 48KW or 76.812dBm
Antenna Gain Vertical = 3.046 db
Coax Loss 0.14046dB/100 feet X 483.7 feet = .679dB coax loss.

76.812
-03.046
73.766
+0.679
74.445dBm or 27.829KW

In order not to exceed licensed power in either plane the lower of the two numbers must be used 27.784KW or rounded to 27.8KW.

27,800 watts or 74.440dBm provides the following ERP numbers

Horizontal
74.440
+3.231
77.671
-0.679
76.992dBm or 50,026 watts

Vertical
74.440
+3.046
77.486dBm
-0.679
76.807dBm or 47,940 watts

TPO is calculated at 27,800 watts.

105% power = 29,190 watts.

Fred A. Francis Jr.
Owner Xenirad Inc.