Federal Communications Commission
Washington, D. C. 20554

Approved by OMB
3060-0627
Expires 01/31/98

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URGENT URGENT

Ann G
SNL 2/23/11

FCC 302-AM
APPLICATION FOR AM BROADCAST STATION LICENSE

(Please read instructions before filling out form.)

FOR COMMISSION USE ONLY
FILE NO. BMML-20110208ADY

SECTION I - APPLICANT FEE INFORMATION

BMML-20110208

1. PAYOR NAME (Last, First, Middle Initial)
Potomac Radio, LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)
2131 Crimmins Lane

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Falls Church	VA	22043

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
703-532-0400	WAGE	FIN: 54876

2. A. Is a fee submitted with this application? [✓] Yes [ ] No

B. If No, indicate reason for fee exemption (see 47 C.F.R. Section

[ ] Governmental Entity [ ] Noncommercial educational licensee [ ] Other (Please explain):

C. If Yes, provide the following information:

Enter in Column (A) the correct Fee Type Code for the service you are applying for. Fee Type Codes may be found in the "Mass Media Services Fee Filing Guide." Column (B) lists the Fee Multiple applicable for this application. Enter fee amount due in Column (C).

(A) FEE TYPE CODE	(B) FEE MULTIPLE	(C) FEE DUE FOR FEE TYPE CODE IN COLUMN (A)	FOR FCC USE ONLY
	0 0 0 1	$	

To be used only when you are requesting concurrent actions which result in a requirement to list more than one Fee Type Code.

(A)	(B)	(C)	FOR FCC USE ONLY
	0 0 0 1	$	

ADD ALL AMOUNTS SHOWN IN COLUMN C, AND ENTER THE TOTAL HERE. THIS AMOUNT SHOULD EQUAL YOUR ENCLOSED REMITTANCE.

TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
$	

SECTION II - APPLICANT INFORMATION

1. NAME OF APPLICANT POTOMAC RADIO, LLC		
MAILING ADDRESS 2131 CRIMMINS LANE		
CITY FALLS CHURCH	STATE VA	ZIP CODE 22043

2. This application is for:

[✓] Commercial [ ] Noncommercial

[✓] AM Directional [ ] AM Non-Directional

Call letters	Community of License	Construction Permit File No.	Modification of Construction Permit File No(s).	Expiration Date of Last Construction Permit
WAGE	Leesburg, VA	BP-20070118AEM		October 29, 2011

3. Is the station now operating pursuant to automatic program test authority in accordance with 47 C.F.R. Section 73.1620?

[ ] Yes [✓] No

If No, explain in an Exhibit.

Exhibit No.

4. Have all the terms, conditions, and obligations set forth in the above described construction permit been fully met?

[✓] Yes [ ] No

If No, state exceptions in an Exhibit.

Exhibit No.

5. Apart from the changes already reported, has any cause or circumstance arisen since the grant of the underlying construction permit which would result in any statement or representation contained in the construction permit application to be now incorrect?

[ ] Yes [✓] No

If Yes, explain in an Exhibit.

Exhibit No.

6. Has the permittee filed its Ownership Report (FCC Form 323) or ownership certification in accordance with 47 C.F.R. Section 73.3615(b)?

[ ] Yes [ ] No

[✓] Does not apply

If No, explain in an Exhibit.

Exhibit No.

7. Has an adverse finding been made or an adverse final action been taken by any court or administrative body with respect to the applicant or parties to the application in a civil or criminal proceeding, brought under the provisions of any law relating to the following: any felony; mass media related antitrust or unfair competition; fraudulent statements to another governmental unit; or discrimination?

[ ] Yes [✓] No

If the answer is Yes, attach as an Exhibit a full disclosure of the persons and matters involved, including an identification of the court or administrative body and the proceeding (by dates and file numbers), and the disposition of the litigation. Where the requisite information has been earlier disclosed in connection with another application or as required by 47 U.S.C. Section 1.65(c), the applicant need only provide: (i) an identification of that previous submission by reference to the file number in the case of an application, the call letters of the station regarding which the application or Section 1.65 information was filed, and the date of filing; and (ii) the disposition of the previously reported matter.

Exhibit No.

8. Does the applicant, or any party to the application, have a petition on file to migrate to the expanded band (1605-1705 kHz) or a permit or license either in the existing band or expanded band that is held in combination (pursuant to the 5 year holding period allowed) with the AM facility proposed to be modified herein?

☐ Yes ☑ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

The APPLICANT hereby waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because use of the same, whether by license or otherwise, and requests and authorization in accordance with this application. (See Section 304 of the Communications Act of 1934, as amended).

The APPLICANT acknowledges that all the statements made in this application and attached exhibits are considered material representations and that all the exhibits are a material part hereof and are incorporated herein as set out in full in

CERTIFICATION

1. By checking Yes, the applicant certifies, that, in the case of an individual applicant, he or she is not subject to a denial of federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. Section 862, or, in the case of a non-individual applicant (e.g., corporation, partnership or other unincorporated association), no party to the application is subject to a denial of federal benefits that includes FCC benefits pursuant to that section. For the definition of a "party" for these purposes, see 47 C.F.R. Section 1.2002(b).

☑ Yes ☐ No

2. I certify that the statements in this application are true, complete, and correct to the best of my knowledge and belief, and are made in good faith.

Name	Signature	
JAMES WEITZMAN	[signature]	
Title	Date	Telephone Number
Managing Member	1/31/2011	703-532-0400

WILLFUL FALSE STATEMENTS ON THIS FORM ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. CODE, TITLE 18, SECTION 1001), AND/OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION

FCC NOTICE TO INDIVIDUALS REQUIRED BY THE PRIVACY ACT AND THE PAPERWORK REDUCTION ACT

The solicitation of personal information requested in this application is authorized by the Communications Act of 1934, as amended. The Commission will use the information provided in this form to determine whether grant of the application is in the public interest. In reaching that determination, or for law enforcement purposes, it may become necessary to refer personal information contained in this form to another government agency. In addition, all information provided in this form will be available for public inspection. If information requested on the form is not provided, the application may be returned without action having been taken upon it or its processing may be delayed while a request is made to provide the missing information. Your response is required to obtain the requested authorization.

Public reporting burden for this collection of information is estimated to average 639 hours and 53 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, can be sent to the Federal Communications Commission, Records Management Branch, Paperwork Reduction Project (3060-0627), Washington, D. C. 20554. Do NOT send completed forms to this address.

THE FOREGOING NOTICE IS REQUIRED BY THE PRIVACY ACT OF 1974, P.L. 93-579, DECEMBER 31, 1974, 5 U.S.C. 552a(e)(3), AND THE PAPERWORK REDUCTION ACT OF 1980, P.L. 96-511, DECEMBER 11, 1980, 44 U.S.C. 3507.

SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant
Potomac Radio, LLC

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

☑ Station License ☐ Direct Measurement of Power

1. Facilities authorized in construction permit

Call Sign	File No. of Construction Permit (if applicable)	Frequency (kHz)	Hours of Operation	Power in kilowatts: Night	Power in kilowatts: Day
WAGE	BP-20070118AEM	1190	Daytime	N/A	50

2. Station location

State	City or Town
Virginia	Leesburg

3. Transmitter location

State	County	City or Town	Street address (or other identification)
VA	Loudoun	Ashburn	21054 Loudoun County Parkway

4. Main studio location

State	County	City or Town	Street address (or other identification)
VA	Fairfax	Falls Church	2131 Crimmins Lane

5. Remote control point location (specify only if authorized directional antenna)

State	County	City or Town	Street address (or other identification)
VA	Fairfax	Falls Church	2131 Crimmins Lane

6. Has type-approved stereo generating equipment been installed? ☐ Yes ☑ No

7. Does the sampling system meet the requirements of 47 C.F.R. Section 73.68? ☑ Yes ☐ No

☐ Not Applicable

Attach as an Exhibit a detailed description of the sampling system as installed. Exhibit No. Engineering Statement

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system	RF common point or antenna current (in amperes) without modulation for day system
N/A	32.042

Measured antenna or common point resistance (in ohms) at operating frequency: Night	Day	Measured antenna or common point reactance (in ohms) at operating frequency: Night	Day
N/A	51.28	N/A	-2.65

Antenna indications for directional operation

Towers	Antenna monitor Phase reading(s) in degrees		Antenna monitor sample current ratio(s)		Antenna base currents	
	Night	Day	Night	Day	Night	Day
1 (SE) 1255859	N/A	-82.5	N/A	0.469	N/A	Not Required
2 (C) 1255860	N/A	0.0	N/A	1.000	N/A	Not Required
3 (NW) 1255861	N/A	+154.7	N/A	0.309	N/A	Not Required

Manufacturer and type of antenna monitor: Potomac Instruments 1901-3 (S/N 836)

9. Description of antenna system ((f directional antenna is used, the information requested below should be given for each element of the array. Use separate sheets if necessary.)

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded.	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit.
Self-Supporting Tapered	57.87	59.4	59.4	Exhibit No. N/A

Excitation ☑ Series ☐ Shunt

Geographic coordinates to nearest second. For directional antenna give coordinates of center of array. For single vertical radiator give tower location.

North Latitude	39 °	02 '	28 "	West Longitude	77 °	26 '	42 "

If not fully described above, attach as an Exhibit further details and dimensions including any other antenna mounted on tower and associated isolation circuits. — Exhibit No. Engineering Statement

Also, if necessary for a complete description, attach as an Exhibit a sketch of the details and dimensions of ground system. — Exhibit No. Engineering Statement

10. In what respect, if any, does the apparatus constructed differ from that described in the application for construction permit or in the permit?

None

11. Give reasons for the change in antenna or common point resistance.

N/A - New Construction

I certify that I represent the applicant in the capacity indicated below and that I have examined the foregoing statement of technical information and that it is true to the best of my knowledge and belief.

Name (Please Print or Type)	Signature (check appropriate box below)
Garrison C. Cavell	[signature]
Address (include ZIP Code)	Date
Cavell, Mertz & Associates, Inc. 7732 Donegan Drive Manassas, VA 20109-2868	01-19-2010 Telephone No. (Include Area Code) (703) 392-9090

☐ Technical Director ☐ Registered Professional Engineer

☐ Chief Operator ☑ Technical Consultant

☐ Other (specify)

Engineering Exhibit

APPLICATION FOR STATION LICENSE
METHOD OF MOMENTS
PROOF OF PERFORMANCE

prepared for
Potomac Radio, LLC
Station WAGE   Leesburg, Virginia

1190 kHz 50 kW DA-D

January 19, 2011

Cavell, Mertz & Associates, Inc.

7732 Donegan Drive
Manassas, Virginia 20109
703.392.9090

Engineering Statement

APPLICATION FOR STATION LICENSE
METHOD OF MOMENTS - PROOF OF PERFORMANCE
prepared for
Potomac Radio, LLC
Station WAGE Leesburg, Virginia
1190 kHz 50 kW DA-D

FCC Form 302-AM, Section III
Engineering Statement – Method of Moments Proof of Performance

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Introduction

This Engineering Statement has been prepared on behalf of *Potomac Radio, LLC* ("*Potomac Radio*"), licensee of radio station WAGE, Leesburg, Virginia, (Facility ID 54876). It supports *Potomac Radio's* Application for License following completion of construction of a daytime directional antenna system for WAGE at a new location and frequency.[1]

A "Method of Moments" ("MoM") Proof-of-Performance has been successfully conducted on the constructed antenna system per the provisions of Section 73.151(c) of the Commission's Rules.[2] The information provided in this Statement demonstrates that the directional antenna parameters for the new antenna array have been determined in accordance with the requirements of the above rule.

Further, the antenna system has been adjusted to produce antenna monitor parameters that are within +/- 5 percent in ratio and +/- 3 degrees in phase of the MoM modeled values, as required by the Commission's Rules. Thus, as demonstrated here, the newly constructed antenna system is in compliance with the terms of the underlying Construction Permit, as well as all pertinent Commission Rules and Policies.

Antenna System Description

The constructed directional antenna facility consists of three tapered, self-supporting, base-insulated, series fed towers. The FAA was notified of the proposed construction and a "Notice of No Hazard" was received from the FAA for each tower.[3] Consequently, tower lighting is not required for these structures by the FCC license or the FAA Rules.

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[1] WAGE was previously licensed to operate on a frequency of 1200 kHz at a different site under BL-19940228DA. A change in frequency and transmitter site location was sought in 2007. A Construction Permit was subsequently granted for the change in daytime frequency, power and location on October 29, 2008 (BP-20070118AEM).

[2] The new WAGE day directional antenna array is eligible under the Commission's Rules for licensing under the MoM Rules in that the antenna system consists of series fed, base insulated towers, using a conventional, buried wire, ground system.

[3] See FAA Aeronautical Study Numbers 2007-AEA-270-OE, 2007-AEA-271-OE, and 2007-AEA-272-OE for towers 1(Southeast), 2 (Center) and 3 (Northwest) respectively. Corresponding FCC Antenna Structure Registration Numbers 1255859, 1255860 and 1255861 have been assigned to WAGE towers 1, 2 and 3.

The theoretical antenna array geometry as authorized in the Construction permit ("CP") is summarized in the table below. As demonstrated in a following section of this Statement, the antenna system was constructed in substantial conformance with these specifications:

FCC ASRN	Tower Number	Relative Tower Location	Distance From Reference Tower	Orientation From Reference Tower	Reference Switch Flag
1255859	1	Southeast	96.5°	130.1° T	None
1255860	2	Center	0.0°	0.0° T	None
1255861	3	Northwest	89.9°	335.1° T	None

Accordingly, the above spacing and orientation descriptions were used in the conduct of the method of moments proof-of-performance documented herein.

Ground System Description

A conventional buried copper wire ground system has been employed in the construction of this antenna array. Specifically, it consists of 120 equally spaced number 10 soft-drawn, copper radial wires buried into the ground and arrayed every 3° around each tower, to a length of 63 meters (206 feet), except where terminated in common, 4-inch transverse copper straps or shortened by setbacks from certain local boundary features. Additionally, each concrete tower base foundation is covered with extruded copper mesh, which is crossed by several (4-inch wide) copper straps. The periphery of the foundation-top mesh area is bonded to a 4-inch perimeter strap around the tower base foundation, to which the 120 copper ground radials are silver soldered.

An additional set of 120 shorter copper radials are bonded to the tower base perimeter strap and interspersed (and buried) between the longer radials. These short supplemental radials are each 15.2 meters (50 feet) in length, and are also number 10 soft-drawn copper wire.

Finally, copper straps are run to seven, 8-foot long buried copper ground rods evenly distributed around each tower base to aid in lightning protection. Copper straps are also buried between the towers and in the transmission line trench and are also tied to the tower base ground strap as well as to the transmitter building grounding system.

Antenna Monitor and Sample System

A new *Potomac Instruments Inc.* Model AM-1901-3 Antenna Monitor, Serial Number 836, was purchased for this construction. The calibration date for this monitor is August 5, 2010. The calibration was verified at the time of the proof of performance.

Delta Electronics, Inc. "TCT-3" toroidal current transformers ("TCTs") are employed to provide sample currents to the antenna monitor. The operating characteristics of these TCTs were verified per the requirements of the FCC's Rules prior to antenna array adjustment. (See following separate section of this Statement on Sample System TCT Calibration.)

New phase stabilized, connectorized, equal length, half-inch *Andrew Corporation* Model 42394-14VA coaxial sample cables were installed at the site under equal environmental conditions, all being buried except where extending equally to terminating locations. The electrical lengths and characteristic impedance of these lines were verified prior to array adjustment per the Commission's MoM proof requirements. (See separate section of this Statement on Sample Line Verification.)

This sampling system conforms to the provisions of Section 73.68(a) of the Commission's Rules that were in effect prior to January 1, 1986. Accordingly, if pertinent, approval of this sampling system is being requested pursuant to the FCC's Public Notice of December 9, 1985. Further, as will be demonstrated herein, the installed antenna monitor - sampling system also complies with the requirements of the newly adopted MoM Proof Rules under Section 73.151(c).

MoM Process

The procedure for conducting a MoM proof involves making impedance measurements at each of the towers to serve as benchmarks for calibrating the array model, characterizing the base environment and taking note of any likely sources of stray base reactances. An initial model of the characteristics of each tower as an individual ("self" modeling) is then done. Tower characteristics (height and width) can then be adjusted to "converge" the modeled resistance of the tower to the measured values. Reactance data are then converged by using conventional circuit analysis techniques to account for the various stray feed reactances encountered at the tower base.

With a calibrated model in hand, theoretical field parameters can then be introduced into the software to develop a set of antenna monitor parameters for the modeled array that will in turn achieve the desired pattern shape when the system is adjusted accordingly. The following text documents the specific approach taken in modeling and adjusting this directional antenna system.

Tower Impedance Measurements to Verify Method of Moments Model

In order to calibrate the MoM model, impedance measurements were taken at each of the tower bases. As discussed in the previous section, by relating the individual as-measured antenna conditions to the model, ("converging the model") confidence is achieved for the derivation of system (antenna monitor) parameters.

In this instance, impedance measurements were conducted using a precision, calibrated measurement system consisting of a *Hewlett-Packard* model 8753C network analyzer in conjunction with a *Tunwall Radio* directional coupler system and an *Electronic Navigation Industries* (ENI) Model 310 L RF amplifier. Analyzer calibration was field verified prior to each measurement using the procedures specified in the manufacturer's instruction manual employing precision calibration standards and techniques.

After calibration of the system, antenna base impedance measurements were made at each tower at the location of the final output jacks[4] ("J-plugs") within the respective Antenna Tuning Units ("ATUs"). As each tower was being measured, all the other tower bases were "open circuited" at the same J-plug impedance measurement locations.

[4] This point is referred to in this report as the tower "reference point" as it is the location where the TCT's samples are taken.

This J-Plug reference point at each ATU is located immediately adjacent to the sampling transformer of the antenna monitor system at the output of the ATU system enclosure. At each ATU enclosure, it was confirmed that the tower RF current passes directly from that point, through heavy conductors, through the enclosure insulator and on to the tower "spider feed" attachment point above the base insulators, without any intervening components or devices.

There are no components in shunt with the ATU outputs following the sampling transformers other than static drain chokes. The presence of the static drain chokes was taken into account using the manufacturer's stated inductive reactances at 1190 kilohertz during the calibration of the MoM model to the measured base impedances. The presence of the tower base insulators reactances was also taken into account for reactance consequences at the 1190 kHz operating frequency.

Tower base environment circuit calculations were then performed both manually and by using the "WCAP" network analysis program software provided by *Westberg Consulting*. (The WCAP software performs nodal analysis calculations, similar to "SPICE" and other circuit analysis software.) These calculations were used throughout the proof process to relate the MoM modeled impedances to the ATU output measurement (reference) points.

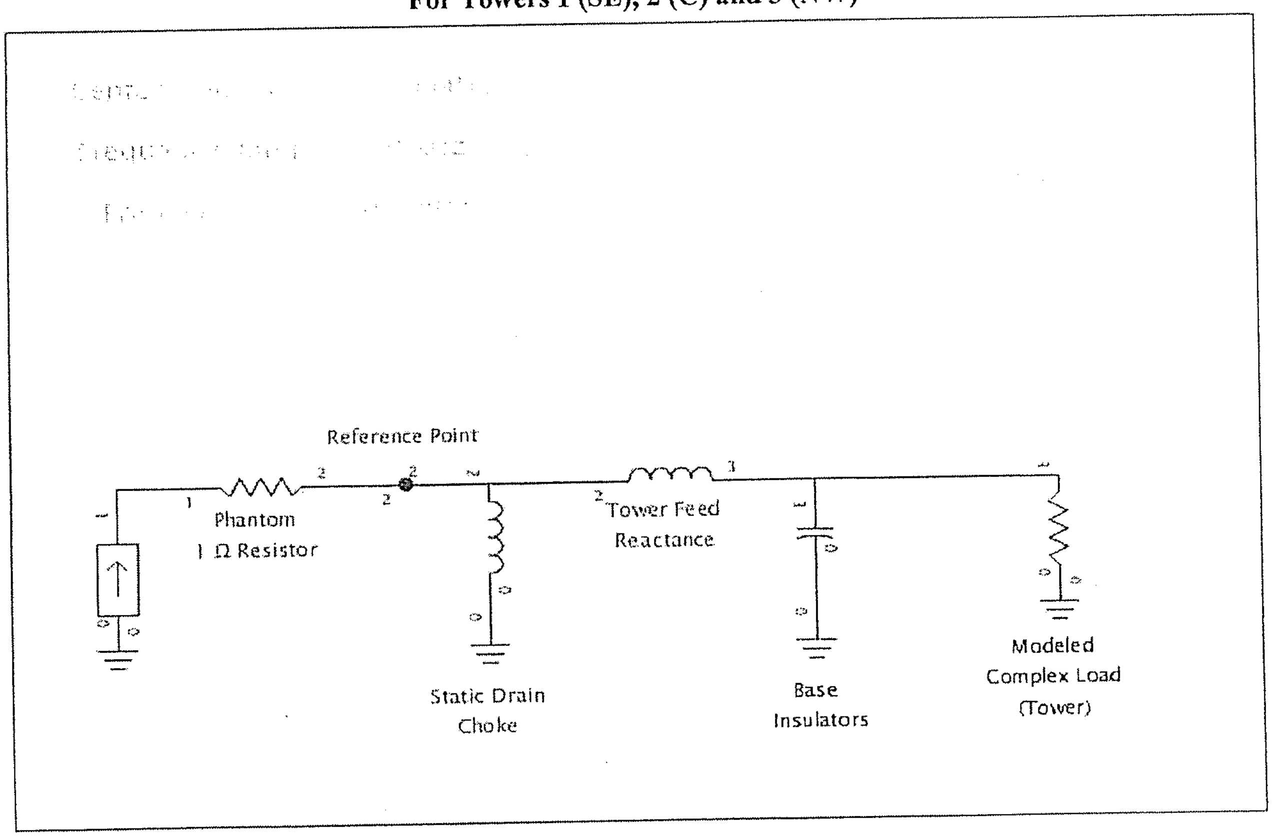
As shown on the following pages, the Open Circuit Reactance ("X_{OC}") found at each tower was calculated for the assumed base conditions. This value was then used in the MoM model as a "load" at ground level for the open circuited ("OC") MoM individual model "self" (individual tower) case. Using these assumed lumped loads, base environment, and MoM analysis, initial values were derived and the model converged.

A schematic of the assumed circuit, along with a summary of results and a tabulation of WCAP calculated values, is provided in the following pages.

In each of the WCAP tabulations and the representative schematic shown below, "Node 2" represents the ATU output "reference point" (TCT location). "Node 3" represents the tower feed-point. "Node 0" represents ground potential. In the Open Circuit "Tower Self" analysis tabulations for each tower, the calculated ATU output impedances appear under the "TO IMPEDANCE" columns, following the "phantom" 1 ohm resistors (R_{1-2}). This phantom resistor is included in series with the drive current sources (I_{0-1}) to provide defined calculation points in the software. The tower feed-point impedances from the MoM model are represented by "complex loads" from "Node 3" to ground (R_{3-0}). An assumed aggregate base insulator stray capacitance of 55.5 pF (picoFarads) was used across all of the tower bases.

As shown, the modeled and measured base impedances at the ATU output jacks (with the other towers open circuited at their ATU output jacks) agree with each other within +/- 2 ohms and +/- 4 percent for resistance and reactance, as required under the Commission's MoM Rules.

Representative Open Circuit Tower Base Environment Schematic
For Towers 1 (SE), 2 (C) and 3 (NW)



Summary of Completed Open Circuit Analysis of Tower Base Environment

Tower Number - Tower Location - (Tower ASRN)	Tower Feed Inductance	Tower Feed Reactance X_L*	Complex Load Impedance Z Modeled	Reference Point* Z_{ATU} Modeled	Reference Point* Z_{ATU} Measured
1 - Southeast (1255859)	3.3820 μH	25.287 Ω	29.703 –j26.224 Ω	29.06 –j1.000 Ω	29.7 –j1.0 Ω
2 - Central (1255860)	5.0905 μH	38.062 Ω	25.802 –j35.519 Ω	25.05 +j2.800 Ω	25.8 +j2.8 Ω
3 - Northwest (1255861)	3.3639 μH	25.152 Ω	30.196 –j24.541 Ω	29.59 +j0.500 Ω	30.2 +j0.5 Ω

Notes:

* - At ATU Output Jack (J-Plug) – Established as ATU "Reference Point"

Static Drain Choke Reactance at 1190 kHz: 100,000 Ω
Static Drain Choke Inductance: 13,374.4 μH

Base Insulator Capacitance: ~ 18.5 pF each
Total Capacitance: ~ 55.5 pF
Total Base Insulator Reactance at 1190 kHz: - 2,410 Ω

Lumped Load Assumption at 1190 kHz: - 2,469.3 Ω
(Base Insulators and Static Drain Choke)

Circuit Analysis Used for Each Tower to Verify Method of Moments Model

WCAP Tower Base Open Circuit "Self" Analysis – Tower 1 (Southeast)

WCAP OUTPUT AT FREQUENCY: 1.190 MHz

NODE VOLTAGES

Node: 1 30.0798 ∠ -1.9060° V
Node: 2 29.0804 ∠ -1.9715° V
Node: 3 39.1937 ∠ -42.1224° V

WCAP PART			CURRENT IN	CURRENT OUT
WCAP PART			**BRANCH VOLTAGE**	**BRANCH CURRENT**
R	3→0	29.7030000	39.19 ∠ -42.122° V	0.99 ∠ -0.668° A
C	3→0	0.00005550	39.19 ∠ -42.122° V	0.02 ∠ 49.117° A
L	2→3	3.38200000	25.29 ∠ 90.017° V	1.00 ∠ 0.017° A
L	2→0	13374.40000000	29.08 ∠ -1.972° V	0.00 ∠ -91.960° A
R	1→2	1.00000000	1.00 ∠ -0.001° V	1.00 ∠ 0.000° A

WCAP PART			FROM IMPEDANCE	TO IMPEDANCE
R	3→0	29.70300000	29.70 - j 26.224	0.00 + j 0.000
C	3→0	0.000055500	0.00 - j 2409.795	0.00 + j 0.000
L	**2→3**	**3.382000000**	29.06 - j 1.0009	29.06 - j 26.296
L	2→0	13374.400000000	0.00 + j 100000.262	0.00 + j 0.000
R	**1→2**	1.00000000	30.06 - j 1.000	**29.06 - j 1.000**
			(Measured:	**29.7 - j 1.0)**

WCAP INPUT DATA:

1.1900	0.0001000	1		
R	29.70300000	3	0	-26.22400000
C	0.00005550	3	0	
L	**3.38200000**	2	3	0.00000000
L	13374.40000000	2	0	0.00000000
R	1.00000000	1	2	0.00000000
I	1.00000000	0	1	0.00000000

WCAP Tower Base Open Circuit "Self" Analysis – Tower 2 (Center)

WCAP OUTPUT AT FREQUENCY: 1.190 MHz

NODE VOLTAGES

Node: 1 26.2038 ∠ 6.1349° V
Node: 2 25.2097 ∠ 6.3778° V
Node: 3 43.2604 ∠ -54.5945° V

WCAP PART			CURRENT IN	CURRENT OUT
WCAP PART			**BRANCH VOLTAGE**	**BRANCH CURRENT**
R	3→0	25.80200000	43.26 ∠ -54.594° V	0.99 ∠ -0.590° A
C	3→0	0.00005550	43.26 ∠ -54.594° V	0.02 ∠ 35.406° A
L	2→3	5.09050000	38.06 ∠ 90.014° V	1.00 ∠ 0.014° A
L	2→0	13374.40000000	25.21 ∠ 6.378° V	0.00 ∠ -83.622° A
R	1→2	1.00000000	1.00 ∠ 0.000° V	1.00 ∠ 0.000° A

WCAP PART			FROM IMPEDANCE	TO IMPEDANCE
R	3→0	25.80200000	25.80 - j 35.519	0.00 + j 0.000
C	3→0	0.00005550	0.00 - j 2409.795	0.00 + j 0.000
L	**2→3**	**5.09050000**	25.06 + j 2.794	25.06 - j 35.267
L	2→0	13374.40000000	0.00 + j 100000.262	0.00 + j 0.000
R	**1→2**	1.00000000	26.05 + j 2.800	**25.05 + j 2.800**
			(Measured:	**25.8 + j 2.8)**

WCAP INPUT DATA:

1.190	0.0001000	1		
R	25.80200000	3	0	-35.51900000
C	0.00005550	3	0	
L	**5.09050000**	2	3	0.00000000
L	13374.40000000	2	0	0.00000000
R	1.00000000	1	2	0.00000000
I	1.00000000	0	1	0.00000000

WCAP Tower Base Open Circuit "Self" Analysis – Tower 3 (Northwest)

WCAP OUTPUT AT FREQUENCY: 1.190 MHz

NODE VOLTAGES

Node: 1 30.5895 ∠ 0.9366° V
Node: 2 29.5896 ∠ 0.9682° V
Node: 3 38.5155 ∠ -39.7953° V

WCAP PART			CURRENT IN	CURRENT OUT
WCAP PART			**BRANCH VOLTAGE**	**BRANCH CURRENT**
R	3→0	30.196000000	38.52 ∠ -39.795° V	0.99 ∠ -0.694° A
C	3→0	0.00005550	38.52 ∠ -39.795° V	0.02 ∠ 50.205° A
L	2→3	3.36390000	25.15 ∠ 90.017° V	1.00 ∠ 0.017° A
L	2→0	13374.40000000	29.59 ∠ 0.968° V	0.00 ∠ -89.032° A
R	1→2	1.00000000	1.00 ∠ 0.001° V	1.00 ∠ 0.001° A

WCAP PART			FROM IMPEDANCE	TO IMPEDANCE
R	3→0	30.19600000	30.20 - j 24.541	0.00 + j 0.000
C	3→0	0.00005550	0.00 - j 2409.795	0.00 + j 0.000
L	**2→3**	**3.36390000**	29.59 + j 0.491	29.26 - j 24.661
L	2→0	13374.40000000	0.00 + j 100000.262	0.00 + j 0.000
R	**1→2**	1.00000000	30.59 + j 0.500	**29.26 + j 0.500**
			(Measured:	**30.2 + j 0.5)**

WCAP INPUT DATA:

1.1900	0.0001000	1		
R	30.19600000	3	0	-24.54100000
C	0.00005550	3	0	
L	**3.36390000**	2	3	0.00000000
L	13374.40000000	2	0	0.00000000
R	1.00000000	1	2	0.00000000
I	1.00000000	0	1	0.00000000

Details of MoM "Open Circuit" Modeling - for Towers Driven Individually

In the underlying MoM modeling used in the preceding work, each tower is first considered individually. "Open Circuit" ("OC" or "Self") analysis calculations are made based upon the physical characteristics of the array. The modeled data is then "converged" with the "as-measured" data for each tower by applying corrections for velocity of propagation through the towers and assumed stray base reactances. For the analysis of the WAGE antenna array, "Expert MiniNec Broadcast Professional" software (Version 14.5 –published by *EM Scientific Inc.*) was employed to develop the initial individual tower cases. Copies of program outputs are provided in the following pages to demonstrate the methods used and results achieved.

Although all of the antenna system radiators are identical tapered self-supporting *Valmont* towers, the accepted practice of using a single "wire" "wedding cake" approach to represent each tower was employed herein, as opposed to a lattice or wire-frame model. The top and bottom wire end points of each of the tower wires were specified in electrical degrees in the Cartesian coordinate system. No end caps were employed. A perfect ground environment was also assumed. The geometry data used in this analysis were taken from the theoretical directional antenna specifications. Each tower was modeled using 11 segments as follows:

Tower Number	Wire Number	End 1	End 2	Average Radius	Number of Segments	Wire Length	Segment Length	Segment Length/Radius
1	1	1	2	0.6549 m	2	17.422°	8.7° or 6.1m	9.3
	2	2	3	0.4219 m	3	21.778°	7.3° or 5.1 m	12.1
	3	3	4	0.3093 m	3	21.778°	7.3° or 5.1 m	16.5
	4	4	5	0.2183 m	3	24.792°	8.3° or 5.8 m	26.6
2	5	6	7	0.6549 m	2	17.422°	8.7° or 6.1m	9.3
	6	7	8	0.4219 m	3	21.778°	7.3° or 5.1 m	12.1
	7	8	9	0.3093 m	3	21.778°	7.3° or 5.1 m	16.5
	8	9	10	0.2183 m	3	22.722°	7.6° or 5.3 m	24.3
3	9	11	12	0.6549 m	2	17.422°	8.7° or 6.1m	9.3
	10	12	13	0.4219 m	3	21.778°	7.3° or 5.1 m	12.1
	11	13	143	0.3093 m	3	21.778°	7.3° or 5.1 m	16.5
	12	14	15	0.2183 m	3	25.272°	8.4° or 5.9 m	27.0

Note: The height (length) of top wire (model tier) was adjusted for each tower to achieve convergence; see following text. As shown above, all segment lengths are < 10°. All "Segment to Length" Ratios are > 8.

After the initial setup of antenna array information in the model, the individual towers were studied iteratively with all other towers open circuited[5], while characteristics were adjusted (in height and radius) until the modeled resistance approximately matched the measured resistance. In this instance, the top tier (or wire) of each tower was adjusted as necessary.

Final adjustments to converge the model reactances with the measured reactances were made through the introduction of the WCAP circuit model, shown in the preceding pages, which allowed an approximation of the series stray reactances found in the tower base environment.

Each tower's adjusted modeled height relative to its physical height falls within the required range of 75 to 125 percent. No change was made in modeled tower radius, therefore each modeled radius fell within the required range of 80 percent to 150 percent of the radius of a circle having a circumference equal to the sum of the widths of the tower sides. A summary of this portion of the model input data is provided below:

Tower	Radiator Physical Height	Modeled Height (degrees)	Modeled % of Height	Modeled Radius	Equivalent Radius
1-Southeast	57.87 m / 82.7°	**85.77°**	103.7%	Unchanged	100%
2-Center	57.87 m / 82.7°	**83.75°**	101.3%	Unchanged	100%
3-Northwest	57.87 m / 82.7°	**86.25°**	104.3%	Unchanged	100%

The preceding WCAP tabulations detailed the base circuit analysis; the following tabulations show the details of the MoM OC models for the individually driven towers.

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[5] The MoM model incorporated assumed loads at ground level for the "other" open circuited towers in the array using the stray shunt reactance data that were calculated using the base circuit models for the open circuited towers. The overall circuit model consists of series and parallel branches representing feedline inductances, shunt inductances (such as static drain chokes), and stray capacitances, such as aggregate base insulator capacitance to ground. For the initial lumped load assumptions, only shunt reactances were considered. Series feedline stray reactances are added in the final convergence step.

MoM Model Details for Towers Driven Individually - Tower 1 OC Self - (1 of 2)

Tower 1 - Open Circuit - Self

GEOMETRY: Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	96.5	130.1	0	.6549	2
		96.5	130.1	17.422		
2	none	96.5	130.1	17.422	.4912	3
		96.5	130.1	39.2		
3	none	96.5	130.1	39.2	.3093	3
		96.5	130.1	60.978		
4	none	96.5	130.1	60.978	.2183	3
		96.5	130.1	85.77		
5	none	0	0	0	.6549	2
		0	0	17.422		
6	none	0	0	17.422	.4912	3
		0	0	39.2		
7	none	0	0	39.2	.3093	3
		0	0	60.978		
8	none	0	0	60.978	.2183	3
		0	0	83.75		
9	none	89.9	335.1	0	.6549	2
		89.9	335.1	17.422		
10	none	89.9	335.1	17.422	.4912	3
		89.9	335.1	39.2		
11	none	89.9	335.1	39.2	.3093	3
		89.9	335.1	60.978		
12	none	89.9	335.1	60.978	.2183	3
		89.9	335.1	86.25		

Number of wires = 12 current nodes = 33

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	2	7.25933	1	8.711
radius	4	.2183	1	.6549

ELECTRICAL DESCRIPTION - Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0201648	.0241972

Sources:

source	node	sector	magnitude	phase	type
1	1	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	0	0	0	0
2	12	0	-2,469.3	0	0	0
3	23	0	-2,469.3	0	0	0

MoM Model Details for Towers Driven Individually - Tower 1 OC Self - (2 of 2)

IMPEDANCE normalization = 50. source = 1; node 1, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.19	29.703	-26.224	39.622	318.6	2.307	-8.0633	-.79758

CURRENT rms Frequency = 1.19 MHz Input power = .0094599 watts Efficiency = 100. %

coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-62.1579	-73.8149	0	.0178461	41.4	.0133783	.0118112
2	-62.1579	-73.8149	8.711	.0170541	39.3	.0132034	.0107941
END	-62.1579	-73.8149	17.422	.0160761	38.	.0126662	9.9E-03
2J1	-62.1579	-73.8149	17.422	.0160761	38.	.0126662	9.9E-03
4	-62.1579	-73.8149	24.6813	.0151201	37.2	.0120364	9.15E-03
5	-62.1579	-73.8149	31.9407	.0139027	36.5	.0111693	8.28E-03
END	-62.1579	-73.8149	39.2	.0124049	35.9	.0100505	7.27E-03
2J2	-62.1579	-73.8149	39.2	.0124049	35.9	.0100505	7.27E-03
7	-62.1579	-73.8149	46.4593	.0109733	35.4	8.95E-03	6.35E-03
8	-62.1579	-73.8149	53.7187	9.3E-03	34.9	7.63E-03	5.32E-03
END	-62.1579	-73.8149	60.978	7.4E-03	34.4	6.1E-03	4.18E-03
2J3	-62.1579	-73.8149	60.978	7.4E-03	34.4	6.1E-03	4.18E-03
10	-62.1579	-73.8149	69.242	5.28E-03	34.	4.38E-03	2.95E-03
11	-62.1579	-73.8149	77.506	2.9E-03	33.5	2.42E-03	1.6E-03
END	-62.1579	-73.8149	85.77	0	0	0	0
GND	0	0	0	1.32E-04	263.2	-1.55E-05	-1.31E-04
13	0	0	8.711	5.26E-04	263.3	-6.12E-05	-5.23E-04
END	0	0	17.422	7.09E-04	263.5	-8.06E-05	-7.05E-04
2J5	0	0	17.422	7.09E-04	263.5	-8.06E-05	-7.05E-04
15	0	0	24.6813	7.86E-04	263.6	-8.75E-05	-7.81E-04
16	0	0	31.9407	8.19E-04	263.8	-8.9E-05	-8.14E-04
END	0	0	39.2	8.08E-04	263.9	-8.52E-05	-8.03E-04
2J6	0	0	39.2	8.08E-04	263.9	-8.52E-05	-8.03E-04
18	0	0	46.4593	7.63E-04	264.1	-7.83E-05	-7.59E-04
19	0	0	53.7187	6.82E-04	264.3	-6.78E-05	-6.79E-04
END	0	0	60.978	5.64E-04	264.5	-5.42E-05	-5.61E-04
2J7	0	0	60.978	5.64E-04	264.5	-5.42E-05	-5.61E-04
21	0	0	68.5687	4.22E-04	264.7	-3.92E-05	-4.2E-04
22	0	0	76.1593	2.43E-04	264.9	-2.17E-05	-2.42E-04
END	0	0	83.75	0	0	0	0
GND	81.5433	37.8511	0	1.01E-04	184.3	-1.E-04	-7.49E-06
24	81.5433	37.8511	8.711	4.03E-04	184.2	-4.02E-04	-2.96E-05
END	81.5433	37.8511	17.422	5.47E-04	184.1	-5.46E-04	-3.91E-05
2J9	81.5433	37.8511	17.422	5.47E-04	184.1	-5.46E-04	-3.91E-05
26	81.5433	37.8511	24.6813	6.1E-04	184.	-6.09E-04	-4.26E-05
27	81.5433	37.8511	31.9407	6.42E-04	183.9	-6.41E-04	-4.35E-05
END	81.5433	37.8511	39.2	6.41E-04	183.7	-6.4E-04	-4.19E-05
2J10	81.5433	37.8511	39.2	6.41E-04	183.7	-6.4E-04	-4.19E-05
29	81.5433	37.8511	46.4593	6.14E-04	183.6	-6.12E-04	-3.87E-05
30	81.5433	37.8511	53.7187	5.59E-04	183.5	-5.58E-04	-3.38E-05
END	81.5433	37.8511	60.978	4.75E-04	183.3	-4.74E-04	-2.73E-05
2J11	81.5433	37.8511	60.978	4.75E-04	183.3	-4.74E-04	-2.73E-05
32	81.5433	37.8511	69.402	3.59E-04	183.1	-3.59E-04	-1.95E-05
33	81.5433	37.8511	77.826	2.08E-04	182.9	-2.08E-04	-1.05E-05
END	81.5433	37.8511	86.25	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 2 OC Self - (1 of 2)

Tower 2 - Open Circuit - Self

GEOMETRY: Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	96.5	130.1	0	.6549	2
		96.5	130.1	17.422		
2	none	96.5	130.1	17.422	.4912	3
		96.5	130.1	39.2		
3	none	96.5	130.1	39.2	.3093	3
		96.5	130.1	60.978		
4	none	96.5	130.1	60.978	.2183	3
		96.5	130.1	85.77		
5	none	0	0	0	.6549	2
		0	0	17.422		
6	none	0	0	17.422	.4912	3
		0	0	39.2		
7	none	0	0	39.2	.3093	3
		0	0	60.978		
8	none	0	0	60.978	.2183	3
		0	0	83.75		
9	none	89.9	335.1	0	.6549	2
		89.9	335.1	17.422		
10	none	89.9	335.1	17.422	.4912	3
		89.9	335.1	39.2		
11	none	89.9	335.1	39.2	.3093	3
		89.9	335.1	60.978		
12	none	89.9	335.1	60.978	.2183	3
		89.9	335.1	86.25		

Number of wires = 12 current nodes = 33

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	2	7.25933	1	8.711
radius	4	.2183	1	.6549

ELECTRICAL DESCRIPTION - Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.19	0	1	.0201648	.0241972

Sources	source	node	sector	magnitude	phase	type
	1	12	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-2,469.3	0	0	0
2	12	0	0	0	0	0
3	23	0	-2,469.3	0	0	0

MoM Model Details for Towers Driven Individually - Tower 2 OC Self - (2 of 2)

IMPEDANCE normalization = 50. source = 1; node 12, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.19	25.802	-34.519	43.096	306.8	3.0496	-5.9148	-1.2852

CURRENT rms Frequency = 1.19 MHz Input power = .00694611 watts Efficiency = 100. %

coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-62.1579	-73.8149	0	1.22E-04	274.9	1.05E-05	-1.21E-04
2	-62.1579	-73.8149	8.711	4.86E-04	275.	4.25E-05	-4.84E-04
END	-62.1579	-73.8149	17.422	6.57E-04	275.2	5.93E-05	-6.54E-04
2J1	-62.1579	-73.8149	17.422	6.57E-04	275.2	5.93E-05	-6.54E-04
4	-62.1579	-73.8149	24.6813	7.3E-04	275.3	6.78E-05	-7.27E-04
5	-62.1579	-73.8149	31.9407	7.64E-04	275.5	7.33E-05	-7.61E-04
END	-62.1579	-73.8149	39.2	7.59E-04	275.7	7.54E-05	-7.55E-04
2J2	-62.1579	-73.8149	39.2	7.59E-04	275.7	7.54E-05	-7.55E-04
7	-62.1579	-73.8149	46.4593	7.22E-04	275.9	7.4E-05	-7.18E-04
8	-62.1579	-73.8149	53.7187	6.52E-04	276.1	6.92E-05	-6.49E-04
END	-62.1579	-73.8149	60.978	5.5E-04	276.3	6.03E-05	-5.46E-04
2J3	-62.1579	-73.8149	60.978	5.5E-04	276.3	6.03E-05	-5.46E-04
10	-62.1579	-73.8149	69.242	4.13E-04	276.5	4.7E-05	-4.11E-04
11	-62.1579	-73.8149	77.506	2.38E-04	276.8	2.8E-05	-2.36E-04
END	-62.1579	-73.8149	85.77	0	0	0	0
GND	0	0	0	.0164077	53.2	9.82E-03	.0131421
13	0	0	8.711	.0155033	51.3	9.69E-03	.0121023
END	0	0	17.422	.0144965	50.2	9.28E-03	.0111378
2J5	0	0	17.422	.0144965	50.2	9.28E-03	.0111378
15	0	0	24.6813	.0135512	49.5	8.8E-03	.0103071
16	0	0	31.9407	.0123726	48.9	8.14E-03	9.32E-03
END	0	0	39.2	.0109432	48.3	7.28E-03	8.17E-03
2J6	0	0	39.2	.0109432	48.3	7.28E-03	8.17E-03
18	0	0	46.4593	9.59E-03	47.8	6.44E-03	7.11E-03
19	0	0	53.7187	8.02E-03	47.4	5.43E-03	5.9E-03
END	0	0	60.978	6.25E-03	47.	4.26E-03	4.57E-03
2J7	0	0	60.978	6.25E-03	47.	4.26E-03	4.57E-03
21	0	0	68.5687	4.45E-03	46.6	3.06E-03	3.23E-03
22	0	0	76.1593	2.44E-03	46.2	1.69E-03	1.76E-03
END	0	0	83.75	0	0	0	0
GND	81.5433	37.8511	0	1.28E-04	280.4	2.32E-05	-1.26E-04
24	81.5433	37.8511	8.711	5.13E-04	280.5	9.35E-05	-5.04E-04
END	81.5433	37.8511	17.422	6.93E-04	280.7	1.29E-04	-6.81E-04
2J9	81.5433	37.8511	17.422	6.93E-04	280.7	1.29E-04	-6.81E-04
26	81.5433	37.8511	24.6813	7.71E-04	280.9	1.46E-04	-7.57E-04
27	81.5433	37.8511	31.9407	8.07E-04	281.2	1.56E-04	-7.92E-04
END	81.5433	37.8511	39.2	8.02E-04	281.5	1.59E-04	-7.86E-04
2J10	81.5433	37.8511	39.2	8.02E-04	281.5	1.59E-04	-7.86E-04
29	81.5433	37.8511	46.4593	7.64E-04	281.7	1.55E-04	-7.49E-04
30	81.5433	37.8511	53.7187	6.92E-04	282.	1.44E-04	-6.77E-04
END	81.5433	37.8511	60.978	5.86E-04	282.3	1.25E-04	-5.73E-04
2J11	81.5433	37.8511	60.978	5.86E-04	282.3	1.25E-04	-5.73E-04
32	81.5433	37.8511	69.402	4.41E-04	282.6	9.62E-05	-4.3E-04
33	81.5433	37.8511	77.826	2.54E-04	282.9	5.68E-05	-2.47E-04
END	81.5433	37.8511	86.25	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 3 OC Self - (1 of 2)

```
Tower 3 - Open Circuit - Self

GEOMETRY: Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire   caps Distance      Angle        Z             radius      segs
 1     none 96.5          130.1        0             .6549       2
            96.5          130.1        17.422
 2     none 96.5          130.1        17.422        .4912       3
            96.5          130.1        39.2
 3     none 96.5          130.1        39.2          .3093       3
            96.5          130.1        60.978
 4     none 96.5          130.1        60.978        .2183       3
            96.5          130.1        85.77
 5     none 0             0            0             .6549       2
            0             0            17.422
 6     none 0             0            17.422        .4912       3
            0             0            39.2
 7     none 0             0            39.2          .3093       3
            0             0            60.978
 8     none 0             0            60.978        .2183       3
            0             0            83.75
 9     none 89.9          335.1        0             .6549       2
            89.9          335.1        17.422
 10    none 89.9          335.1        17.422        .4912       3
            89.9          335.1        39.2
 11    none 89.9          335.1        39.2          .3093       3
            89.9          335.1        60.978
 12    none 89.9          335.1        60.978        .2183       3
            89.9          335.1        86.25

Number of wires          =  12         current nodes  =  33

                        minimum                     maximum
Individual wires       wire    value               wire   value
segment length          2      7.25933              1     8.711
radius                  4      .2183                1     .6549

ELECTRICAL DESCRIPTION   Frequencies (MHz)
    frequency                 no. of  segment length (wavelengths)
 no. lowest        step        steps   minimum        maximum
 1   1.19          0           1       .0201648       .0241972

Sources:    source node    sector  magnitude      phase          type
               1     23       1       1.              0           voltage

Lumped loads
                resistance     reactance      inductance  capacitance passive
load   node     (ohms)         (ohms)         (mH)        (uF)        circuit
 1      1       0              -2,469.3       0           0           0
 2      12      0              -2,469.3       0           0           0
 3      23      0              0              0           0           0
```

MoM Model Details for Towers Driven Individually - Tower 3 OC Self - (2 of 2)

IMPEDANCE normalization = 50. source = 1; node 23, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.19	30.196	-24.541	38.911	320.9	2.2052	-8.4959	-.66202

CURRENT rms Frequency = 1.19 MHz Input power = .00997176 watts Efficiency = 100. %

coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-62.1579	-73.8149	0	1.03E-04	181.9	-1.02E-04	-3.46E-06
2	-62.1579	-73.8149	8.711	4.1E-04	181.9	-4.1E-04	-1.35E-05
END	-62.1579	-73.8149	17.422	5.56E-04	181.8	-5.56E-04	-1.73E-05
2J1	-62.1579	-73.8149	17.422	5.56E-04	181.8	-5.56E-04	-1.73E-05
4	-62.1579	-73.8149	24.6813	6.2E-04	181.7	-6.2E-04	-1.82E-05
5	-62.1579	-73.8149	31.9407	6.52E-04	181.6	-6.51E-04	-1.78E-05
END	-62.1579	-73.8149	39.2	6.5E-04	181.4	-6.49E-04	-1.61E-05
2J2	-62.1579	-73.8149	39.2	6.5E-04	181.4	-6.49E-04	-1.61E-05
7	-62.1579	-73.8149	46.4593	6.21E-04	181.3	-6.21E-04	-1.4E-05
8	-62.1579	-73.8149	53.7187	5.64E-04	181.1	-5.63E-04	-1.12E-05
END	-62.1579	-73.8149	60.978	4.77E-04	181.	-4.77E-04	-8.09E-06
2J3	-62.1579	-73.8149	60.978	4.77E-04	181.	-4.77E-04	-8.09E-06
10	-62.1579	-73.8149	69.242	3.61E-04	180.8	-3.61E-04	-4.92E-06
11	-62.1579	-73.8149	77.506	2.09E-04	180.6	-2.09E-04	-2.07E-06
END	-62.1579	-73.8149	85.77	0	0	0	0
GND	0	0	0	1.42E-04	266.4	-8.95E-06	-1.41E-04
13	0	0	8.711	5.65E-04	266.5	-3.46E-05	-5.64E-04
END	0	0	17.422	7.61E-04	266.7	-4.4E-05	-7.59E-04
2J5	0	0	17.422	7.61E-04	266.7	-4.4E-05	-7.59E-04
15	0	0	24.6813	8.43E-04	266.9	-4.61E-05	-8.41E-04
16	0	0	31.9407	8.78E-04	267.1	-4.47E-05	-8.77E-04
END	0	0	39.2	8.66E-04	267.3	-4.02E-05	-8.65E-04
2J6	0	0	39.2	8.66E-04	267.3	-4.02E-05	-8.65E-04
18	0	0	46.4593	8.18E-04	267.6	-3.47E-05	-8.17E-04
19	0	0	53.7187	7.31E-04	267.8	-2.78E-05	-7.3E-04
END	0	0	60.978	6.04E-04	268.1	-2.01E-05	-6.04E-04
2J7	0	0	60.978	6.04E-04	268.1	-2.01E-05	-6.04E-04
21	0	0	68.5687	4.52E-04	268.4	-1.29E-05	-4.52E-04
22	0	0	76.1593	2.6E-04	268.6	-6.14E-06	-2.6E-04
END	0	0	83.75	0	0	0	0
GND	81.5433	37.8511	0	.0181723	39.1	.0141022	.0114613
24	81.5433	37.8511	8.711	.0174055	36.9	.0139195	.0104498
END	81.5433	37.8511	17.422	.0164344	35.6	.0133586	9.57E-03
2J9	81.5433	37.8511	17.422	.0164344	35.6	.0133586	9.57E-03
26	81.5433	37.8511	24.6813	.0154768	34.9	.012701	8.84E-03
27	81.5433	37.8511	31.9407	.0142518	34.1	.0117953	8.E-03
END	81.5433	37.8511	39.2	.0127403	33.5	.0106268	7.03E-03
2J10	81.5433	37.8511	39.2	.0127403	33.5	.0106268	7.03E-03
29	81.5433	37.8511	46.4593	.0112925	33.	9.47E-03	6.15E-03
30	81.5433	37.8511	53.7187	9.59E-03	32.5	8.09E-03	5.15E-03
END	81.5433	37.8511	60.978	7.67E-03	32.	6.5E-03	4.06E-03
2J11	81.5433	37.8511	60.978	7.67E-03	32.	6.5E-03	4.06E-03
32	81.5433	37.8511	69.402	5.47E-03	31.5	4.67E-03	2.86E-03
33	81.5433	37.8511	77.826	3.E-03	31.1	2.57E-03	1.55E-03
END	81.5433	37.8511	86.25	0	0	0	0

Derivation of Directional Antenna Operating Parameters

With the antenna array characteristics now verified and the model converged for the individual towers, moment method calculations were made (a "Medium Wave Array Synthesis") using the normalized licensed antenna field ratio magnitudes and phases for the directional pattern in conjunction with the established array geometry and the converged tower heights and radii. This process yields the directional antenna complex voltage values for sources located at ground level for each tower of the array that would produce current moment sums for the towers. These values, when normalized, will equate to the theoretical field parameters for the authorized directional antenna pattern. Tower base currents and driving point impedances were then calculated for the directional pattern. (The indicated voltages and currents not specified as "RMS" values are corresponding "peak" values.)

The currents at the ATU J-plug "reference point" outputs (where the TCT derived antenna monitor samples are taken) were then calculated from the MoM tower currents using the WCAP circuit modeling software, along with the base environment assumptions that were derived from the single tower measurements, and the MoM-calculated directional antenna operating impedances, and corresponding base voltages and currents.

The following pages provide details of the MoM array synthesis modeling performed for each directional antenna pattern. The designations employed in the model output data for the antenna "wire" and corresponding base node information are as follows:

Tower	Wire	Base Node
1 – Southeast	1	1
2 – Center	5	12
3 – Northwest	9	23

The resulting normalized antenna monitor parameters, derived from the WCAP analysis, are provided after the Day pattern synthesis model data shown in the following pages.

MoM Model Details – Directional Antenna Array Synthesis (1 of 3)

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = 1.19 MHz

tower	field ratio magnitude	phase (deg)
1	.544	-88.7
2	1.	0
3	.343	159.

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	voltage phase (deg)	current magnitude	current phase (deg)
1	1,127.34	284.	19.4193	279.
12	1,618.15	299.3	40.7014	2.7
23	140.398	20.	12.7293	158.

Sum of square of source currents = 4,355.31

Total power = 50,000. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.0164945	.0208674
Y(1, 2)	-.00246851	-.0148103
Y(1, 3)	-.006129	.0128834
Y(2, 1)	-.00246685	-.0148118
Y(2, 2)	.0142759	.0324531
Y(2, 3)	-.00274894	-.0164878
Y(3, 1)	-.00612854	.012883
Y(3, 2)	-.00275118	-.0164853
Y(3, 3)	.0172822	.0219169

TOWER IMPEDANCE MATRIX

impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	29.7644	-26.2609
Z(1, 2)	12.5189	-13.7965
Z(1, 3)	-8.22656	-11.3222
Z(2, 1)	12.5161	-13.7968
Z(2, 2)	26.092	-34.5204
Z(2, 3)	14.4898	-13.2048
Z(3, 1)	-8.22667	-11.3226
Z(3, 2)	14.4936	-13.204
Z(3, 3)	30.2738	-24.5508

MoM Model Details - Directional Antenna Array Synthesis (2 of 3)

GEOMETRY: Wire coordinates in degrees; other dimensions in meters; Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	96.5	130.1	0	.6549	2
		96.5	130.1	17.422		
2	none	96.5	130.1	17.422	.4912	3
		96.5	130.1	39.2		
3	none	96.5	130.1	39.2	.3093	3
		96.5	130.1	60.978		
4	none	96.5	130.1	60.978	.2183	3
		96.5	130.1	85.77		
5	none	0	0	0	.6549	2
		0	0	17.422		
6	none	0	0	17.422	.4912	3
		0	0	39.2		
7	none	0	0	39.2	.3093	3
		0	0	60.978		
8	none	0	0	60.978	.2183	3
		0	0	83.75		
9	none	89.9	335.1	0	.6549	2
		89.9	335.1	17.422		
10	none	89.9	335.1	17.422	.4912	3
		89.9	335.1	39.2		
11	none	89.9	335.1	39.2	.3093	3
		89.9	335.1	60.978		
12	none	89.9	335.1	60.978	.2183	3
		89.9	335.1	86.25		

Number of wires = 12 current nodes = 33

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	2	7.25933	1	8.711
radius	4	.2183	1	.6549

ELECTRICAL DESCRIPTION Frequencies (MHz)

frequency			no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.19	0	1	.0201648	.0241972

Sources:

source	node	sector	magnitude	phase	type
1	1	1	1,594.3	284.	voltage
2	12	1	2,288.41	299.3	voltage
3	23	1	198.552	20.	voltage

IMPEDANCE normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.19	57.832	5.0565	58.053	5.	1.189	-21.274	-3.3E-02
source = 2; node 12, sector 1							
1.19	17.818	-35.54	39.757	296.6	4.3503	-4.0659	-2.1618
source = 3; node 23, sector 1							
1.19	-8.189	-7.3885	11.03	222.1	****	****	****

MoM Model Details - Directional Antenna Array Synthesis (3 of 3)

CURRENT rms
Frequency = 1.19 MHz
Input power = 50,000. watts
Efficiency = 100. %

coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-62.1579	-73.8149	0	19.4193	279.	3.04618	-19.1789
2	-62.1579	-73.8149	8.711	19.3336	275.	1.67482	-19.2609
END	-62.1579	-73.8149	17.422	18.6742	272.8	.911121	-18.6519
2J1	-62.1579	-73.8149	17.422	18.6742	272.8	.911121	-18.6519
4	-62.1579	-73.8149	24.6813	17.8288	271.5	.478102	-17.8223
5	-62.1579	-73.8149	31.9407	16.6197	270.4	.124799	-16.6193
END	-62.1579	-73.8149	39.2	15.022	269.4	-.149459	-15.0212
2J2	-62.1579	-73.8149	39.2	15.022	269.4	-.149459	-15.0212
7	-62.1579	-73.8149	46.4593	13.4196	268.7	-.305957	-13.4161
8	-62.1579	-73.8149	53.7187	11.4779	268.	-.399275	-11.471
END	-62.1579	-73.8149	60.978	9.21539	267.4	-.424586	-9.20561
2J3	-62.1579	-73.8149	60.978	9.21539	267.4	-.424586	-9.20561
10	-62.1579	-73.8149	69.242	6.63465	266.8	-.375761	-6.624
11	-62.1579	-73.8149	77.506	3.67282	266.2	-.244597	-3.66467
END	-62.1579	-73.8149	85.77	0	0	0	0
GND	0	0	0	40.7013	2.7	40.6572	1.89373
13	0	0	8.711	38.3954	1.3	38.3848	.902841
END	0	0	17.422	35.8567	.6	35.8549	.356049
2J5	0	0	17.422	35.8567	.6	35.8549	.356049
15	0	0	24.6813	33.4882	.1	33.4881	.0509563
16	0	0	31.9407	30.5476	359.6	30.547	-.191498
END	0	0	39.2	26.9924	359.2	26.9899	-.370013
2J6	0	0	39.2	26.9924	359.2	26.9899	-.370013
18	0	0	46.4593	23.638	358.9	23.6336	-.46025
19	0	0	53.7187	19.7503	358.6	19.7441	-.495818
END	0	0	60.978	15.3725	358.2	15.3653	-.471313
2J7	0	0	60.978	15.3725	358.2	15.3653	-.471313
21	0	0	68.5687	10.9426	358.	10.9356	-.390314
22	0	0	76.1593	6.0039	357.7	5.99894	-.243977
END	0	0	83.75	0	0	0	0
GND	81.5433	37.8511	0	12.7293	158.	-11.8	4.77433
24	81.5433	37.8511	8.711	12.4464	158.5	-11.5842	4.55174
END	81.5433	37.8511	17.422	11.8737	158.9	-11.0739	4.28397
2J9	81.5433	37.8511	17.422	11.8737	158.9	-11.0739	4.28397
26	81.5433	37.8511	24.6813	11.2433	159.	-10.4978	4.02591
27	81.5433	37.8511	31.9407	10.3981	159.2	-9.71755	3.69987
END	81.5433	37.8511	39.2	9.3265	159.3	-8.72273	3.30115
2J10	81.5433	37.8511	39.2	9.3265	159.3	-8.72273	3.30115
29	81.5433	37.8511	46.4593	8.28339	159.3	-7.75102	2.92168
30	81.5433	37.8511	53.7187	7.04847	159.4	-6.59816	2.47895
END	81.5433	37.8511	60.978	5.63822	159.5	-5.27972	1.97841
2J11	81.5433	37.8511	60.978	5.63822	159.5	-5.27972	1.97841
32	81.5433	37.8511	69.402	4.02681	159.5	-3.77171	1.41048
33	81.5433	37.8511	77.826	2.20989	159.5	-2.07024	.773122
END	81.5433	37.8511	86.25	0	0	0	0

Derivation of Directional Antenna System "Antenna Monitor" Parameters

With the modeled directional antenna ground level complex voltage and current values for sources located at ground level for each tower now being derived, WCAP circuit analysis calculations[6] were run to develop the current magnitude and phase information that will be present at the ATU reference point, where the TCT sampling devices are located.

Since the current transformers and sampling lines are essentially identical, the antenna monitor ratios and phases corresponding to the theoretical parameters can be calculated and normalized directly from the modeled ATU currents, as shown below:

Directional Antenna Monitor Operating Parameters

Tower	Modeled Current Pulse	Current Magnitude at Toroid	Current Phase at Toroid	Antenna Monitor Ratio	Antenna Monitor Phase
1- Southeast	1	19.389 A	280.34°	0.469	- 82.8°
2 – Center	12	41.30 A	3.11°	1.000	0.0°
3 – Northwest	23	12.7686 A	157.811°	0.309	154.7°

The phasing and coupling systems for the authorized day pattern was adjusted accordingly such that the antenna monitor phase and ratio indications were within 5% of the ratio values, and 3° of the phase values shown above, per the requirements of §73.62(a) of the Commission's Rules.

As-Constructed Certified Array Geometry

A survey was conducted to confirm proper antenna array construction. A copy of the surveyor's certification is provided in a following page.

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[6] For the WCAP analysis, the same schematic diagrams and node nomenclature are employed as were described previously for the OC-self analysis. Specifically, node 2 represents the ATU TCT reference point and node 3 represents the tower feedpoint. Node 0 represents ground potential. The tower operating impedances were represented by complex loads from node 3 to ground (R_{3-0}).

Using the information provided in the survey, the relative distances in feet and azimuths (referenced to true north) provided on the certified survey drawing were compared to the relative distances and azimuths relative to true north of the array elements using the Construction Permit array geometry as baseline, and the "Law of Cosines" analysis method.

The following tabulation shows those distances and other information along with error determination.

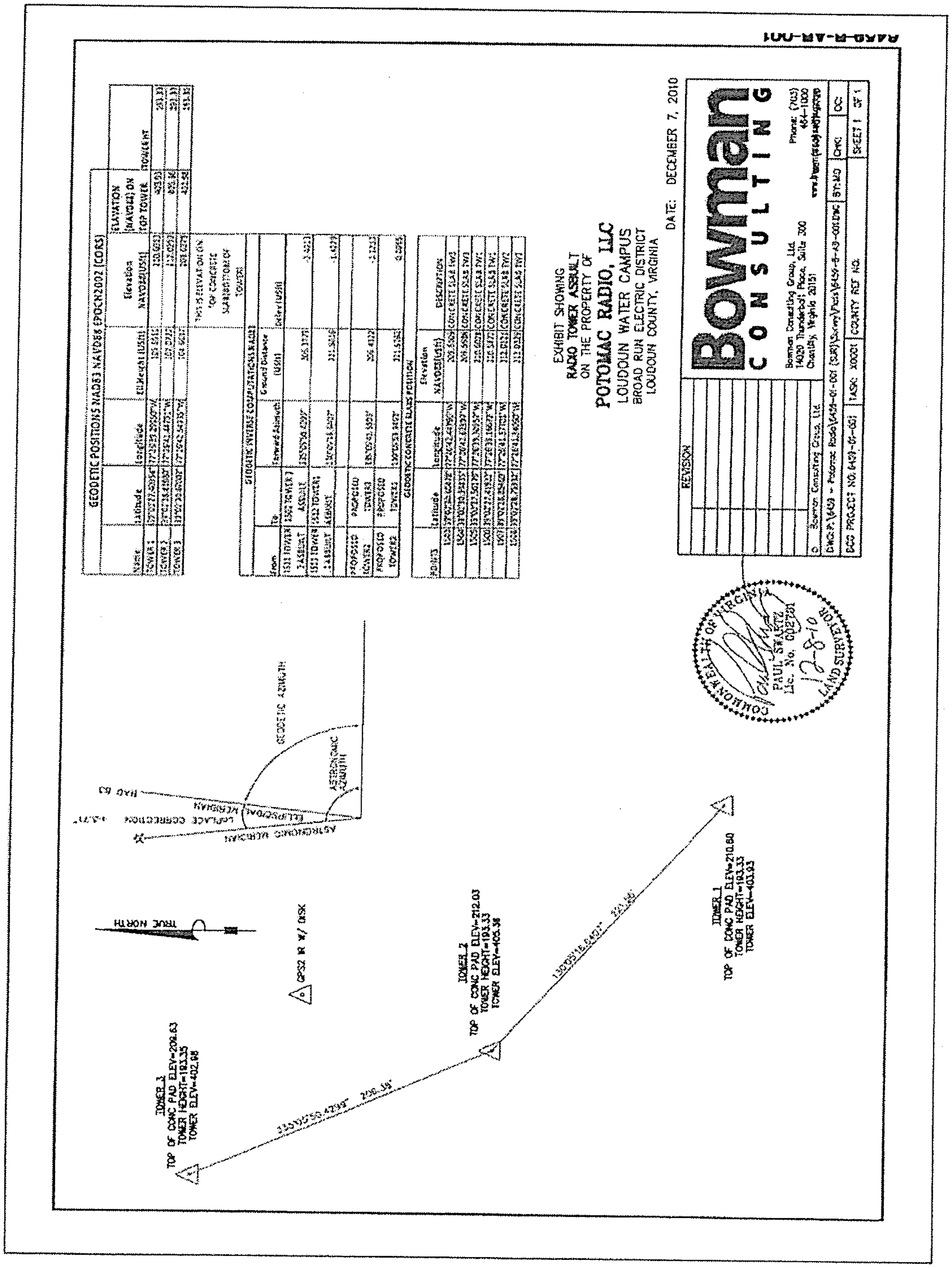
"As-Built" Array Geometry Summary

Tower	Specified Array Geometry			"As-Built" Survey		"As-Built" Error/Deviation	
	Spacing (deg)	Spacing (feet)	Azimuth (° True)	Spacing (feet)	Azimuth (° True)	(feet)	(degrees)
1 – SE	96.5	221.5560	130.1	221.5616	130.08796	0.05	0.02
2 – C	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3 - NW	89.9	206.4030	335.1	206.3779	335.09734	0.01	0.01

The "as built" tower displacements from their specified locations, as documented in the survey of the following page, are expressed in the above table in terms of feet, as well as in electrical degrees at carrier frequency. (This corresponds to space phasing differences in the far-field radiation pattern of the array.)

The results shown above are well below the +/- 3 degree operating phase range specified for antenna monitor parameters by the FCC Rules and well within the 1.5° tolerance specified in the Commission's DA 09-2340 Public Notice. As such, it has been proven that this antenna array has been constructed in accordance with the terms of its Construction Permit and the pertinent Rules and Regulations of the Federal Communications Commission.

"As-Built" Survey of Array



Sampling System Measurements

Impedance and length measurements were made of the antenna monitor sampling system using a precision calibrated measurement system consisting of a *Hewlett-Packard* model 8753C network analyzer in conjunction with a *Tunwall Radio* directional coupler system and an *Electronic Navigation Industries* (ENI) Model 310 L RF amplifier. Analyzer calibration was field verified prior to each measurement using the procedures specified in the manufacturer's instruction manual using precision calibration standards and techniques.

The measurements were accomplished by looking into the antenna monitor ends of the sampling lines for two conditions – with and without the sampling lines connected to the sampling devices at the tower bases under open-circuited conditions.

The following table shows the frequency nearest the carrier frequency where resonance (zero reactance corresponding with low resistance) was found. As the length of a distortion-less transmission line is 180 electrical degrees at the difference frequency between adjacent frequencies of resonance, and frequencies of resonance occur at odd multiples of 90 degrees electrical length, the sampling line length at the resonant frequency below carrier frequency, which is the closest one to the carrier frequency in terms of the ratio of frequencies, was found to be 270 electrical degrees. The electrical lengths at carrier frequency appearing in the table below were calculated by ratioing the frequencies in the customary fashion.

Tower	Sampling Line Open-Circuited Resonance Nearest to 1190 kHz	Sampling Line Ratio Calculated Electrical Length at 1190 kHz	1190 kHz Measured Impedance with Sampling Toroid (TCT) Connected
1 – Southeast	1459.38 kHz	366.9°	50.55 +j1.50 Ω
2 – Center	1459.45 kHz	366.9°	50.38 +j1.54 Ω
3 – Northwest	1459.00 kHz	367.0°	50.43 +j1.59 Ω

As shown, the sampling line lengths meet the Commission's requirement that they be equal in length within +/-1 electrical degree.

The characteristic impedance of the sample lines was calculated using the following formula, where $R_1 + jX_1$ and $R_2 + jX_2$ are the measured impedances at the +45 and –45 degree offset frequencies, respectively:

$$Zo = \sqrt{\sqrt{R_1^2 + X_1^2} \bullet \sqrt{R_2^2 + X_2^2}}$$

Tower	-45 Degree Offset Frequency (kHz)	-45 Degree Measured Impedance (Ohms)	+45 Degree Offset Frequency (kHz)	+45 Degree Measured Impedance (Ohms)	Calculated Characteristic Impedance (Ohms)
1 – Southeast	1313.4	5.8 –j49.9	1605.3	7.2 +j49.8	50.28
2 – Center	1313.5	5.7 –j50.0	1605.4	7.25 +j49.8	50.32
3 – Northwest	1313.1	5.7 –j50.0	1604.9	7.2 +j49.8	50.32

As shown, the sampling line measured characteristic impedances meet the Commission's requirement that they be equal within +/-2 ohms.

The *Delta Electronics, Inc.* TCT-3 toroidal transformers used for the station in the refurbished sampling system were calibrated by measuring their outputs with a common reference signal using a *Hewlett-Packard* 8753C network analyzer in a calibrated measurement system. They were placed side-by-side with a conductor passing the reference signal passing through them and their outputs were fed into the A and B receiver inputs of the analyzer which was configured to measure the relative ratios and phases of their output voltages.

The following results were found for the carrier frequency, 1190 kilohertz:

Tower	TCT Serial Number	Test 1 Ratio	Test 1 Phase	Test 2 Ratio	Test 2 Phase
1 – Southeast	17982	0.986	+0.102°	Reference	Reference
2 – Center	17976	Reference	Reference	--	--
3 – Northwest	17975	0.986	-0.26°	0.988	+0.184°

Delta type TCT-3 toroidal transformers are rated for absolute magnitude accuracy of ±2% and absolute phase accuracy of ±2 degrees. As the maximum measured transformer-to-transformer variations between the three transformers were fractional amounts, they clearly provide far more accurate relative indications than could be the case assuming their rated accuracies.

Reference Point Field Strength Measurements

Reference field strength measurements were made using the station's *Potomac Instruments, Inc.* model FIM-21, Serial Number 989, calibrated on November 19, 2010, and a *Potomac Instruments, Inc.* model FIM-41, Serial Number 2152, calibrated on October 28, 2009. Indications on both meters were compared and found to be in agreement. Measurement points were then selected at three locations along the designated "monitored radial" (278°) specified on the station's license and additionally on a major lobe radial (149°). The radial directions, measured field strengths, measurement point distance, location descriptions, and GPS coordinates (with datum reference) for these reference points are shown in the following tables.

Reference Point Field Strength Measurements – 278° (Monitored Minima)

Date	Time	Point	Field Strength	GPS Coordinates NAD-83 Datum	Distance (km)	Description
01/05//2011	1420	1	450 mV/m	39° 02' 30.2" 77° 26' 57.4"	0.38	100 yards north of first bridge on Loudoun County Parkway leaving site, 25 yards down in field off road
01/05/2011	1445	2	800 mV/m	39° 02' 33.0" 77° 27' 31.4"	1.20	Marblehead Dr @ Western Gailes Blvd.
01/05/2011	1515	3	350 mV/m	39° 02' 40.4" 77° 28' 19.0"	2.36	Ashburn Village Shopping Center at corner of Christina Drive and Ashburn Village Drive

Reference Point Field Strength Measurements – 149° (Main Lobe)

Date	Time	Point	Field Strength	GPS Coordinates NAD-83 Datum	Distance (km)	Description
01/05/2011	1433	1	3200 mV/m	39° 02' 01.8" 77° 26' 27.7"	0.88	30 feet NE from the NE corner of the perimeter fence around the Water Treatment Facility.
01/05/2011	1510	2	1520 mV/m	39° 01' 40.0" 77° 26' 04.7"	1.73	Median between East and West Bound lanes of Nokes Blvd. 100' West of the island of SB 28 on-ramp.
01/05/2011	1547	3	1060 mV/m	39° 01' 03.1" 77° 25' 36.3"	3.05	South side of Atlantic Blvd. Opposite Double Tree Hotel. Next to Dulles Sports Plex sign.

Direct Measurement of Power

Common point impedance measurements for both were made using a *Hewlett-Packard* model 8753C network analyzer in conjunction with a *Tunwall Radio* directional coupler system and an *Electronic Navigation Industries* (ENI) Model 310 L RF amplifier. Analyzer calibration was field verified prior to each measurement using the procedures specified in the manufacturer's instruction manual using precision calibration standards and techniques. The "as adjusted" common point impedance measurements were made at the phasor cabinet input jack adjacent to the common point current meter that is used to determine operating power. The results are as follows:

Mode - Daytime	Common Point Resistance	Common Point Reactance
Directional Pattern	51.28 Ω	-2.65 Ω

The authorized common point input power of the nominal 50 kW daytime directional antenna system is 52,650 watts. This value is obtained by applying the provisions of §73.51(b)(2) of the Commission's Rules, i.e. 50,000 Watts x 1.053 = 52,650 Watts. Accordingly, the common point currents for each mode of operation, found by the following calculation $(52,650 \text{ Watts/Resistance})^{1/2}$ are:

Mode - Daytime	Common Point Resistance	52,650 Watt Common Point Current
Directional Pattern	51.28 Ω	32.042 A (Rounds to 32.0 A)

RF Exposure Evaluation

The operation of facility described herein will not result in the exposure of workers or the general public to levels of radio frequency radiation in excess of the limits specified in FCC Rule Section 1.1310.

In particular, fences have been installed about the tower bases to restrict public access. The as-constructed fence distances are beyond those necessary to prevent electric and magnetic field exposure above the levels described in the Commission's Rules.

The minimum fence sizes were determined with reference to FCC OET Bulletin 65 (Edition 97-01). Interpolated values from the Supplement A tables can be employed to estimate the necessary "Distance for Compliance with FCC limits" at 1190 kilohertz, for each tower using the MoM modeled base currents and drive point impedances, or actual measured values. In this instance, calculated values are used to determine safe fence distances from each tower, assuming the derived electrical tower heights for the base impedance and current calculations, and the physical electrical height of 82.7° for the OET Tables. (No other RF emitters are located on or near this site.) The results of these calculations are as follows:

Tower	Calculated Base Current	Calculated Base Resistance	Calculated I^2R Power	Required Distance	Actual Fence Face Closest Point
1 (SE)	19.4193 A	57.832 Ohms	21.809 kW	2.85 m	3.96 m
2 (C)	40.7013 A	17.818 Ohms	29.517 kW	3.31 m	6.63 m
3 (NW)	12.7293 A	-8.189 Ohms	1.327 kW	1 m	6.63 m

Based upon the above, it is believed that the Commission's RF exposure prevention requirements are met in that the fences limit public access to areas with fields that exceed the requirements of the Rules for this directional antenna operation. Further, all fence enclosure areas are posted with RF exposure warning signs on all fence sides, RF burn warning ("Do Not Touch") signs are posted on the towers themselves, and the fence gates are securely chained and locked. Additionally, all metal fence metal materials are tied into the station RF ground system.

With respect to worker safety, no work will be permitted that will endanger employees or subcontractors. Access to high exposure or shock/burn areas will be controlled and supervised by knowledgeable, responsible, station personnel. If it is necessary for workers to be inside the tower base fence enclosures for extended periods of time, the station may switch to low power nondirectional operation on Tower 2 (the Central tower), thus de-activating Towers 1, and 3, or it may choose to temporarily terminate operation entirely while work is performed within the enclosures. No one will be permitted to climb an energized tower. It is therefore believed that the constructed facility is in full compliance with the FCC's requirements with regard to radio frequency energy exposure.

Satisfaction of CP Conditions

The WAGE Construction Permit is subject to six Special Operating Conditions, which are discussed in the following paragraphs. All six Special Operating Conditions are being met with the filing of this License Application. Specifically:

FCC Special Operating Condition 1 addresses the Station's former "Silent Status" and states that the Station's license was to automatically expire as a matter of law on August 3, 2010, if the Station did not resume broadcasting before that time. Further, it states that "upon resumption of broadcasting, the licensee must notify the Commission by letter. This notice will be in addition to an application for a license to cover this permit." This condition is satisfied in that the Station did resume broadcasting and appropriately notified the Commission prior to the August 3, 2010 date. It should also be noted that subsequently, the Station sought and received a further Special Temporary Authority to remain silent as of July 25, 2010, pending the completion of the construction authorized in the underlying daytime CP. The Station is now ready to resume operation with the constructed facilities upon receipt of Program Test Authority.

FCC Special Operating Condition 2 requires that a License Application (FCC Form 302-AM) be submitted to cover the construction permit before the permit expires on October 29, 2011. FCC Form 302-AM, to which this Statement is attached, is being filed at this time, prior to the expiration date, which therefore satisfies this Special Operating Condition.

FCC Special Operating Condition 3 requires that the Permittee install a type-accepted transmitter. A type-accepted Nautel NX-50 transmitter has been acquired, properly installed at the authorized transmitter site, and commissioned by a factory representative. This Special Operating Condition is also satisfied.

FCC Special Operating Condition 4 requires that the Permittee be responsible for satisfying all reasonable complaints of blanketing interference within the 1 V/m contour as required by Section 73.88 of the Commission's Rules. *Potomac Radio, LLC* acknowledges its responsibility under this Rule and has Station personnel prepared and available to respond appropriately.

FCC Special Operating Condition 5 requires that a ground system consist of 120 equally spaced, buried, copper radials be installed about the base of each tower, each 63 meters in length except where intersecting radials are shortened and bonded to a transverse copper strap midway between adjacent towers, plus a copper ground screen 7.3 meters square, about the base of each tower. As described elsewhere in this Statement, a conventional buried copper wire ground system, consisting of 120 equally spaced number 10 soft-drawn copper radial wires, has been buried into the ground, and arrayed every 3° around each tower, to a length of 63 meters (206 feet), except where terminated in common, 4-inch transverse copper straps or shortened by setbacks from certain local boundary features.

However, in lieu of a 7.3 meter square copper ground screen at each tower base, for practical site construction reasons, each concrete tower base foundation is instead covered with a 4.3 meter extruded copper mesh, which is crossed by several (4-inch wide) copper straps. The periphery of this foundation-top mesh area is bonded to a 4-inch perimeter strap around the tower base foundation, to which the 120 copper ground radials are silver soldered. An additional set of 120 shorter copper radials are bonded to the tower base screen perimeter strap and interspersed and buried between the longer radials. These short supplemental radials are each 15.2 meters (50 feet) in length and are also number 10 soft-drawn copper wire. Further, copper straps are run to seven, 8-foot long, buried copper ground rods evenly distributed around each tower base to aid in lightning protection. Copper straps are also buried between the towers and in buried transmission line and sample cable trench and are tied to the tower base ground strap as well as the transmitter building grounding system. As such, it is felt that this Special Operating Condition has been materially satisfied through the use of an essentially equivalent, conventionally employed, tower base area treatment.

FCC Special Operating Condition 6 requires the surrender of the license of WBIS(AM), Annapolis, Maryland (Facility ID No. 2297) to the Commission for cancellation prior to the commencement of Program Test Authority by the facilities authorized under the 1190 kHz CP. This Special Operating Condition is being satisfied by the return of the WBIS license simultaneously herewith.

FCC Special Operating Condition 7 requires that the Permittee abandon the licensed 1200 kHz frequency (BL-19940228DA) prior to or simultaneously with the filing of a FCC Form 302 covering the 1190 kHz CP. The licensed 1200 kHz site has been completely dismantled. The former 5 kW 1200 kHz transmitter is being refurbished and retuned to 1190 kHz so that it can be installed as an auxiliary transmitter at the CP site.

FCC Special Operating Condition 8 requires that the Permittee submit a proof of performance as set forth in either Section 73.151(a) or 73.151(c) of the Rules before program tests are authorized. This Statement, which is attached to this Application, provides a Moment Method proof of performance, as set forth in Section 73.151(c) of the Commission's Rules. This antenna system uses series-fed radiators and the associated sampling system is constructed as described in Section 73.151(c)(2)(i) of the Commission's Rules. Therefore this Special Operating Condition is satisfied.

Certification

These application materials have been prepared on behalf of *Potomac Radio LLC* by the undersigned or under his direction and are true and correct to the best of his knowledge and belief. Mr. Cavell's qualifications are a matter of record before the FCC.

Respectfully submitted,

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