

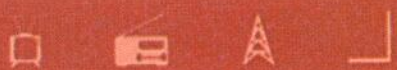
***Directional Antenna System
for
WFNQ, Nashua, New Hampshire***

February 27, 2018

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 WFNQ.

The antenna is the ERI model LP-2E-DA-HW configuration. The circular polarized system consists of two half-wavelength spaced bays using one driven circular polarized radiating element per bay and one horizontal parasitic element per bay. The antenna was tested on a 5.5" o.d. pole, which is the structure the station plans to use to support the array. All tests were performed on a frequency of 106.3 megahertz, which is the center of the FM broadcast channel assigned to WFNQ.

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 WFNQ, Nashua, New Hampshire

(Continued)

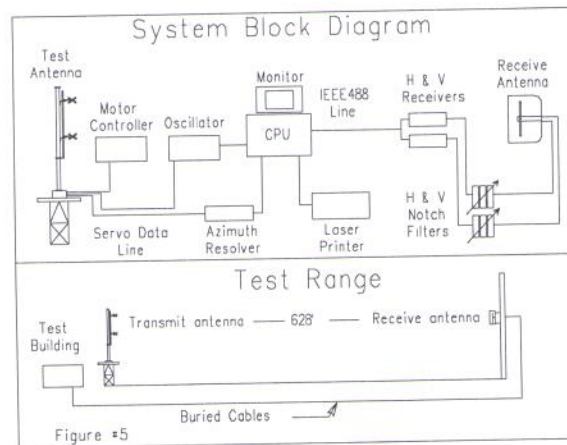
DESCRIPTION OF THE TEST PROCEDURE

The test antenna consisted of a full-scale model of the complete circular polarized system with the associated horizontal parasitic element. 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 5.5" 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.

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



Directional Antenna System For WFNQ, Nashua, New Hampshire

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

The LP-2E-DA-HW array is to be mounted on the 5.5" o.d. pole at a bearing of North 110 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 6 kilowatts (7.782 dBk).

Directional Antenna System
For
WFNQ, Nashua, New Hampshire

(Continued)

The power at North 220-260 degrees East does not exceed 3.6 kilowatts (5.563 dBk).

The power at North 320 degrees East does not exceed 1.25 kilowatts (0.969 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 than 85% of the filed composite pattern.

The clear vertical length of the structure required to support the antenna is 20 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.



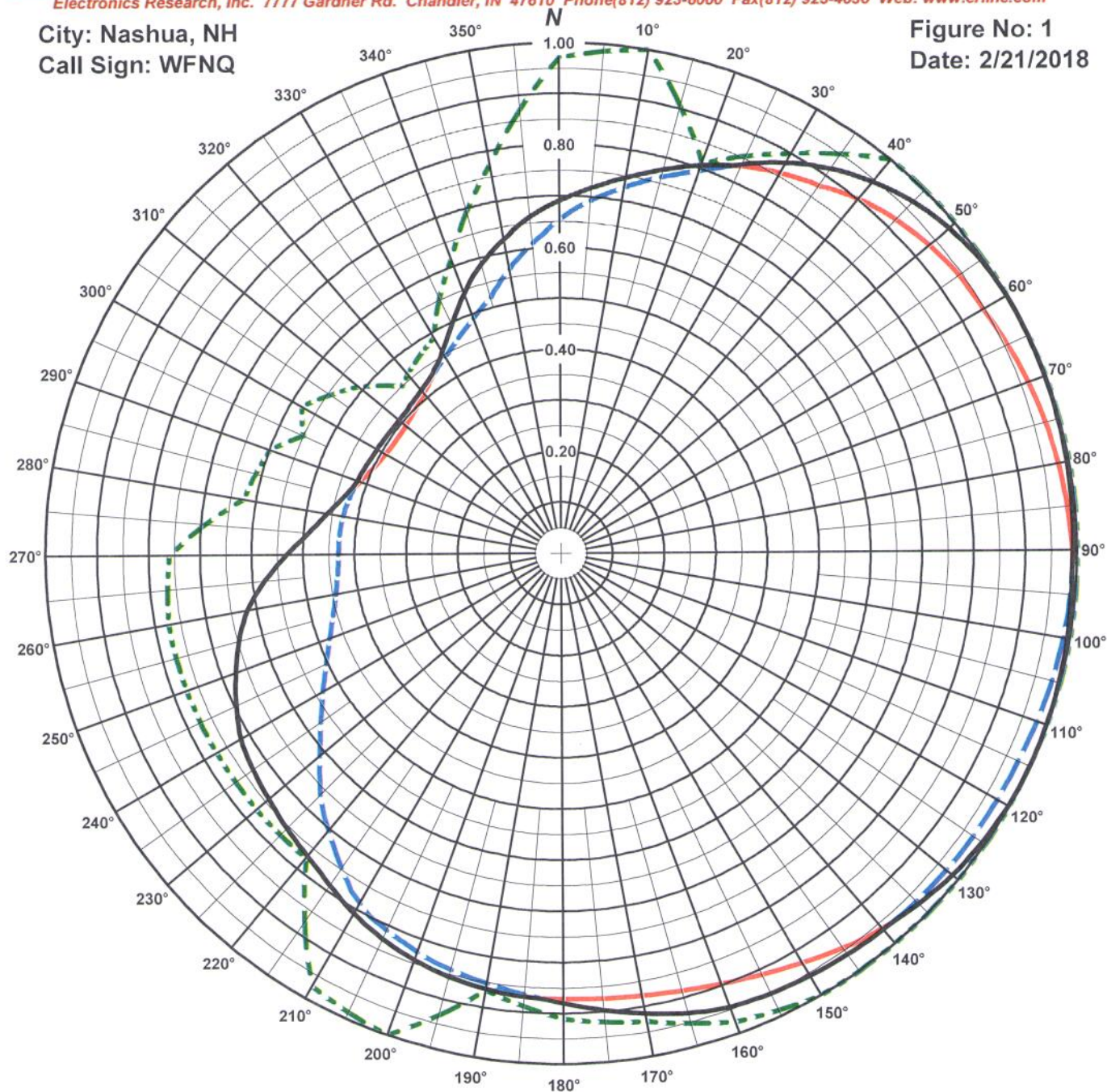
The Microsoft Word document on file electronically at Electronic Research, Inc. governs the specifications, scope, and configuration of the product described. All other representations whether verbal, printed, or electronic are subordinate to the master copy of this document on file at ERI.

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: Nashua, NH
Call Sign: WFNQ

Figure No: 1
Date: 2/21/2018



Antenna Orientation: 110° True

Frequency: 106.3 MHz

Antenna Type: LP-2E-DA-HW

Antenna Mounting: Standard

Tower Type: 5.5" o.d. Pole

HORIZONTAL

RMS: .792

Maximum: 1 @ 115°

Minimum: .39 @ 305°

VERTICAL

RMS: .778

Maximum: 1 @ 63°

Minimum: .407 @ 309°

COMPOSITE

RMS: .804

Maximum: 1 @ 63°

Minimum: .407 @ 309°

FCC ENVELOPE

RMS: .867

Maximum: 1 @ 10°

Minimum: .45 @ 317°

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 BPH-20170825ABF.

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: WFNQ

Location: Nashua, NH

Frequency: 106.3 MHz

Date: 2/21/2018

Antenna: LP-2E-DA-HW

Antenna Orientation: 110° True

Number of Bays: 2

Azimuth	Envelope			Polarization	Azimuth	Envelope			Polarization
	Field	kW	dBk			Field	kW	dBk	
0°	0.690	2.857	4.559	Horizontal	180°	0.879	4.640	6.665	Vertical
5°	0.718	3.090	4.900	Horizontal	185°	0.869	4.532	6.563	Horizontal
10°	0.746	3.341	5.239	Horizontal	190°	0.864	4.476	6.509	Horizontal
15°	0.776	3.613	5.578	Horizontal	195°	0.855	4.388	6.422	Horizontal
20°	0.806	3.900	5.911	Horizontal	200°	0.843	4.266	6.300	Horizontal
25°	0.837	4.205	6.238	Vertical	205°	0.828	4.114	6.142	Horizontal
30°	0.879	4.637	6.662	Vertical	210°	0.809	3.932	5.946	Horizontal
35°	0.915	5.027	7.013	Vertical	215°	0.788	3.722	5.708	Horizontal
40°	0.945	5.359	7.291	Vertical	220°	0.769	3.546	5.498	Horizontal
45°	0.968	5.627	7.503	Vertical	225°	0.755	3.419	5.339	Horizontal
50°	0.985	5.824	7.653	Vertical	230°	0.742	3.306	5.193	Horizontal
55°	0.996	5.948	7.743	Vertical	235°	0.732	3.211	5.066	Horizontal
60°	1.000	5.996	7.778	Vertical	240°	0.719	3.098	4.910	Horizontal
65°	1.000	5.999	7.781	Vertical	245°	0.696	2.909	4.638	Horizontal
70°	0.999	5.992	7.775	Vertical	250°	0.672	2.710	4.330	Horizontal
75°	0.998	5.978	7.766	Vertical	255°	0.647	2.514	4.004	Horizontal
80°	0.997	5.960	7.752	Vertical	260°	0.618	2.289	3.596	Horizontal
85°	0.995	5.936	7.735	Vertical	265°	0.576	1.993	2.994	Horizontal
90°	0.992	5.908	7.714	Vertical	270°	0.532	1.696	2.296	Horizontal
95°	0.993	5.910	7.716	Horizontal	275°	0.491	1.444	1.597	Horizontal
100°	0.996	5.949	7.744	Horizontal	280°	0.459	1.266	1.024	Horizontal
105°	0.998	5.976	7.764	Horizontal	285°	0.435	1.133	0.543	Horizontal
110°	0.999	5.994	7.777	Horizontal	290°	0.419	1.055	0.231	Vertical
115°	1.000	6.000	7.782	Horizontal	295°	0.414	1.028	0.119	Vertical
120°	0.998	5.979	7.767	Horizontal	300°	0.410	1.009	0.039	Vertical
125°	0.994	5.923	7.725	Horizontal	305°	0.408	0.998	-0.008	Vertical
130°	0.986	5.831	7.658	Horizontal	310°	0.407	0.996	-0.018	Vertical
135°	0.975	5.706	7.563	Horizontal	315°	0.411	1.013	0.055	Vertical
140°	0.965	5.584	7.469	Vertical	320°	0.419	1.051	0.216	Vertical
145°	0.961	5.541	7.436	Vertical	325°	0.431	1.114	0.470	Horizontal
150°	0.957	5.490	7.396	Vertical	330°	0.456	1.249	0.967	Horizontal
155°	0.952	5.432	7.350	Vertical	335°	0.496	1.475	1.687	Horizontal
160°	0.945	5.363	7.294	Vertical	340°	0.542	1.762	2.460	Horizontal
165°	0.932	5.210	7.168	Vertical	345°	0.587	2.070	3.160	Horizontal
170°	0.914	5.015	7.003	Vertical	350°	0.626	2.349	3.708	Horizontal
175°	0.897	4.824	6.834	Vertical	355°	0.661	2.625	4.190	Horizontal

Horizontal Polarization:

Maximum: 1.082 (0.344 dB)

Horizontal Plane: 1.082 (0.344 dB)

Maximum ERP: 6.000 kW

Vertical Polarization:

Maximum: 1.082 (0.344 dB)

Horizontal Plane: 1.082 (0.344 dB)

Maximum ERP: 6.000 kW

Total Input Power: 5.544 kW

Reference: WFNQ1M.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: WFNQ

Location: Nashua, NH

Frequency: 106.3 MHz

Date: 2/21/2018

Antenna: LP-2E-DA-HW

Antenna Orientation: 110° True

Number of Bays: 2

Azimuth	Horizontal			Vertical			Azimuth	Horizontal			Vertical		
	Field	kW	dBk	Field	kW	dBk		Field	kW	dBk	Field	kW	dBk
0°	0.690	2.857	4.559	0.655	2.572	4.103	180°	0.872	4.557	6.587	0.879	4.640	6.665
5°	0.718	3.090	4.900	0.693	2.880	4.594	185°	0.869	4.532	6.563	0.865	4.493	6.525
10°	0.746	3.341	5.239	0.728	3.179	5.023	190°	0.864	4.476	6.509	0.853	4.367	6.402
15°	0.776	3.613	5.578	0.761	3.479	5.414	195°	0.855	4.388	6.422	0.841	4.247	6.281
20°	0.806	3.900	5.911	0.795	3.794	5.791	200°	0.843	4.266	6.300	0.827	4.108	6.136
25°	0.833	4.167	6.199	0.837	4.205	6.238	205°	0.828	4.114	6.142	0.810	3.937	5.952
30°	0.856	4.400	6.435	0.879	4.637	6.662	210°	0.809	3.932	5.946	0.787	3.718	5.703
35°	0.875	4.595	6.623	0.915	5.027	7.013	215°	0.788	3.722	5.708	0.748	3.356	5.259
40°	0.900	4.858	6.865	0.945	5.359	7.291	220°	0.769	3.546	5.498	0.705	2.986	4.750
45°	0.919	5.070	7.050	0.968	5.627	7.503	225°	0.755	3.419	5.339	0.663	2.639	4.214
50°	0.933	5.225	7.181	0.985	5.824	7.653	230°	0.742	3.306	5.193	0.614	2.260	3.541
55°	0.942	5.322	7.261	0.996	5.948	7.743	235°	0.732	3.211	5.066	0.572	1.961	2.926
60°	0.945	5.359	7.290	1.000	5.996	7.778	240°	0.719	3.098	4.910	0.535	1.719	2.353
65°	0.954	5.466	7.377	1.000	5.999	7.781	245°	0.696	2.909	4.638	0.504	1.526	1.836
70°	0.963	5.565	7.455	0.999	5.992	7.775	250°	0.672	2.710	4.330	0.479	1.376	1.387
75°	0.971	5.654	7.524	0.998	5.978	7.766	255°	0.647	2.514	4.004	0.459	1.264	1.019
80°	0.978	5.733	7.584	0.997	5.960	7.752	260°	0.618	2.289	3.596	0.445	1.187	0.743
85°	0.983	5.802	7.636	0.995	5.936	7.735	265°	0.576	1.993	2.994	0.436	1.140	0.568
90°	0.988	5.862	7.680	0.992	5.908	7.714	270°	0.532	1.696	2.296	0.433	1.123	0.502
95°	0.993	5.910	7.716	0.989	5.874	7.690	275°	0.491	1.444	1.597	0.432	1.118	0.483
100°	0.996	5.949	7.744	0.986	5.836	7.661	280°	0.459	1.266	1.024	0.429	1.105	0.432
105°	0.998	5.976	7.764	0.983	5.792	7.629	285°	0.435	1.133	0.543	0.425	1.083	0.348
110°	0.999	5.994	7.777	0.978	5.744	7.592	290°	0.415	1.035	0.149	0.419	1.055	0.231
115°	1.000	6.000	7.782	0.974	5.696	7.556	295°	0.401	0.967	-0.146	0.414	1.028	0.119
120°	0.998	5.979	7.767	0.973	5.678	7.542	300°	0.393	0.926	-0.334	0.410	1.009	0.039
125°	0.994	5.923	7.725	0.972	5.665	7.532	305°	0.390	0.912	-0.401	0.408	0.998	-0.008
130°	0.986	5.831	7.658	0.970	5.646	7.517	310°	0.393	0.925	-0.340	0.407	0.996	-0.018
135°	0.975	5.706	7.563	0.968	5.619	7.496	315°	0.400	0.962	-0.168	0.411	1.013	0.055
140°	0.962	5.547	7.441	0.965	5.584	7.469	320°	0.413	1.025	0.105	0.419	1.051	0.216
145°	0.945	5.358	7.290	0.961	5.541	7.436	325°	0.431	1.114	0.470	0.431	1.112	0.461
150°	0.927	5.153	7.121	0.957	5.490	7.396	330°	0.456	1.249	0.967	0.447	1.197	0.783
155°	0.910	4.972	6.965	0.952	5.432	7.350	335°	0.496	1.475	1.687	0.467	1.310	1.173
160°	0.897	4.824	6.834	0.945	5.363	7.294	340°	0.542	1.762	2.460	0.492	1.453	1.622
165°	0.886	4.710	6.730	0.932	5.210	7.168	345°	0.587	2.070	3.160	0.521	1.629	2.120
170°	0.878	4.628	6.654	0.914	5.015	7.003	350°	0.626	2.349	3.708	0.567	1.929	2.854
175°	0.874	4.578	6.607	0.897	4.824	6.834	355°	0.661	2.625	4.190	0.611	2.239	3.501

Horizontal Polarization:

Maximum: 1.082 (0.344 dB)

Horizontal Plane: 1.082 (0.344 dB)

Maximum ERP: 6.000 kW

Vertical Polarization:

Maximum: 1.082 (0.344 dB)

Horizontal Plane: 1.082 (0.344 dB)

Maximum ERP: 6.000 kW

Total Input Power: 5.544 kW

Reference: WFNQ1M.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: WFNQ

Location: Nashua, NH

Frequency: 106.3 MHz

Antenna: 2 bay LP-2E-DA-HW

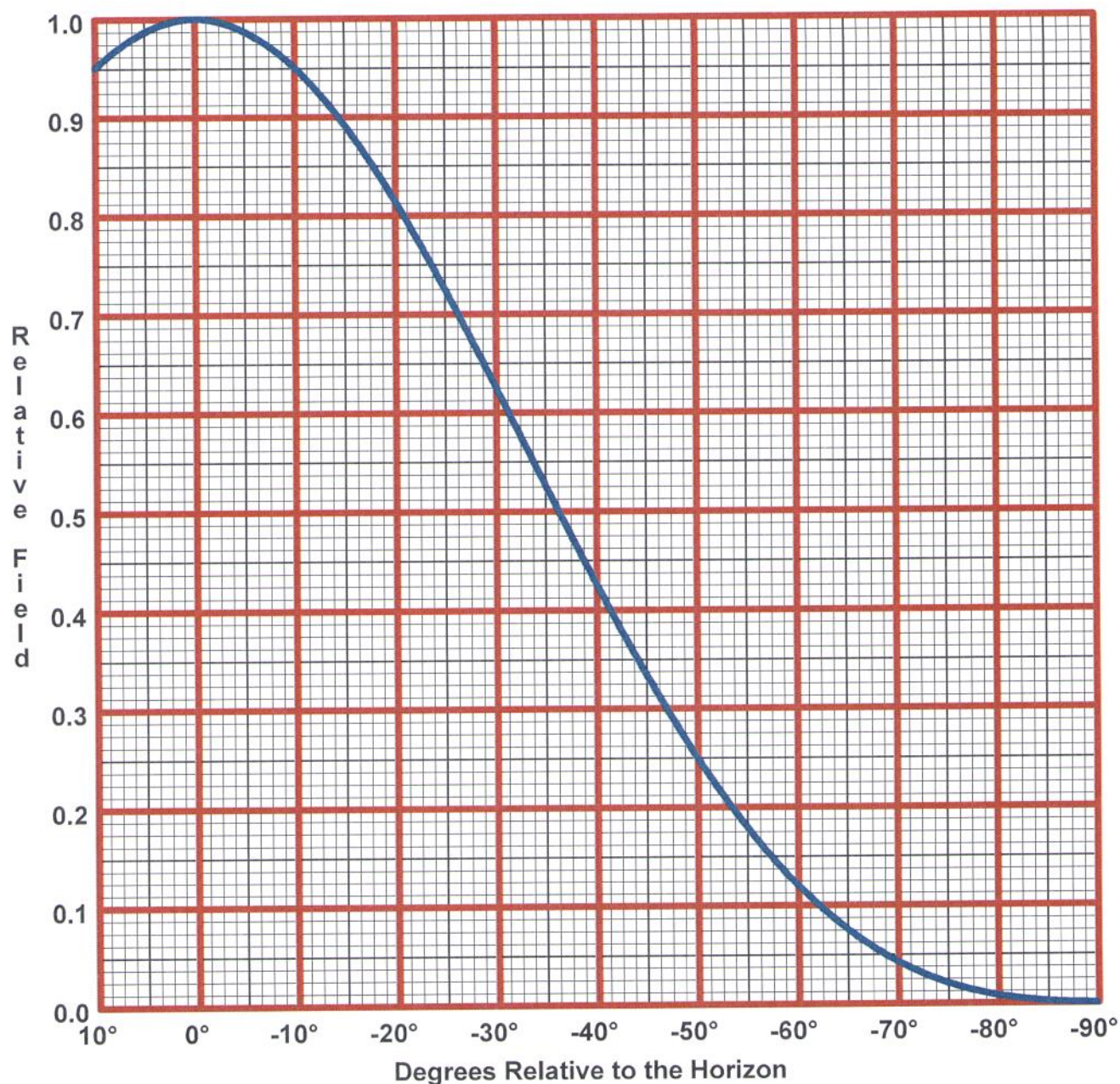
Date: 2/21/2018

H/V Power Ratio: 1

.5 Wave-length Spacing

0° Beam Tilt

0% First Null Fill



Horizontal Polarization:

Maximum: 1.082 (0.344 dB)

Horizontal Plane: 1.082 (0.344 dB)

Maximum ERP: 6.000 kW

Vertical Polarization:

Maximum: 1.082 (0.344 dB)

Horizontal Plane: 1.082 (0.344 dB)

Maximum ERP: 6.000 kW

Directional Antenna System for WFNQ, Nashua, New Hampshire

(Continued)

ANTENNA SPECIFICATIONS

Antenna Type:	LP-2E-DA-HW
Frequency:	106.3 MHz
Number of Bays:	Two

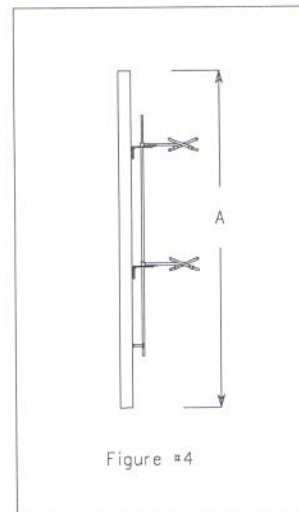
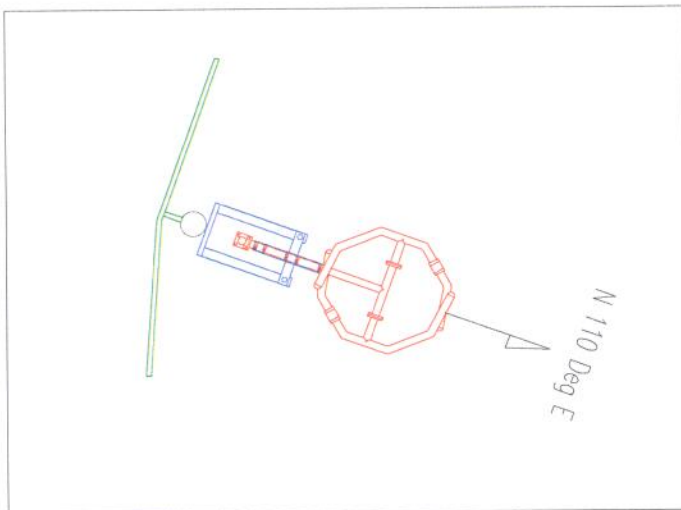
MECHANICAL SPECIFICATIONS

Mounting:	Standard
System length:	13 ft
Aperture length required:	19 ft 7 in
Orientation:	110° true

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

ELECTRICAL SPECIFICATIONS (For directional use)

Maximum horizontal ERP:	6.000 kW (7.782 dBk)
Horizontal maximum power gain:	1.082 (0.344 dB)
Maximum vertical ERP:	6.000 kW (7.782 dBk)
Vertical maximum power gain:	1.082 (0.344 dB)
Total input power:	5.544 kW (7.438 dBk)





WFNQ-FM NH1 Media Center 4 Church Street
Concord, NH 03301 603-230-9000

May 25, 2018

SUPERVISING ENGINEER'S CERTIFICATION

Certification:

This is to certify that the directional antenna system specified in FCC Permit File Number BPH-20170825ABF for radio station WFNQ-FM (Facility ID 23329) in Nashua NH was assembled and installed by qualified personnel, under my supervision, pursuant to the manufacturer's detailed specifications and instructions. The installation was carried out in accordance with good engineering practice.

Qualifications:

I am the Vice President of Engineering for WBIN Media Co., Inc. d/b/a Binnie Media, owner of 16 radio stations in NH, Maine and Vermont. I previously served as Director of Engineering for Nassau Broadcasting NH, Chief Engineer for Saga Communications NH, Director of Operations and Engineering for Tele-Media NH and served in other Engineering positions in NH and for Greater Media, WEEI, Curt Goudy Broadcasting and Sconnix Broadcasting all in Boston MA. I have been actively involved in the design, installation and maintenance of FM and AM transmission systems since 1980.

Sincerely,

Dirk Nadon
VP Engineering
WBIN Media Co., Inc
Binnie Media



MERIDIAN

LAND SERVICES, INC.

CIVIL ENGINEERING | LAND SURVEYING | PERMITTING | SOIL & WETLAND MAPPING | SEPTIC DESIGN | ENVIRONMENTAL

Office: 31 Old Nashua Road, Suite 2, Amherst, NH 03031

Mailing: PO Box 118, Milford, NH 03055

Phone: 603-673-1441 * Fax 603-673-1584

www.MeridianLandServices.com

May 24, 2018

Binnie Media

Attn. Dirk Nadon, Vice President Engineering

NH1 Media Center

4 Church Street

Concord, New Hampshire 03301

Re: WFNQ – FM Station 106.3 MHz, 80-1 Premium Outlets Blvd, Merrimack, New Hampshire – Directional Antenna Orientation prepared for Binnie Media.

Dear Mr. Nadon,

On Tuesday, May 8, 2018, Meridian Land Services, Inc. verified the direction of the WFNQ array, at 80-1 Premium Outlets Blvd, Merrimack, New Hampshire, Lat. 42°49'36.9"N, Long. 71°30'07.9"W, as positioned along an azimuth of 110 degrees (within 1 degree tolerance) from True North. Azimuth was determined from total station observations on the Bay 1 Antenna Feed Line, from control stations established on NH State Coordinate Grid established through GPS observations.

Observed Grid Azimuth 110°01'49"

0°06'42" West - NH Grid to Geodetic North

(determined using NGS Coordinate Conversion and Transformation Tool)

Azimuth from True North 110°08'21"

Design Azimuth 110°

Please call should you have any questions.

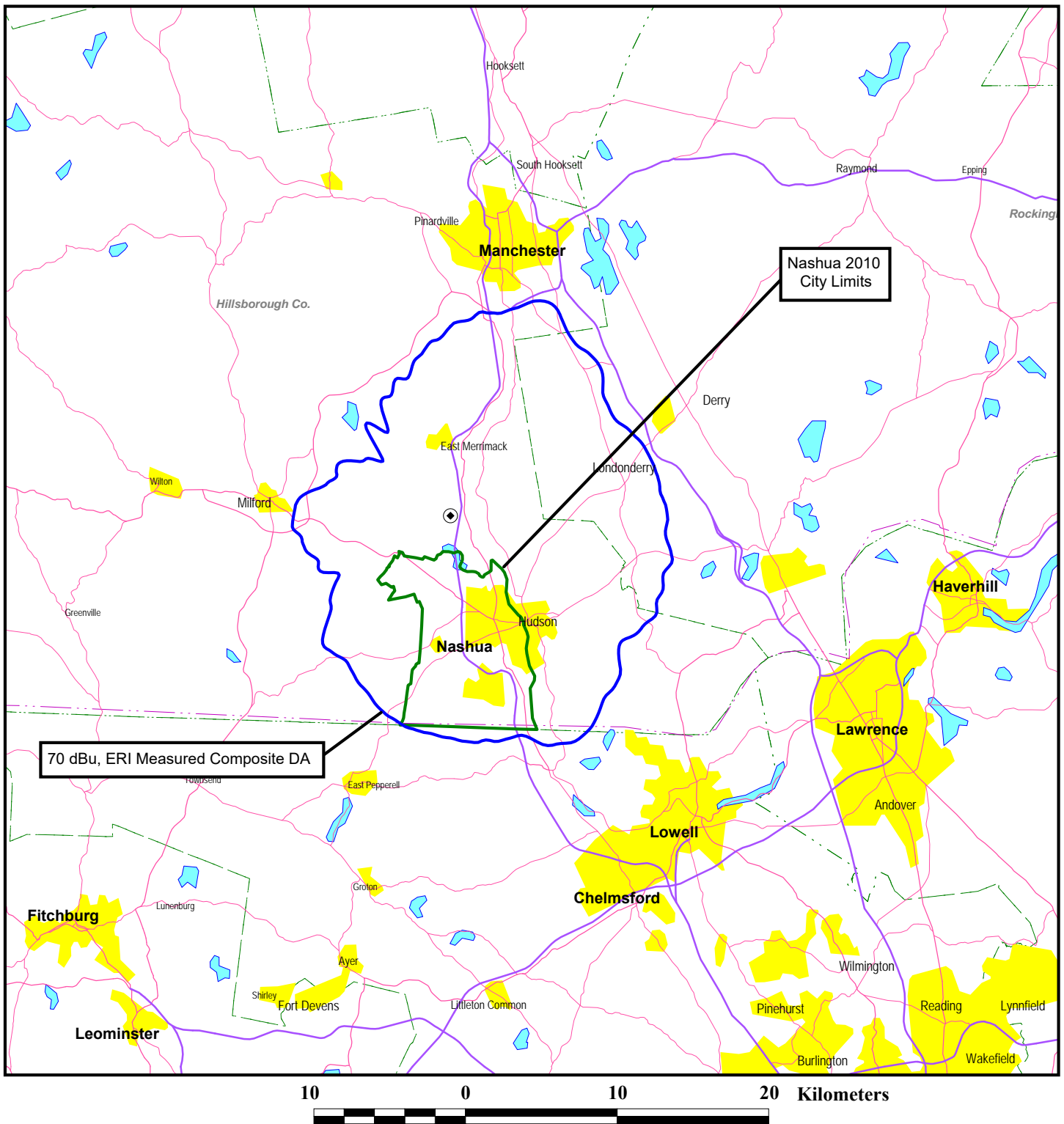
Very truly yours,

Meridian Land Services, Inc.



Kenneth C. Clinton, LLS/PLS
President / Chief of Survey

Figure 1



COMPLIANCE WITH SECTION 73.315

STATION WFNQ
NASHUA, NEW HAMPSHIRE
CH 292A 6 KW (DA) 81 M

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