

FOR  
FCC  
USE  
ONLY

**FCC 302-AM**  
**APPLICATION FOR AM**  
**BROADCAST STATION LICENSE**

(Please read instructions before filling out form.)

FOR COMMISSION USE ONLY

FILE NO.

*BMMK-20140530AUK*

**SECTION I - APPLICANT FEE INFORMATION**

1. PAYOR NAME (Last, First, Middle Initial)

**WSUA Broadcasting Corporation**

MAILING ADDRESS (Line 1) (Maximum 35 characters)

2100 Coral Way

MAILING ADDRESS (Line 2) (Maximum 35 characters)

Suite 704

CITY

**Coral Gables**

STATE OR COUNTRY (if foreign address)

**FL**

ZIP CODE

**33145-2635**

TELEPHONE NUMBER (include area code)

**3052851260**

CALL LETTERS

**WSUA**

OTHER FCC IDENTIFIER (If applicable)

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		
M	M	R

(B)

FEE MULTIPLE			
0	0	0	1

(C)

FEE DUE FOR FEE TYPE CODE IN COLUMN (A)
\$ 635.00

FOR FCC USE ONLY

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

(A)

M	O	R
---	---	---

(B)

0	0	0	1
---	---	---	---

(C)

\$ 730.00
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FOR FCC USE ONLY

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

\$ 1365.00

FOR FCC USE ONLY

<b>SECTION II - APPLICANT INFORMATION</b>		
1. NAME OF APPLICANT WSUA Broadcasting Corporation		
MAILING ADDRESS 2100 Coral Way , Suite 704		
CITY Coral Gables	STATE FL	ZIP CODE 33145-2635

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
WSUA	Miami, FL.	n/a		

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.  
n/a

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.  
n/a

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.  
n/a

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.  
n/a

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 <i>EUCARIO BERMUDEZ</i>	Signature <i>E. Bermudez</i>	
Title <i>President</i>	Date <i>4/23/14</i>	Telephone Number <i>305-644-6645</i>

**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

**WSUA BROADCASTING CORPORATION**

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	Day
WSUA	n/a	1260	Unlimited	20.0	50.0

**2. Station location**

State Florida	City or Town Miami
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**3. Transmitter location**

State Florida	County Dade	City or Town Miami	Street address (or other identification) 13905 NW 6th Terrace
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**4. Main studio location**

State Florida	County Dade	City or Town Miami	Street address (or other identification) 2100 Coral Way
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**5. Remote control point location (specify only if authorized directional antenna)**

State Florida	County Dade	City or Town Miami	Street address (or other identification) 2100 Coral Way
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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.  
ENG**8. Operating constants:**

RF common point or antenna current (in amperes) without modulation for night system 20.5	RF common point or antenna current (in amperes) without modulation for day system 32.5
Measured antenna or common point resistance (in ohms) at operating frequency Night 50.0 Day 50.0	Measured antenna or common point reactance (in ohms) at operating frequency Night -5.0 Day -5.0

**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 (E)	-130.0	-111.7	.441	.571		
2 (EC)	0.0	0.0	1.000	1.000		
3 (WC)	74.0	82.5	.283	.500		
4 (W)	-53.3	-157.7	.404	.433		
5 (SE)	-83.9	-5.2	.311	.261		
6 (SW)	-57.3		.384			

Manufacturer and type of antenna monitor:

Potomac Instruments 1901-6

# SECTION III - Page 2

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.
Guyed tower	1,2,3,4=73.2; 5,6=79.2	1,2,3,4=74.1; 5,6=80.2	1,2,3,4=75.0; 5,6=81.1	<div>Exhibit No. n/a</div>

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	25	°	46	'	22	"	West Longitude	80	°	25	'	16	"
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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.  
ENG

Also, if necessary for a complete description, attach as an Exhibit a sketch of the details and dimensions of ground system.

Exhibit No.  
ENG


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

n/a

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

n/a

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) Kurt Gorman	Signature (check appropriate box below) 
Address (include ZIP Code) PHASETEK, INC. 550 California Rd., Unit 11 Quakertown, PA 18951	Date 4/13/2014
	Telephone No. (Include Area Code) 215-536-6648

☐ Technical Director

☐ Registered Professional Engineer

☐ Chief Operator

☒ Technical Consultant

☐ Other (specify)

**ENGINEERING STATEMENT CONCERNING**

**APPLICATION FOR LICENSE INFORMATION**

**EMPLOYING MOMENT METHOD MODELING**

**WSUA, 1260 KHZ, DA-2**

**MIAMI, FLORIDA**

**APRIL, 2014**

***PHASETEK INC.***  
**ENGINEERING STATEMENT CONCERNING  
APPLICATION FOR LICENSE INFORMATION  
EMPLOYING MOMENT METHOD MODELING  
WSUA, 1260 KHZ, DA-2  
MIAMI, FLORIDA  
APRIL, 2014**

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# ***PHASETEK INC.***

## **ENGINEERING STATEMENT CONCERNING APPLICATION FOR LICENSE INFORMATION EMPLOYING MOMENT METHOD MODELING WSUA, 1260 KHZ, DA-2 MIAMI, FLORIDA APRIL, 2014**

### **SUMMARY**

Adjustment of the Antenna System and a Proof of Performance employing Moment Method Modeling was performed on Radio Station WSUA, 1260 KHz, Miami, Florida. There is no change to the presently licensed standard radiation patterns for Day and Night. This report was prepared on behalf of WSUA BROADCASTING CORPORATION, licensee of Radio Station WSUA.

### **SITE MODIFICATIONS**

The WSUA Transmitter site remains as currently licensed for Radio Stations WACC, 830 KHz and WSUA, 1260 KHz. All Towers remain unchanged. A License Application employing Moment Method Modeling as set forth in Section 73.151(C) has been done to re-license Radio Station WSUA.

### **REFERENCE POINTS**

Reference Points were measured at pattern minima and maxima for the Directional modes of operation. These Points and their measured field intensity are shown in Figure 15.

### **SPURIOUS EMISSIONS**

Because of the common usage of the Transmitter site by both Radio Stations WSUA, 1260 KHz and WACC, 830 KHz, filtering is installed and adjusted at all Towers to prevent interaction and spurious radiation products. No changes have been made to the filtering circuits. All filter circuits are located on the matching network side of the Sampling TCT's for both stations. The "reject" 1260 kHz Filters (located in the WACC equipment) measure greater than 30,000 ohms, and are not included in the circuit model.

# ***PHASETEK INC.***

## **ENGINEERING STATEMENT CONCERNING APPLICATION FOR LICENSE INFORMATION EMPLOYING MOMENT METHOD MODELING WSUA, 1260 KHZ, DA-2 MIAMI, FLORIDA APRIL, 2014**

### **CO-LOCATED TV TOWER**

Located on the WSUA transmitter site property is a tall tower utilized for TV, STL, and various other communications. This tower is centered between towers 2 and 3, and in line with them. The tower stands 164.9 M. above ground with aviation obstruction lighting. It is uniform cross section, guyed, and grounded at the base. The tower has detuning skirts and circuits to detune at both 830 kHz and 1260 kHz. The ASRN for the tower is: 1030081.

The moment method model for the WSUA individual towers was generated without this tower to match measured impedance data. After this was done, the TV tower was inserted into the model in both a base grounded and base insulated condition, to verify the effect on the model. An electrical height of 271° and 100% of the tower's equivalent radius was used in the model. The modeled height is 108.7% of the physical height.

A summary of the computed impedance data is shown in figure 3. In all cases, the modeled individual tower impedances are within the required tolerance of  $\pm 2.0$  and  $\pm 4.0\%$  ohms of the measured values. Because of the effective height of the tower, it is not possible to effectively detune in the model with a lumped impedance at the base. For the directional array computations, the tower was removed as would be the detuned case.

### **ARRAY GEOMETRY SURVEY**

As there is no change to the presently licensed Day and Night standard pattern radiation, and no new construction has been done, a survey of the tower geometry is not submitted with this application.

# ***PHASETEK INC.***

## **ENGINEERING STATEMENT CONCERNING APPLICATION FOR LICENSE INFORMATION EMPLOYING MOMENT METHOD MODELING WSUA, 1260 KHZ, DA-2 MIAMI, FLORIDA APRIL, 2014**

### **METHOD OF MOMENTS DETAIL**

All Moment Method Modeling was done with Expert MININEC Broadcast Professional, Version 23. One wire was used to represent each Tower. Towers were driven individually to verify the Model compared to measured impedance data. Once the Model was verified, both the Day and Night Directional Antenna Systems were computed. For Directional modes, the complex voltage values for sources located at ground level were computed. These sources produce current moment sums for each Tower that, when normalized, equate to the Theoretical Field Parameters for each respective Tower.

### **MEASURING EQUIPMENT AND PERSONNEL**

All Tower Resistance and Reactance measurements were made with a Delta Electronics OIB-3 Operating Impedance Bridge. Before use, tests of known impedances were made to verify operation. All Field Intensity Measurements were made with a Potomac Instruments Field Intensity Meter; PI4100, Serial Number 154. All measurements were taken by Mr. Jim Johnson of James M. Johnson & Associates.

### **CONCLUSION**

It is believed that the WSUA Antenna System has been adjusted in accordance with all applicable Commission rules and regulations. The foregoing was prepared on behalf of WSUA BROADCASTING CORPORATION, under the immediate supervision of Kurt Gorman, Phasetek Inc., Quakertown, Pennsylvania, whose qualifications are a matter of record with the Federal Communications Commission. The statements herein are true and correct of his knowledge, except such statements made on information and belief, and as to these statements he believes them to be true and correct.

***PHASETEK INC.***

**ENGINEERING STATEMENT CONCERNING  
APPLICATION FOR LICENSE INFORMATION  
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MIAMI, FLORIDA  
APRIL, 2014**

A handwritten signature in black ink, consisting of two large, overlapping loops that resemble the number '2' or a stylized 'G'.

---

**Kurt Gorman, President  
Phasetek Inc.  
Quakertown, Pennsylvania**

## **FIGURE 1**

### **ANTENNA SYSTEM AS ADJUSTED**

**APPLICATION FOR LICENSE INFORMATION  
EMPLOYING MOMENT METHOD MODELING  
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#### **ANTENNA SYSTEM DESCRIPTION**

1. The Antenna System consists of six (6) uniform, guyed, vertical steel transmitting Towers. Towers 1, 2, 3, and 4 stand 73.2M (110.7°) above their Base Insulators. Towers 5 and 6 stand 79.2M (119.8°) above their Base Insulators. The Towers are arranged with Tower 2 as a reference; Tower 1 is spaced 90.0° on a bearing of 73.0°T. Tower 3 is spaced 180.0° on a bearing of 253.0°T. Tower 4 is spaced 270.0° on a bearing of 253.0°T. Tower 5 is spaced 97.2° on a bearing of 149.0°T. Tower 6 is spaced 159.4° on a bearing of 222.0°T. Towers 1, 4, 5, and 6 have aviation obstruction lighting that is isolated at the tower base with a choke. Towers 2 and 3 have a similar choke that is used as a static drain. Tower 5 supports an STL antenna. The line for the antenna is isolated at the base with a Phasetek Inc. isocoupler.
2. The Ground System remains as currently licensed. No changes have been made. Copper strap connects all Towers to the main Transmitter grounding point.
3. The Sampling System consists of six (6) Delta Electronics TCT-1-HV, 0.5 V/A Toroidal Current Transformers. All TCT's are at the Output of each Antenna Tuning Unit. These TCT's are connected to a Potomac Instruments 1901-6 Antenna Monitor via six (6) equal lengths of Andrew, LDF4-50A, 1/2" phase stabilized foam coaxial cable.

**FIGURE 1  
ANTENNA SYSTEM AS ADJUSTED**

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EMPLOYING MOMENT METHOD MODELING  
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CONTINUED  
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**ANTENNA SYSTEM DESCRIPTION – Continued**

**TOWER REGISTRATION NUMBERS:**

TOWER 1: 1030077

TOWER 2: 1030078

TOWER 3: 1030079

TOWER 4: 1030080

TOWER 5: 1030083

TOWER 6: 1030082

**DIRECTIONAL OPERATION (COMMON POINT DAY)**

Impedance = 50.0 – j 5.0 Ohms

Current = 32.5 Amperes

Power = 52,650 Watts

**DIRECTIONAL OPERATION (COMMON POINT NIGHT)**

Impedance = 50.0 – j 5.0 Ohms

Current = 20.5 Amperes

Power = 21,060 Watts

Directional Antenna Monitor indications are within  $\pm 5\%$  and  $\pm 3^\circ$  of the modeled TCT values.

**FIGURE 2**  
**WSUA SAMPLING SYSTEM DESCRIPTION/MEASUREMENTS**

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**SAMPLING SYSTEM DESCRIPTION**

The Sampling System consists of Delta Electronics Toroidal Sampling Transformers (0.5 volt/amp) mounted at the base of each Tower. The sampling devices are connected to the Antenna Monitor with equal lengths of Andrew LDF4-50A. The Antenna Monitor is a Potomac Instruments Model 1901-6, Serial Number 652.

**SAMPLE LINE MEASUREMENTS**

Impedance measurements were made of the Antenna Sampling Lines using an Array Solutions Power Aim 120 Vector Network Analyzer (VNA). Measurements were done with the lines open circuited and then connected to the TCT's.

The table below shows the frequencies above and below the carrier frequency where resonance, defined as zero reactance corresponding with low resistance, was found. Frequencies of resonance occur at odd multiples of 90 degrees electrical length, the Sample Line length at the resonant frequency below the carrier frequency, which is the closest one to the carrier frequency, was found to be 450 electrical degrees. The electrical length at carrier frequency appearing in the table below was calculated by ratioing the frequencies.

**SAMPLE LINE MEASUREMENTS**

	Resonant Frequency (KHz) below 1260 KHz	Resonant Frequency (KHz) above 1260 KHz	Calculated Electrical Length (deg) at 1260 KHz	Measured Impedance (ohms) Connected to TCT @ 1260 KHz
<b>Tower 1</b>	1218.4	1702.4	465.4	50.80 -j 1.89
<b>Tower 2</b>	1217.5	1701.8	465.7	50.73 -j 1.96
<b>Tower 3</b>	1218.5	1702.4	465.3	50.61 -j 1.94
<b>Tower 4</b>	1217.7	1702.1	465.6	50.62 -j 1.95
<b>Tower 5</b>	1217.1	1701.6	465.9	50.61 -j 1.73
<b>Tower 6</b>	1218.4	1702.5	465.4	50.51 -j 1.72

**FIGURE 2**  
**WSUA SAMPLING SYSTEM DESCRIPTION/MEASUREMENTS**

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**CONTINUED**

**SAMPLE LINE MEASUREMENTS (CONTINUED)**

To determine the characteristic impedance values of the Sample Lines, open-circuited measurements were made with frequencies offset to produce  $\pm 45$  degrees of electrical length from resonance. The characteristic impedance was calculated using the following formula, where  $R_1 + j X_1$  and  $R_2 + j X_2$  are the measured impedances at the +45 and -45 degree offset frequencies, respectively:

$$Z_0 = ((R_1^2 + X_1^2)^{1/2} \cdot (R_2^2 + X_2^2)^{1/2})^{1/2}$$

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	1340.2	8.90 +j 51.30	1096.6	6.48 -j 47.00	49.70
2	1339.3	8.81 +j 51.21	1095.8	6.44 -j 47.09	49.69
3	1340.4	8.71 +j 51.26	1096.7	6.40 -j 47.08	49.70
4	1339.5	8.72 +j 51.09	1095.9	6.42 -j 47.16	49.67
5	1338.8	8.73 +j 51.11	1095.4	6.45 -j 47.22	49.71
6	1340.2	8.66 +j 50.77	1096.6	6.42 -j 47.16	49.51

**SAMPLING TCT MEASUREMENTS**

Measurements of the Delta Electronics Model TCT-1-HV, 0.5 V/A Toroidal Current Transformers were performed by feeding a single current thru all TCT's in series and sampling with equal length cable to the antenna monitor. Measurements are normalized to Tower #2 (reference) and are within the manufacturer's rating of  $\pm 2.0\%$  and  $\pm 2.0^\circ$ .

**FIGURE 2**  
**WSUA SAMPLING SYSTEM DESCRIPTION/MEASUREMENTS**

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**CONTINUED**

**SAMPLING TCT MEASUREMENTS CONT'D**

TOWER	SERIAL #	MAGNITUDE	PHASE
1	3192	1.000	0.2°
2	3179	1.000	0.0°
3	3194	.998	0.2°
4	3195	.997	0.2°
5	3177	.998	0.1°
6	3193	.997	0.2°

**ANTENNA MONITOR MEASUREMENT**

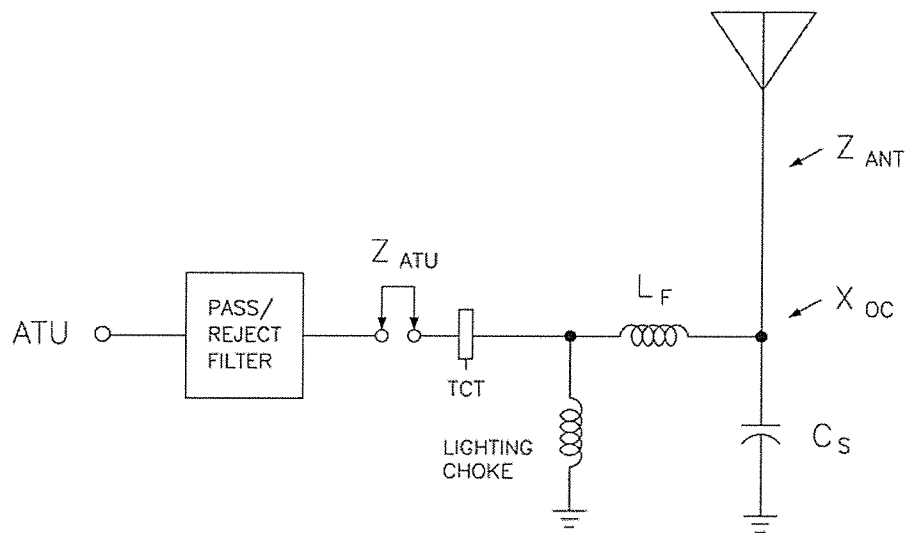
Measurement of the Potomac Instruments Model 1901-6 Antenna Monitor was performed to verify calibration. A single RF Voltage was applied to the Reference Input (Tower #2) and each other Input by use of a "T" divider and equal electrical length coaxial cables.

Tower	Ratio	Phase
1	.998	+0.3°
2	1.000	0.0°
3	.998	+0.3°
4	.996	-0.1°
5	.997	+0.3°
6	.998	-0.1°

The above is within the manufacturer's rating of  $\pm 1.0\%$  and  $\pm 1.0^\circ$ .

**FIGURE 3**  
**WSUA TOWER IMPEDANCE MEASUREMENTS COMPARED TO**  
**METHOD OF MOMENTS MODEL**

**APPLICATION FOR LICENSE INFORMATION**  
**EMPLOYING MOMENT METHOD MODELING**  
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**MIAMI, FLORIDA**  
**APRIL, 2014**



TOWER	Specified	Measured	Measured	Calculated	Measured
	Cs (pf)	L <sub>F</sub> (μH)	X <sub>F</sub> (Ω)	X <sub>OC</sub> (Ω)	Z <sub>ATU</sub> (Ω)
1	20	4.50	+j35.6	-j10,326.8	124.0 +j 274.7
2	20	3.61	+j28.6	-j10,326.8	135.0 +j 272.2
3	20	2.00	+j15.8	-j10,326.8	120.0 +j 238.1
4	20	2.46	+j19.5	-j10,326.8	146.0 +j 226.8
5	35	2.73	+j21.6	-j4,638.6	465.0 +j 380.5
6	32	1.26	+j10.0	-j5,212.8	440.0 +j 306.2

**FIGURE 3 CONTINUED**  
**WSUA TOWER IMPEDANCE MEASUREMENTS COMPARED TO**  
**METHOD OF MOMENTS MODEL**

**APPLICATION FOR LICENSE INFORMATION**  
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**MODELED  $Z_{ANT}$  ( $\Omega$ )**

<b>TOWER</b>	<b>WITHOUT TV TOWER</b>	<b>TV TOWER OPEN CIRCUITED</b>	<b>TV TOWER GROUNDED</b>
1	122.8 +j 235.5	119.9 +j 236.3	121.6 +j 235.3
2	131.3 +j 236.2	132.9 +j 242.4	133.7 +j 246.5
3	112.4 +j 223.8	118.3 +j 222.9	121.5 +j 226.7
4	148.2 +j 201.6	143.0 +j 207.9	144.0 +j 206.3
5	407.7 +j 367.3	395.5 +j 368.8	397.2 +j 367.2
6	373.8 +j 314.9	398.4 +j 303.6	405.0 +j 308.2

**MODELED  $Z_{ATU}$  ( $\Omega$ )**

<b>TOWER</b>	<b>WITHOUT TV TOWER</b>	<b>TV TOWER OPEN CIRCUITED</b>	<b>TV TOWER GROUNDED</b>
1	128.0 +j 273.9	125.0 +j 274.8	126.8 +j 273.7
2	137.0 +j 267.7	138.9 +j 274.1	139.8 +j 278.3
3	117.2 +j 242.8	123.3 +j 241.7	126.8 +j 245.6
4	153.8 +j 222.4	148.6 +j 229.0	149.6 +j 227.4
5	475.3 +j 374.0	461.6 +j 378.4	463.2 +j 376.2
6	420.5 +j 312.6	445.7 +j 295.8	453.9 +j 299.7

**FIGURE 4**  
**WSUA MOMENT MODEL PARAMETERS**

**APPLICATION FOR LICENSE INFORMATION**  
**EMPLOYING MOMENT METHOD MODELING**  
**WSUA 1260 KHZ, DA-2**  
**MIAMI, FLORIDA**  
**APRIL, 2014**

<b>Tower #</b>	<b>Wire #</b>	<b># of Segments</b>	<b>Base Node</b>
1	1	15	1
2	2	15	16
3	3	15	31
4	4	15	46
5	5	15	61
6	6	15	76

<b>Tower #</b>	<b>Physical Height Degrees</b>	<b>Modeled Height Degrees</b>	<b>Modeled Radius Meters</b>	<b>% of Equivalent Radius</b>
1	110.7	120.0	.26	112.9
2	110.7	121.0	.30	130.2
3	110.7	121.5	.32	138.9
4	110.7	118.5	.26	112.9
5	119.8	139.1	.32	138.9
6	119.8	136.6	.34	147.6

All Towers are uniform cross section, guyed with Base Insulator. Each tower is three (3) sided, 19" face width.

All base insulators were manufactured by Utility Tower.

Tower #5 Isocoupler is Phasetek Inc. Model #P600-402-HV with a maximum capacity of 5pf.

All Towers have a Phasetek Inc./ KTL Lighting Choke. These measure +j 16,260 ohms @ 1260 KHz.

**FIGURE 5A**  
**WSUA MOMENT SUMMARY FOR INDIVIDUAL TOWERS**  
**(WITHOUT TV TOWER)**

WSUA TOWER 1 WITHOUT TV TOWER

**GEOMETRY**

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		

Number of wires = 6  
 current nodes = 90

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	5 9.27333
radius	1 .26	6 .34

**ELECTRICAL DESCRIPTION**

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
	lowest			minimum maximum
1	1.26	0	1	.0219444 .0257593

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	16	0	-10,326.8	0	0	0
2	31	0	-10,326.8	0	0	0
3	46	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0

**IMPEDANCE**

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	impd (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.26	122.75	235.46	265.54	62.5	11.811	-1.4743	-5.4082

# FIGURE 5A CONTINUED

WSUA TOWER 2 WITHOUT TV TOWER

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		

Number of wires = 6  
current nodes = 90

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	5 9.27333
radius	1 .26	6 .34

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
1	1.26	0	1	minimum .0219444 maximum .0257593

Sources

source	node	sector	magnitude	phase	type
1	16	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	31	0	-10,326.8	0	0	0
3	46	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node							
1.26	131.27	236.21	270.24	60.9	11.42	-1.5251	-5.285

# FIGURE 5A CONTINUED

WSUA TOWER 3 WITHOUT TV TOWER

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90. 90.	73. 73.	0 120.	.26	15
2	none	0 0	0 0	0 121.	.3	15
3	none	180. 180.	253. 253.	0 121.5	.32	15
4	none	270. 270.	253. 253.	0 118.5	.26	15
5	none	97.2 97.2	149. 149.	0 139.1	.32	15
6	none	159.4 159.4	222. 222.	0 136.6	.34	15

Number of wires = 6  
current nodes = 90

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	5 9.27333
radius	1 .26	6 .34

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
lowest			minimum	maximum
1	1.26	0	1	.0219444 .0257593

## Sources

source	node	sector	magnitude	phase	type
1	31	1	1.	0	voltage

## Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	46	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 31, sector 1							
1.26	112.39	223.76	250.4	63.3	11.515	-1.5124	-5.3155

## FIGURE 5A CONTINUED

WSUA TOWER 4 WITHOUT TV TOWER

### GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90. 90.	73. 73.	0 120.	.26	15
2	none	0 0	0 0	0 121.	.3	15
3	none	180. 180.	253. 253.	0 121.5	.32	15
4	none	270. 270.	253. 253.	0 118.5	.26	15
5	none	97.2 97.2	149. 149.	0 139.1	.32	15
6	none	159.4 159.4	222. 222.	0 136.6	.34	15

Number of wires = 6  
current nodes = 90

	minimum	maximum
Individual wires	wire	wire
segment length	4	5
radius	1	6
	value	value
	7.9	9.27333
	.26	.34

### ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of	segment length (wavelengths)
	lowest		steps	minimum maximum
1	1.26	0	1	.0219444 .0257593

### Sources

source	node	sector	magnitude	phase	type
1	46	1	1.	0	voltage

### Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	31	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0

### IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 46, sector 1							
1.26	148.24	201.59	250.22	53.7	8.6695	-2.0127	-4.3075

# FIGURE 5A CONTINUED

WSUA TOWER 5 WITHOUT TV TOWER

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90. 90.	73. 73.	0 120.	.26	15
2	none	0 0	0 0	0 121.	.3	15
3	none	180. 180.	253. 253.	0 121.5	.32	15
4	none	270. 270.	253. 253.	0 118.5	.26	15
5	none	97.2 97.2	149. 149.	0 139.1	.32	15
6	none	159.4 159.4	222. 222.	0 136.6	.34	15

Number of wires = 6  
current nodes = 90

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	5 9.27333
radius	1 .26	6 .34

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
1	lowest			minimum maximum
1	1.26	0	1	.0219444 .0257593

## Sources

source node	sector	magnitude	phase	type
1 61	1	1.	0	voltage

## Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	31	0	-10,326.8	0	0	0
4	46	0	-10,326.8	0	0	0
5	76	0	-5,212.8	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 61, sector 1							
1.26	407.68	367.3	548.74	42.	14.827	-1.1734	-6.2569

## FIGURE 5A CONTINUED

WSUA TOWER 6 WITHOUT TV TOWER

### GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90. 90.	73. 73.	0 120.	.26	15
2	none	0 0	0 0	0 121.	.3	15
3	none	180. 180.	253. 253.	0 121.5	.32	15
4	none	270. 270.	253. 253.	0 118.5	.26	15
5	none	97.2 97.2	149. 149.	0 139.1	.32	15
6	none	159.4 159.4	222. 222.	0 136.6	.34	15

Number of wires = 6  
current nodes = 90

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	5 9.27333
radius	1 .26	6 .34

### ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
1	lowest			minimum maximum
1	1.26	0	1	.0219444 .0257593

### Sources

source	node	sector	magnitude	phase	type
1	76	1	1.	0	voltage

### Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	31	0	-10,326.8	0	0	0
4	46	0	-10,326.8	0	0	0
5	61	0	-4,638.6	0	0	0

### IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node	76, sector 1						
1.26	373.8	314.85	488.73	40.1	12.836	-1.3561	-5.7153

**FIGURE 5B**  
**WSUA MOMENT SUMMARY FOR INDIVIDUAL TOWERS**  
**(TV TOWER GROUNDED)**

WSUA TOWER 1 WITH TV TOWER GROUNDED

**GEOMETRY**

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		
7	none	90.	253.	0	.36	28
		90.	253.	271.		

Number of wires = 7  
current nodes = 118

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	7.9	7	9.67857
radius	1	.26	7	.36

**ELECTRICAL DESCRIPTION**

Frequencies (MHz)

frequency			no. of steps	segment length (wavelengths)	
no.	lowest	step		minimum	maximum
1	1.26	0	1	.0219444	.0268849

**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	16	0	-10,326.8	0	0	0
2	31	0	-10,326.8	0	0	0
3	46	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0

**IMPEDANCE**

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.26	121.59	235.29	264.85	62.7	11.865	-1.4676	-5.4249

# FIGURE 5B CONTINUED

WSUA TOWER 2 WITH TV TOWER GROUNDED

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		
7	none	90.	253.	0	.36	28
		90.	253.	271.		

Number of wires = 7  
current nodes = 118

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	7 9.67857
radius	1 .26	7 .36

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of	segment length (wavelengths)
	lowest		steps	minimum maximum
1	1.26	0	1	.0219444 .0268849

## Sources

source	node	sector	magnitude	phase	type
1	16	1	1.	0	voltage

## Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	31	0	-10,326.8	0	0	0
3	46	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 16, sector 1							
1.26	133.67	246.52	280.43	61.5	12.057	-1.4441	-5.4839

# FIGURE 5B CONTINUED

WSUA TOWER 3 WITH TV TOWER GROUNDED

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		
7	none	90.	253.	0	.36	28
		90.	253.	271.		

Number of wires = 7  
current nodes = 118

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	7 9.67857
radius	1 .26	7 .36

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
	lowest			minimum maximum
1	1.26	0	1	.0219444 .0268849

Sources

source	node	sector	magnitude	phase	type
1	31	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	46	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 31, sector 1							
1.26	121.47	226.7	257.19	61.8	11.214	-1.5532	-5.219

# FIGURE 5B CONTINUED

WSUA TOWER 4 WITH TV TOWER GROUNDED

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90. 90.	73. 73.	0 120.	.26	15
2	none	0 0	0 0	0 121.	.3	15
3	none	180. 180.	253. 253.	0 121.5	.32	15
4	none	270. 270.	253. 253.	0 118.5	.26	15
5	none	97.2 97.2	149. 149.	0 139.1	.32	15
6	none	159.4 159.4	222. 222.	0 136.6	.34	15
7	none	90. 90.	253. 253.	0 271.	.36	28

Number of wires = 7  
current nodes = 118

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	7 9.67857
radius	1 .26	7 .36

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
	lowest			minimum maximum
1	1.26	0	1	.0219444 .0268849

Sources

source	node	sector	magnitude	phase	type
1	46	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	31	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1.26	143.95	206.27	251.53	55.1	9.0271	-1.9323	-4.4474

# FIGURE 5B CONTINUED

WSUA TOWER 5 WITH TV TOWER GROUNDED

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		
7	none	90.	253.	0	.36	28
		90.	253.	271.		

Number of wires = 7  
current nodes = 118

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	7 9.67857
radius	1 .26	7 .36

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
	lowest			minimum maximum
1	1.26	0	1	.0219444 .0268849

## Sources

source	node	sector	magnitude	phase	type
1	61	1	1.	0	voltage

## Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	31	0	-10,326.8	0	0	0
4	46	0	-10,326.8	0	0	0
5	76	0	-5,212.8	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 61, sector 1							
1.26	397.16	367.19	540.9	42.8	14.791	-1.1763	-6.2477

## FIGURE 5B CONTINUED

WSUA TOWER 6 WITH TV TOWER GROUNDED

### GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		
7	none	90.	253.	0	.36	28
		90.	253.	271.		

Number of wires = 7  
current nodes = 118

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	7 9.67857
radius	1 .26	7 .36

### ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of	segment length (wavelengths)
	lowest		steps	minimum maximum
1	1.26	0	1	.0219444 .0268849

Sources

source	node	sector	magnitude	phase	type
1	76	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	31	0	-10,326.8	0	0	0
4	46	0	-10,326.8	0	0	0
5	61	0	-4,638.6	0	0	0

### IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 76, sector 1							
1.26	405.	308.17	508.91	37.3	12.835	-1.3562	-5.7152

**FIGURE 5C**  
**WSUA MOMENT SUMMARY FOR INDIVIDUAL TOWERS**  
**(TV TOWER OPEN CIRCUITED)**

WSUA TOWER 1 WITH TV TOWER OPEN CIRCUITED

**GEOMETRY**

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		
7	none	90.	253.	0	.36	28
		90.	253.	271.		

Number of wires = 7  
 current nodes = 118

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	7.9	7	9.67857
radius	1	.26	7	.36

**ELECTRICAL DESCRIPTION**

Frequencies (MHz)

frequency		no. of	segment length (wavelengths)		
no.	lowest		steps	minimum	maximum
1	1.26	0	1	.0219444	.0268849

**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	16	0	-10,326.8	0	0	0
2	31	0	-10,326.8	0	0	0
3	46	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0
6	91	1,000.	10,000.	0	0	0

**IMPEDANCE**

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.26	119.87	236.25	264.92	63.1	12.044	-1.4457	-5.4799

# FIGURE 5C CONTINUED

WSUA TOWER 2 WITH TV TOWER OPEN CIRCUITED

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		
7	none	90.	253.	0	.36	28
		90.	253.	271.		

Number of wires = 7  
current nodes = 118

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	7 9.67857
radius	1 .26	7 .36

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
	lowest			minimum maximum
1	1.26	0	1	.0219444 .0268849

Sources

source	node	sector	magnitude	phase	type
1	16	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	31	0	-10,326.8	0	0	0
3	46	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0
6	91	1,000.	10,000.	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 16, sector 1							
1.26	132.93	242.35	276.41	61.3	11.787	-1.4774	-5.4006

## FIGURE 5C CONTINUED

WSUA TOWER 3 WITH TV TOWER OPEN CIRCUITED

### GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		
7	none	90.	253.	0	.36	28
		90.	253.	271.		

Number of wires = 7  
current nodes = 118

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	7 9.67857
radius	1 .26	7 .36

### ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
	lowest			minimum maximum
1	1.26	0	1	.0219444 .0268849

### Sources

source	node	sector	magnitude	phase	type
1	31	1	1.	0	voltage

### Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	46	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0
6	91	1,000.	10,000.	0	0	0

### IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 31, sector 1							
1.26	118.32	222.88	252.34	62.	11.096	-1.5698	-5.1806

# FIGURE 5C CONTINUED

WSUA TOWER 4 WITH TV TOWER OPEN CIRCUITED

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		
7	none	90.	253.	0	.36	28
		90.	253.	271.		

Number of wires = 7  
current nodes = 118

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	7 9.67857
radius	1 .26	7 .36

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of	segment length (wavelengths)
	lowest		steps	minimum maximum
1	1.26	0	1	.0219444 .0268849

Sources

source	node	sector	magnitude	phase	type
1	46	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	31	0	-10,326.8	0	0	0
4	61	0	-4,638.6	0	0	0
5	76	0	-5,212.8	0	0	0
6	91	1,000.	10,000.	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 46, sector 1							
1.26	142.99	207.93	252.35	55.5	9.1476	-1.9067	-4.4936

# FIGURE 5C CONTINUED

WSUA TOWER 5 WITH TV TOWER OPEN CIRCUITED

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90. 90.	73. 73.	0 120.	.26	15
2	none	0 0	0 0	0 121.	.3	15
3	none	180. 180.	253. 253.	0 121.5	.32	15
4	none	270. 270.	253. 253.	0 118.5	.26	15
5	none	97.2 97.2	149. 149.	0 139.1	.32	15
6	none	159.4 159.4	222. 222.	0 136.6	.34	15
7	none	90. 90.	253. 253.	0 271.	.36	28

Number of wires = 7  
current nodes = 118

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	7 9.67857
radius	1 .26	7 .36

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
	lowest			minimum maximum
1	1.26	0	1	.0219444 .0268849

Sources

source	node	sector	magnitude	phase	type
1	61	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	31	0	-10,326.8	0	0	0
4	46	0	-10,326.8	0	0	0
5	76	0	-5,212.8	0	0	0
6	91	1,000.	10,000.	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 61, sector 1							
1.26	395.52	368.78	540.77	43.	14.846	-1.1719	-6.2618

# FIGURE 5C CONTINUED

WSUA TOWER 6 WITH TV TOWER OPEN CIRCUITED

## GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		
7	none	90.	253.	0	.36	28
		90.	253.	271.		

Number of wires = 7  
current nodes = 118

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	7 9.67857
radius	1 .26	7 .36

## ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
	lowest			minimum maximum
1	1.26	0	1	.0219444 .0268849

Sources

source	node	sector	magnitude	phase	type
1	76	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,326.8	0	0	0
2	16	0	-10,326.8	0	0	0
3	31	0	-10,326.8	0	0	0
4	46	0	-10,326.8	0	0	0
5	61	0	-4,638.6	0	0	0
6	91	1,000.	10,000.	0	0	0

## IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 76, sector 1							
1.26	398.44	303.56	500.9	37.3	12.641	-1.3772	-5.6584

# **FIGURE 6** **WSUA MOMENT MODEL ARRAY SYNTHESIS (DIRECTIONAL DAY)**

WSUA DIRECTIONAL DAY

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = 1.26 MHz

tower	field ratio magnitude	phase (deg)
1	.752	-125.2
2	1.	0
3	.638	83.7
4	.399	-150.
5	.1	-85.
6	0	0

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	3,385.56	303.4	7.81145	259.6
16	2,747.35	67.3	13.53	12.4
31	2,220.98	161.4	6.86316	94.9
46	933.743	287.8	5.86166	215.
61	1,169.32	305.4	3.25336	5.8
76	6.9932	138.3	1.33092	138.3

Sum of square of source currents = 675.793

Total power = 50,000. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.0023481	-.00268705
Y(1, 2)	.00137481	.000524222
Y(1, 3)	-.000315274	-.000370064
Y(1, 4)	-.000186063	.000119235
Y(1, 5)	.000923495	6.8785E-05
Y(1, 6)	-.000120156	-.000233808
Y(2, 1)	.00137481	.00052422
Y(2, 2)	.00237949	-.0026286
Y(2, 3)	.000659095	-.00128119
Y(2, 4)	-.000476076	-.000417897
Y(2, 5)	.00111676	.000228211
Y(2, 6)	.000485429	-.000683293
Y(3, 1)	-.000315287	-.000370064
Y(3, 2)	.000659072	-.0012812
Y(3, 3)	.00230529	-.00296338
Y(3, 4)	.00131669	.000326454
Y(3, 5)	-6.4943E-05	-.000788757
Y(3, 6)	.00091765	-.00035007
Y(4, 1)	-.000186066	.000119243
Y(4, 2)	-.000476081	-.000417886
Y(4, 3)	.00131669	.000326479
Y(4, 4)	.00242275	-.00303907
Y(4, 5)	-.000380005	-7.6204E-05
Y(4, 6)	.000173839	-.000405878
Y(5, 1)	.000923444	6.8681E-05
Y(5, 2)	.0011167	.000228065
Y(5, 3)	-6.5009E-05	-.000788748
Y(5, 4)	-.000380014	-7.6178E-05
Y(5, 5)	.00162844	-.000952762
Y(5, 6)	.000274679	-.000573744
Y(6, 1)	-.000120178	-.000233805
Y(6, 2)	.000485352	-.000683319
Y(6, 3)	.000917567	-.000350144
Y(6, 4)	.000173797	-.000405888
Y(6, 5)	.000274691	-.00057374
Y(6, 6)	.00086916	-.00135038

FIGURE 6 CONTINUED

TOWER IMPEDANCE MATRIX		
impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	121.17	230.125
Z(1, 2)	43.5972	-71.6942
Z(1, 3)	-3.26474	31.9483
Z(1, 4)	37.1172	-1.18929
Z(1, 5)	-42.2142	-143.098
Z(1, 6)	-40.1232	76.2739
Z(2, 1)	43.5976	-71.6943
Z(2, 2)	132.413	231.455
Z(2, 3)	-24.1538	-25.8199
Z(2, 4)	-18.7396	26.8938
Z(2, 5)	26.6342	-142.252
Z(2, 6)	-53.9609	-41.2314
Z(3, 1)	-3.26498	31.9477
Z(3, 2)	-24.1522	-25.8196
Z(3, 3)	116.615	218.967
Z(3, 4)	47.9984	-56.0974
Z(3, 5)	-61.4333	60.8369
Z(3, 6)	40.3239	-148.713
Z(4, 1)	37.1169	-1.19006
Z(4, 2)	-18.7386	26.8928
Z(4, 3)	47.9966	-56.0974
Z(4, 4)	144.302	203.424
Z(4, 5)	54.3472	63.3803
Z(4, 6)	-109.368	-68.7375
Z(5, 1)	-42.2032	-143.11
Z(5, 2)	26.6516	-142.26
Z(5, 3)	-61.4387	60.8367
Z(5, 4)	54.3461	63.3846
Z(5, 5)	403.702	366.481
Z(5, 6)	-135.675	-67.1466
Z(6, 1)	-40.1271	76.2745
Z(6, 2)	-53.9597	-41.2353
Z(6, 3)	40.3404	-148.718
Z(6, 4)	-109.367	-68.7491
Z(6, 5)	-135.675	-67.1451
Z(6, 6)	372.315	626.395

# **FIGURE 7** **WSUA MOMENT MODEL SUMMARY FOR DIRECTIONAL DAY MODE**

## WSUA DIRECTIONAL DAY

### GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90. 90.	73. 73.	0 120.	.26	15
2	none	0 0	0 0	0 121.	.3	15
3	none	180. 180.	253. 253.	0 121.5	.32	15
4	none	270. 270.	253. 253.	0 118.5	.26	15
5	none	97.2 97.2	149. 149.	0 139.1	.32	15
6	none	159.4 159.4	222. 222.	0 136.6	.34	15

Number of wires = 6  
current nodes = 90

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	5 9.27333
radius	1 .26	6 .34

### ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
	lowest			minimum maximum
1	1.26	0	1	.0219444 .0257593

### Sources

source	node	sector	magnitude	phase	type
1	1	1	4,788.13	303.4	voltage
2	16	1	3,885.51	67.3	voltage
3	31	1	3,141.08	161.4	voltage
4	46	1	1,320.58	287.8	voltage
5	61	1	1,653.75	305.4	voltage

### Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	76	0	309.59	0	0	0

### IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.26	312.44	300.3	433.35	43.9	12.099	-1.4391	-5.4966
source = 2; node 16, sector 1							
1.26	116.64	166.22	203.06	54.9	7.3629	-2.374	-3.756
source = 3; node 31, sector 1							
1.26	128.46	297.1	323.68	66.6	16.64	-1.0452	-6.6979

# FIGURE 7 CONTINUED

source = 4; node 46, sector 1  
1.26 47.236 152.16 159.32 72.8 11.721 -1.4857 -5.3802

source = 5; node 61, sector 1  
1.26 177.94 -312.42 359.54 299.7 14.743 -1.1802 -6.2352

## CURRENT rms

Frequency = 1.26 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	26.3135	-86.0674	0	7.81449	259.5	-1.4194	-7.68451
2	26.3135	-86.0674	8.	9.89152	247.9	-3.72451	-9.16352
3	26.3135	-86.0674	16.	11.2438	242.7	-5.16135	-9.98918
4	26.3135	-86.0674	24.	12.2312	239.2	-6.25583	-10.5104
5	26.3135	-86.0674	32.	12.8797	236.7	-7.06547	-10.7688
6	26.3135	-86.0674	40.	13.1976	234.8	-7.61003	-10.7826
7	26.3135	-86.0674	48.	13.1898	233.2	-7.89817	-10.5636
8	26.3135	-86.0674	56.	12.8629	231.9	-7.93579	-10.1231
9	26.3135	-86.0674	64.	12.2264	230.8	-7.72956	-9.47302
10	26.3135	-86.0674	72.	11.2937	229.8	-7.2878	-8.62756
11	26.3135	-86.0674	80.	10.0812	228.9	-6.62093	-7.60218
12	26.3135	-86.0674	88.	8.60716	228.2	-5.74067	-6.4131
13	26.3135	-86.0674	96.	6.88959	227.5	-4.65868	-5.07574
14	26.3135	-86.0674	104.	4.9397	226.8	-3.38209	-3.60029
15	26.3135	-86.0674	112.	2.7443	226.2	-1.90089	-1.97934
END	26.3135	-86.0674	120.	0	0	0	0
GND	0	0	0	13.5331	12.4	13.2194	2.89672
17	0	0	8.06667	15.4691	7.3	15.3445	1.95935
18	0	0	16.1333	16.5371	4.6	16.4828	1.33852
19	0	0	24.2	17.1847	2.7	17.1654	.814139
20	0	0	32.2667	17.4561	1.2	17.4522	.364532
21	0	0	40.3333	17.3699	359.9	17.3698	-.0165622
22	0	0	48.4	16.9388	358.9	16.9356	-.330275
23	0	0	56.4667	16.1762	358.	16.166	-.576109
24	0	0	64.5333	15.0982	357.1	15.0794	-.753244
25	0	0	72.6	13.7242	356.4	13.6971	-.861073
26	0	0	80.6667	12.0763	355.7	12.0428	-.899456
27	0	0	88.7333	10.1787	355.1	10.1416	-.868711
28	0	0	96.8	8.05382	354.5	8.01699	-.76937
29	0	0	104.867	5.71606	354.	5.68434	-.601305
30	0	0	112.933	3.15183	353.4	3.13107	-.361123
END	0	0	121.	0	0	0	0
GND	-52.6269	172.135	0	6.86336	94.8	-.572324	6.83946
32	-52.6269	172.135	8.1	8.68006	89.6	.0638782	8.67983
33	-52.6269	172.135	16.2	9.72907	87.3	.463566	9.71802
34	-52.6269	172.135	24.3	10.4472	85.7	.781966	10.4179
35	-52.6269	172.135	32.4	10.8781	84.5	1.03435	10.8288
36	-52.6269	172.135	40.5	11.0395	83.6	1.22569	10.9713
37	-52.6269	172.135	48.6	10.9416	82.9	1.3576	10.8571
38	-52.6269	172.135	56.7	10.5936	82.2	1.43086	10.4965
39	-52.6269	172.135	64.8	10.0061	81.7	1.44624	9.90098
40	-52.6269	172.135	72.9	9.19175	81.2	1.40495	9.08375
41	-52.6269	172.135	81.	8.16539	80.8	1.30861	8.05985
42	-52.6269	172.135	89.1	6.94275	80.4	1.15927	6.84528
43	-52.6269	172.135	97.2	5.53884	80.	.958993	5.45519
44	-52.6269	172.135	105.3	3.96287	79.7	.708913	3.89895
45	-52.6269	172.135	113.4	2.20449	79.4	.406478	2.16669
END	-52.6269	172.135	121.5	0	0	0	0
GND	-78.9403	258.202	0	5.86222	215.	-4.79935	-3.36629
47	-78.9403	258.202	7.9	6.55636	213.1	-5.49347	-3.57877
48	-78.9403	258.202	15.8	6.91805	212.	-5.86599	-3.66736

FIGURE 7 CONTINUED

49	-78.9403	258.202	23.7	7.11269	211.2	-6.08317	-3.68583
50	-78.9403	258.202	31.6	7.16005	210.6	-6.16504	-3.64124
51	-78.9403	258.202	39.5	7.06917	210.	-6.12047	-3.53738
52	-78.9403	258.202	47.4	6.84646	209.6	-5.95544	-3.37739
53	-78.9403	258.202	55.3	6.49829	209.1	-5.67564	-3.16464
54	-78.9403	258.202	63.2	6.03189	208.8	-5.2874	-2.90294
55	-78.9403	258.202	71.1	5.45551	208.4	-4.79791	-2.59667
56	-78.9403	258.202	79.	4.77834	208.1	-4.21512	-2.25063
57	-78.9403	258.202	86.9	4.00999	207.8	-3.54738	-1.86979
58	-78.9403	258.202	94.8	3.15942	207.5	-2.80246	-1.45883
59	-78.9403	258.202	102.7	2.23227	207.2	-1.98518	-1.02084
60	-78.9403	258.202	110.6	1.22327	206.9	-1.09061	-.55404
END	-78.9403	258.202	118.5	0	0	0	0
GND	-83.3167	-50.0617	0	3.25311	5.7	3.23682	.325118
62	-83.3167	-50.0617	9.27333	2.31128	351.7	2.28678	-.335641
63	-83.3167	-50.0617	18.5467	1.80046	335.1	1.63353	-.757127
64	-83.3167	-50.0617	27.82	1.52532	314.4	1.06733	-1.08969
65	-83.3167	-50.0617	37.0933	1.46369	292.9	.57056	-1.3479
66	-83.3167	-50.0617	46.3667	1.54258	275.2	.140865	-1.53614
67	-83.3167	-50.0617	55.64	1.67044	262.5	-.219472	-1.65596
68	-83.3167	-50.0617	64.9133	1.78224	253.5	-.507162	-1.70855
69	-83.3167	-50.0617	74.1867	1.84185	247.	-.71931	-1.69558
70	-83.3167	-50.0617	83.46	1.83091	242.2	-.854022	-1.61953
71	-83.3167	-50.0617	92.7333	1.74096	238.5	-.910652	-1.48379
72	-83.3167	-50.0617	102.007	1.56916	235.5	-.889752	-1.29252
73	-83.3167	-50.0617	111.28	1.31588	233.	-.792688	-1.05033
74	-83.3167	-50.0617	120.553	.982232	230.8	-.620682	-.761272
75	-83.3167	-50.0617	129.827	.565651	228.9	-.371949	-.426162
END	-83.3167	-50.0617	139.1	0	0	0	0
GND	-118.457	106.659	0	1.32802	138.4	-.993182	.881598
77	-118.457	106.659	9.10667	.914205	138.4	-.684053	.6065
78	-118.457	106.659	18.2133	.634208	138.6	-.475629	.419519
79	-118.457	106.659	27.32	.393171	139.	-.296792	.257872
80	-118.457	106.659	36.4267	.183221	140.5	-.141357	.116568
81	-118.457	106.659	45.5333	9.48E-03	211.4	-8.09E-03	-4.94E-03
82	-118.457	106.659	54.64	.147475	314.1	.102681	-.105856
83	-118.457	106.659	63.7467	.265427	315.8	.190196	-.185141
84	-118.457	106.659	72.8533	.350612	316.4	.253733	-.241968
85	-118.457	106.659	81.96	.402308	316.7	.29279	-.27591
86	-118.457	106.659	91.0667	.420381	316.9	.307177	-.286988
87	-118.457	106.659	100.173	.405213	317.1	.297032	-.275626
88	-118.457	106.659	109.28	.357545	317.3	.262745	-.242494
89	-118.457	106.659	118.387	.27801	317.4	.204671	-.188148
90	-118.457	106.659	127.493	.165901	317.5	.122263	-.112137
END	-118.457	106.659	136.6	0	0	0	0

# **FIGURE 8** **WSUA MOMENT MODEL ARRAY SYNTHESIS (DIRECTIONAL NIGHT)**

WSUA DIRECTIONAL NIGHT

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = 1.26 MHz

tower	field ratio magnitude	phase (deg)
1	.491	-140.6
2	1.	0
3	.324	97.1
4	.343	-52.9
5	.559	-137.6
6	.518	-84.5

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	1,754.73	295.2	4.92746	232.6
16	2,747.6	85.1	11.1011	3.3
31	1,129.99	205.8	3.1562	78.8
46	798.371	30.3	4.46476	310.1
61	2,332.64	291.7	3.5171	271.6
76	1,642.93	342.8	4.36019	302.9

Sum of square of source currents = 417.583

Total power = 20,000. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.00233118	-.00271603
Y(1, 2)	.001432	.0004338
Y(1, 3)	-.000200711	-.000420975
Y(1, 4)	-.000166688	6.6309E-05
Y(1, 5)	.000954583	-6.2272E-06
Y(1, 6)	-1.8609E-05	-.000411884
Y(2, 1)	.00143201	.000433795
Y(2, 2)	.00271937	-.00259945
Y(2, 3)	.000971357	-.00103165
Y(2, 4)	-.000297827	-.00044074
Y(2, 5)	.00137472	.0002061
Y(2, 6)	.00113853	-.000657247
Y(3, 1)	-.000200714	-.000420977
Y(3, 2)	.00097134	-.00103164
Y(3, 3)	.00244724	-.00251701
Y(3, 4)	.00150526	.000420166
Y(3, 5)	.000200834	-.000642472
Y(3, 6)	.00153719	.000100244
Y(4, 1)	-.000166689	6.6314E-05
Y(4, 2)	-.000297834	-.000440729
Y(4, 3)	.00150526	.000420187
Y(4, 4)	.00251198	-.00307068
Y(4, 5)	-.000249652	-.000116318
Y(4, 6)	.00051301	-.000465203
Y(5, 1)	.000954525	-6.3366E-06
Y(5, 2)	.00137465	.000205925
Y(5, 3)	.000200772	-.000642502
Y(5, 4)	-.000249667	-.000116306
Y(5, 5)	.00181849	-.00100265
Y(5, 6)	.000766455	-.000638701
Y(6, 1)	-1.8642E-05	-.000411894
Y(6, 2)	.00113844	-.000657334
Y(6, 3)	.00153712	.000100083
Y(6, 4)	.000512957	-.000465246
Y(6, 5)	.00076647	-.000638688
Y(6, 6)	.00212146	-.00135782

# FIGURE 8 CONTINUED

TOWER IMPEDANCE MATRIX		
impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	121.17	230.125
Z(1, 2)	43.5975	-71.6943
Z(1, 3)	-3.26475	31.9483
Z(1, 4)	37.1173	-1.18917
Z(1, 5)	-42.2143	-143.097
Z(1, 6)	-40.1235	76.2737
Z(2, 1)	43.5978	-71.694
Z(2, 2)	132.412	231.455
Z(2, 3)	-24.1533	-25.8196
Z(2, 4)	-18.7396	26.8937
Z(2, 5)	26.6345	-142.252
Z(2, 6)	-53.9606	-41.2319
Z(3, 1)	-3.26503	31.9478
Z(3, 2)	-24.1523	-25.8198
Z(3, 3)	116.615	218.968
Z(3, 4)	47.9985	-56.0976
Z(3, 5)	-61.4334	60.8371
Z(3, 6)	40.3243	-148.713
Z(4, 1)	37.1169	-1.18991
Z(4, 2)	-18.7387	26.8927
Z(4, 3)	47.9965	-56.097
Z(4, 4)	144.302	203.425
Z(4, 5)	54.347	63.3802
Z(4, 6)	-109.367	-68.7379
Z(5, 1)	-42.2031	-143.11
Z(5, 2)	26.652	-142.26
Z(5, 3)	-61.4391	60.8368
Z(5, 4)	54.346	63.3849
Z(5, 5)	403.7	366.481
Z(5, 6)	-135.674	-67.1468
Z(6, 1)	-40.1272	76.2741
Z(6, 2)	-53.9593	-41.2351
Z(6, 3)	40.3409	-148.719
Z(6, 4)	-109.366	-68.7493
Z(6, 5)	-135.674	-67.1455
Z(6, 6)	369.685	316.806

# **FIGURE 9** **WSUA MOMENT MODEL SUMMARY FOR DIRECTIONAL NIGHT MODE**

## WSUA DIRECTIONAL NIGHT

### GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	73.	0	.26	15
		90.	73.	120.		
2	none	0	0	0	.3	15
		0	0	121.		
3	none	180.	253.	0	.32	15
		180.	253.	121.5		
4	none	270.	253.	0	.26	15
		270.	253.	118.5		
5	none	97.2	149.	0	.32	15
		97.2	149.	139.1		
6	none	159.4	222.	0	.34	15
		159.4	222.	136.6		

Number of wires = 6  
current nodes = 90

	minimum	maximum
Individual wires	wire value	wire value
segment length	4 7.9	5 9.27333
radius	1 .26	6 .34

### ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency	step	no. of steps	segment length (wavelengths)
	lowest			minimum maximum
1	1.26	0	1	.0219444 .0257593

### Sources

source	node	sector	magnitude	phase	type
1	1	1	2,481.57	295.2	voltage
2	16	1	3,885.7	85.1	voltage
3	31	1	1,598.05	205.8	voltage
4	46	1	1,129.07	30.3	voltage
5	61	1	3,298.85	291.7	voltage
6	76	1	2,323.45	342.8	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							
1.26	164.03	316.09	356.11	62.6	15.704	-1.1077	-6.4757
source = 2; node 16, sector 1							
1.26	35.362	244.97	247.51	81.8	36.033	-.48223	-9.7842
source = 3; node 31, sector 1							
1.26	-215.72	285.74	358.02	127.1	****	****	****
source = 4; node 46, sector 1							
1.26	30.414	176.21	178.82	80.2	22.626	-.76826	-7.9012
source = 5; node 61, sector 1							
1.26	622.96	227.58	663.23	20.1	14.132	-1.2313	-6.0752
source = 6; node 76, sector 1							
1.26	289.11	241.65	376.8	39.9	9.8938	-1.7618	-4.7693

# FIGURE 9 CONTINUED

CURRENT rms

Frequency = 1.26 MHz

Input power = 20,000. watts

Efficiency = 100. %

coordinates in degrees

current

no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	26.3135	-86.0674	0	4.92746	232.6	-2.99366	-3.9138
2	26.3135	-86.0674	8.	6.20814	226.5	-4.27547	-4.50126
3	26.3135	-86.0674	16.	6.97513	223.7	-5.04344	-4.81832
4	26.3135	-86.0674	24.	7.50578	221.8	-5.59363	-5.00481
5	26.3135	-86.0674	32.	7.82929	220.4	-5.95944	-5.07768
6	26.3135	-86.0674	40.	7.95692	219.3	-6.15347	-5.04453
7	26.3135	-86.0674	48.	7.89532	218.5	-6.18242	-4.91057
8	26.3135	-86.0674	56.	7.65082	217.7	-6.05188	-4.68078
9	26.3135	-86.0674	64.	7.23096	217.1	-5.76814	-4.36066
10	26.3135	-86.0674	72.	6.64493	216.5	-5.3387	-3.95643
11	26.3135	-86.0674	80.	5.90344	216.1	-4.77235	-3.47495
12	26.3135	-86.0674	88.	5.01814	215.6	-4.07869	-2.92336
13	26.3135	-86.0674	96.	4.00023	215.2	-3.26703	-2.30832
14	26.3135	-86.0674	104.	2.8569	214.9	-2.34342	-1.6341
15	26.3135	-86.0674	112.	1.58121	214.6	-1.30224	-.896887
END	26.3135	-86.0674	120.	0	0	0	0
GND	0	0	0	11.1011	3.3	11.0823	.64657
17	0	0	8.06667	13.4037	1.9	13.3965	.440095
18	0	0	16.1333	14.6869	1.2	14.6838	.303136
19	0	0	24.2	15.5177	.7	15.5166	.187194
20	0	0	32.2667	15.9584	.3	15.9581	.0874394
21	0	0	40.3333	16.0344	0.0	16.0344	2.44E-03
22	0	0	48.4	15.7614	359.8	15.7613	-.0680715
23	0	0	56.4667	15.1537	359.5	15.1532	-.123976
24	0	0	64.5333	14.2269	359.3	14.2259	-.165016
25	0	0	72.6	12.9997	359.2	12.9983	-.190917
26	0	0	80.6667	11.493	359.	11.4913	-.201437
27	0	0	88.7333	9.72936	358.8	9.72738	-.196371
28	0	0	96.8	7.72982	358.7	7.72783	-.175504
29	0	0	104.867	5.5075	358.6	5.50576	-.138419
30	0	0	112.933	3.04844	358.4	3.04728	-.0839053
END	0	0	121.	0	0	0	0
GND	-52.6269	172.135	0	3.1562	78.8	.614599	3.09578
32	-52.6269	172.135	8.1	3.99047	87.5	.17204	3.98676
33	-52.6269	172.135	16.2	4.49527	91.4	-.107519	4.49398
34	-52.6269	172.135	24.3	4.85256	93.9	-.331987	4.84119
35	-52.6269	172.135	32.4	5.07774	95.8	-.512105	5.05185
36	-52.6269	172.135	40.5	5.17639	97.2	-.651479	5.13523
37	-52.6269	172.135	48.6	5.1515	98.4	-.751428	5.0964
38	-52.6269	172.135	56.7	5.00616	99.3	-.812671	4.93975
39	-52.6269	172.135	64.8	4.74442	100.1	-.835941	4.6702
40	-52.6269	172.135	72.9	4.37161	100.8	-.822202	4.29359
41	-52.6269	172.135	81.	3.89421	101.4	-.772733	3.81677
42	-52.6269	172.135	89.1	3.31945	102.	-.689092	3.24713
43	-52.6269	172.135	97.2	2.65432	102.5	-.572834	2.59177
44	-52.6269	172.135	105.3	1.90314	102.9	-.424972	1.85508
45	-52.6269	172.135	113.4	1.06083	103.3	-.244303	1.03231
END	-52.6269	172.135	121.5	0	0	0	0
GND	-78.9403	258.202	0	4.46476	310.1	2.87336	-3.4173
47	-78.9403	258.202	7.9	5.07892	308.8	3.18374	-3.95717
48	-78.9403	258.202	15.8	5.40688	308.2	3.34127	-4.25092
49	-78.9403	258.202	23.7	5.59529	307.7	3.42129	-4.42741
50	-78.9403	258.202	31.6	5.66163	307.3	3.43305	-4.50203
51	-78.9403	258.202	39.5	5.61372	307.	3.38083	-4.48151
52	-78.9403	258.202	47.4	5.45683	306.8	3.26766	-4.37029
53	-78.9403	258.202	55.3	5.19606	306.6	3.09653	-4.17259
54	-78.9403	258.202	63.2	4.83712	306.4	2.87078	-3.89312
55	-78.9403	258.202	71.1	4.38653	306.3	2.59417	-3.53722
56	-78.9403	258.202	79.	3.85152	306.1	2.27084	-3.11087
57	-78.9403	258.202	86.9	3.23972	306.	1.90512	-2.62037

# FIGURE 9 CONTINUED

58	-78.9403	258.202	94.8	2.55821	305.9	1.50095	-2.07162
59	-78.9403	258.202	102.7	1.81139	305.8	1.0607	-1.46835
60	-78.9403	258.202	110.6	.994751	305.8	.581512	-.807077
END	-78.9403	258.202	118.5	0	0	0	0
GND	-83.3167	-50.0617	0	3.51709	271.6	.097271	-3.51574
62	-83.3167	-50.0617	9.27333	4.77776	245.	-2.0159	-4.33164
63	-83.3167	-50.0617	18.5467	5.85708	235.	-3.3607	-4.79699
64	-83.3167	-50.0617	27.82	6.74987	229.1	-4.41714	-5.10388
65	-83.3167	-50.0617	37.0933	7.42675	225.2	-5.23023	-5.27269
66	-83.3167	-50.0617	46.3667	7.87358	222.4	-5.8121	-5.31157
67	-83.3167	-50.0617	55.64	8.08251	220.3	-6.16583	-5.22585
68	-83.3167	-50.0617	64.9133	8.05109	218.6	-6.29358	-5.02104
69	-83.3167	-50.0617	74.1867	7.78205	217.2	-6.19949	-4.70389
70	-83.3167	-50.0617	83.46	7.28304	216.	-5.89078	-4.28268
71	-83.3167	-50.0617	92.7333	6.56609	215.	-5.37796	-3.76712
72	-83.3167	-50.0617	102.007	5.64663	214.1	-4.67426	-3.16792
73	-83.3167	-50.0617	111.28	4.54158	213.3	-3.79424	-2.49594
74	-83.3167	-50.0617	120.553	3.265	212.6	-2.75002	-1.76002
75	-83.3167	-50.0617	129.827	1.81627	211.9	-1.54118	-.961043
END	-83.3167	-50.0617	139.1	0	0	0	0
GND	-118.457	106.659	0	4.36019	302.9	2.36831	-3.66092
77	-118.457	106.659	9.10667	5.51333	289.9	1.87518	-5.18465
78	-118.457	106.659	18.2133	6.27711	284.1	1.53246	-6.08717
79	-118.457	106.659	27.32	6.84522	280.3	1.22793	-6.73418
80	-118.457	106.659	36.4267	7.22488	277.6	.952161	-7.16186
81	-118.457	106.659	45.5333	7.41635	275.4	.703616	-7.3829
82	-118.457	106.659	54.64	7.41987	273.7	.483352	-7.40411
83	-118.457	106.659	63.7467	7.23759	272.3	.293125	-7.23165
84	-118.457	106.659	72.8533	6.87485	271.1	.134699	-6.87353
85	-118.457	106.659	81.96	6.34024	270.1	9.52E-03	-6.34024
86	-118.457	106.659	91.0667	5.64512	269.2	-.0814332	-5.64454
87	-118.457	106.659	100.173	4.80297	268.4	-.137685	-4.80099
88	-118.457	106.659	109.28	3.82788	267.6	-.159202	-3.82457
89	-118.457	106.659	118.387	2.73099	266.9	-.146105	-2.72708
90	-118.457	106.659	127.493	1.51093	266.3	-.0978162	-1.50776
END	-118.457	106.659	136.6	0	0	0	0

**FIGURE 10**  
**DERIVED DIRECTIONAL PARAMETERS**

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**APRIL, 2014**

**DAY:**

	Theoretical		Base Network Input Current		Normalized TCT	
Tower	Field	Phase	Amplitude	Phase	Amplitude	Phase
1 (E)	.752	-125.2°	7.61	-98.68°	.571	-111.7°
2 (EC)	1.000	0.0°	13.34	+13.02°	1.000	0.0°
3 (WC)	.638	+83.7°	6.67	+95.52°	.500	+82.5°
4 (W)	.399	-150.0°	5.78	-144.69°	.433	-157.7°
5 (SE)	.100	-85.0°	3.48	+7.80°	.261	-5.2°

**NIGHT:**

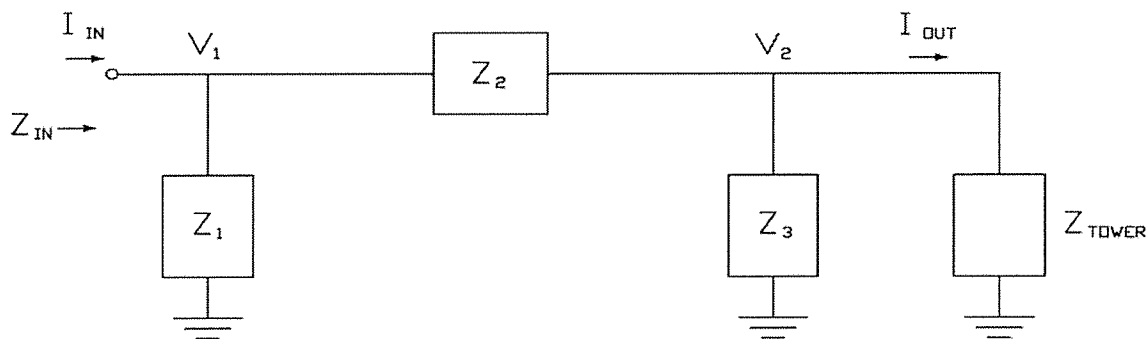
	Theoretical		Base Network Input Current		Normalized TCT	
Tower	Field	Phase	Amplitude	Phase	Amplitude	Phase
1 (E)	.491	-140.6°	4.79	-126.43°	.441	-130.0°
2 (EC)	1.000	0.0°	10.86	+3.52°	1.000	0.0°
3 (WC)	.324	+97.1°	3.07	+77.52°	.283	+74.0°
4 (W)	.343	-52.9°	4.39	-49.74°	.404	-53.3°
5 (SE)	.559	-137.6°	3.38	-80.33°	.311	-83.9°
6 (SW)	.518	-84.5°	4.17	-53.76°	.384	-57.3°

**FIGURE 11**  
**WSUA TOWER BASE CIRCUIT ANALYSIS DESCRIPTION**

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**MIAMI, FLORIDA**  
**APRIL, 2014**

**CIRCUIT ANALYSIS**

Circuit Analysis was performed on each Tower of the WSUA model. "Phasetek" nodal Circuit Analysis program was used to compute base model Input/Output voltages and currents. For the Directional modes, the calculated Mininec Tower Base Drive Voltage was used to determine the Base Network Input Current. This point is the location of the Sampling TCT. " $Z_1$ " represents the ATU Shunt impedance, " $Z_2$ " represents the Tower Feed impedance, and " $Z_3$ " represents the Tower Base Shunt impedance.



**FIGURE 12A**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(WITHOUT TV TOWER)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 1 (WITHOUT TV TOWER)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 35.60 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
 TOWER IMPEDANCE (R,X) : 122.80, 235.50 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	132.44	241.95
1		2	0.00	35.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	89.69	-3.19

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	128.03	273.91	302.36	64.95
INPUT CURRENT (AMPS) :	0.14	-0.30	0.33	-64.95
OUTPUT CURRENT (AMPS) :	0.14	-0.31	0.34	-65.65

INPUT/OUTPUT CURRENT RATIO = 0.9794  
 INPUT/OUTPUT PHASE = 0.70 DEGREES

**FIGURE 12A CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(WITHOUT TV TOWER)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 2 (WITHOUT TV TOWER)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 28.60 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
 TOWER IMPEDANCE (R,X) : 131.30, 236.20 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	141.63	242.32
1		2	0.00	28.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	91.81	-2.71

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	137.02	267.65	300.69	62.89
INPUT CURRENT (AMPS) :	0.15	-0.30	0.33	-62.89
OUTPUT CURRENT (AMPS) :	0.15	-0.30	0.34	-63.64

INPUT/OUTPUT CURRENT RATIO = 0.9789  
 INPUT/OUTPUT PHASE = 0.75 DEGREES

**FIGURE 12A CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(WITHOUT TV TOWER)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 3 (WITHOUT TV TOWER)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 15.80 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
 TOWER IMPEDANCE (R,X) : 112.40, 223.80 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	120.77	229.79
1		2	0.00	15.80

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	94.85	-1.54

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	117.20	242.80	269.60	64.23
INPUT CURRENT (AMPS) :	0.16	-0.33	0.37	-64.23
OUTPUT CURRENT (AMPS) :	0.16	-0.34	0.38	-64.87

INPUT/OUTPUT CURRENT RATIO = 0.9793  
 INPUT/OUTPUT PHASE = 0.64 DEGREES

**FIGURE 12A CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(WITHOUT TV TOWER)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 4 (WITHOUT TV TOWER)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 19.50 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
 TOWER IMPEDANCE (R,X) : 148.20, 201.60 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	158.04	204.42
1		2	0.00	19.50

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	94.28	-2.49

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	153.76	222.35	270.34	55.33
INPUT CURRENT (AMPS) :	0.21	-0.30	0.37	-55.33
OUTPUT CURRENT (AMPS) :	0.21	-0.31	0.38	-56.17

INPUT/OUTPUT CURRENT RATIO = 0.9817  
 INPUT/OUTPUT PHASE = 0.84 DEGREES

**FIGURE 12A CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(WITHOUT TV TOWER)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 5 (WITHOUT TV TOWER)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 21.60 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -3609.00 OHMS  
 TOWER IMPEDANCE (R,X) : 407.70, 367.30 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	497.45	346.35
1		2	0.00	21.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	97.96	-1.64

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	475.26	374.03	604.79	38.20
INPUT CURRENT (AMPS) :	0.13	-0.10	0.17	-38.20
OUTPUT CURRENT (AMPS) :	0.13	-0.12	0.18	-43.66

INPUT/OUTPUT CURRENT RATIO = 0.9262  
 INPUT/OUTPUT PHASE = 5.45 DEGREES

**FIGURE 12A CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(WITHOUT TV TOWER)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 6 (WITHOUT TV TOWER)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 10.00 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -3947.30 OHMS  
 TOWER IMPEDANCE (R,X) : 373.80, 314.90 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	436.79	297.25
1		2	0.00	10.00

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	98.93	-0.89

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	420.45	312.64	523.95	36.63
INPUT CURRENT (AMPS) :	0.15	-0.11	0.19	-36.63
OUTPUT CURRENT (AMPS) :	0.15	-0.13	0.20	-41.00

INPUT/OUTPUT CURRENT RATIO = 0.9429  
 INPUT/OUTPUT PHASE = 4.37 DEGREES

**FIGURE 12B**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER GROUNDED)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 1 (TV TOWER GROUNDED)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 35.60 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
 TOWER IMPEDANCE (R,X) : 121.60, 235.30 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	131.14	241.78
1		2	0.00	35.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	89.65	-3.17

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	126.77	273.74	301.67	65.15
INPUT CURRENT (AMPS) :	0.14	-0.30	0.33	-65.15
OUTPUT CURRENT (AMPS) :	0.14	-0.31	0.34	-65.84

INPUT/OUTPUT CURRENT RATIO = 0.9794  
 INPUT/OUTPUT PHASE = 0.69 DEGREES

**FIGURE 12B CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER GROUNDED)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 2 (TV TOWER GROUNDED)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 28.60 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
 TOWER IMPEDANCE (R,X) : 133.70, 246.50 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	144.71	253.32
1		2	0.00	28.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	92.06	-2.57

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	139.81	278.34	311.48	63.33
INPUT CURRENT (AMPS) :	0.14	-0.29	0.32	-63.33
OUTPUT CURRENT (AMPS) :	0.14	-0.30	0.33	-64.09

INPUT/OUTPUT CURRENT RATIO = 0.9779  
 INPUT/OUTPUT PHASE = 0.76 DEGREES

**FIGURE 12B CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER GROUNDED)**

CUSTOMER : WSUA  
NETWORK ID : TOWER 3 (TV TOWER GROUNDED)

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 15.80 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : 121.50, 226.70 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	130.66	232.53
1		2	0.00	15.80

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	95.05	-1.58

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	126.75	245.60	276.38	62.70
INPUT CURRENT (AMPS) :	0.17	-0.32	0.36	-62.70
OUTPUT CURRENT (AMPS) :	0.17	-0.33	0.37	-63.39

INPUT/OUTPUT CURRENT RATIO = 0.9791  
INPUT/OUTPUT PHASE = 0.69 DEGREES

**FIGURE 12B CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER GROUNDED)**

CUSTOMER : WSUA  
NETWORK ID : TOWER 4 (TV TOWER GROUNDED)

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 19.50 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : 144.00, 206.30 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	153.80	209.64
1		2	0.00	19.50

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	94.22	-2.40

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	149.55	227.35	272.13	56.66
INPUT CURRENT (AMPS) :	0.20	-0.31	0.37	-56.66
OUTPUT CURRENT (AMPS) :	0.20	-0.32	0.37	-57.48

INPUT/OUTPUT CURRENT RATIO = 0.9813  
INPUT/OUTPUT PHASE = 0.82 DEGREES

**FIGURE 12B CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER GROUNDED)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 5 (TV TOWER GROUNDED)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 21.60 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -3609.00 OHMS  
 TOWER IMPEDANCE (R,X) : 397.20, 367.20 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	485.00	349.37
1		2	0.00	21.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	97.89	-1.64

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	463.21	376.20	596.73	39.08
INPUT CURRENT (AMPS) :	0.13	-0.11	0.17	-39.08
OUTPUT CURRENT (AMPS) :	0.13	-0.13	0.18	-44.40

INPUT/OUTPUT CURRENT RATIO = 0.9260  
 INPUT/OUTPUT PHASE = 5.31 DEGREES

**FIGURE 12B CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER GROUNDED)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 6 (TV TOWER GROUNDED)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 10.00 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -3947.30 OHMS  
 TOWER IMPEDANCE (R,X) : 405.00, 308.20 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	470.68	281.92
1		2	0.00	10.00

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	99.06	-0.89

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	453.85	299.68	543.86	33.44
INPUT CURRENT (AMPS) :	0.15	-0.10	0.18	-33.44
OUTPUT CURRENT (AMPS) :	0.15	-0.12	0.19	-38.16

INPUT/OUTPUT CURRENT RATIO = 0.9446  
 INPUT/OUTPUT PHASE = 4.72 DEGREES

**FIGURE 12C**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER OPEN CIRCUITED)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 1 (TV TOWER OPEN CIRCUITED)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 35.60 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
 TOWER IMPEDANCE (R,X) : 119.90, 236.30 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	129.35	242.93
1		2	0.00	35.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	89.62	-3.12

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	125.02	274.82	301.92	65.54
INPUT CURRENT (AMPS) :	0.14	-0.30	0.33	-65.54
OUTPUT CURRENT (AMPS) :	0.14	-0.31	0.34	-66.22

INPUT/OUTPUT CURRENT RATIO = 0.9793  
 INPUT/OUTPUT PHASE = 0.68 DEGREES

**FIGURE 12C CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER OPEN CIRCUITED)**

CUSTOMER : WSUA  
NETWORK ID : TOWER 2 (TV TOWER OPEN CIRCUITED)

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 28.60 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : 132.90, 242.40 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	143.65	248.93
1		2	0.00	28.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	91.97	-2.62

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	138.86	274.08	307.25	63.13
INPUT CURRENT (AMPS) :	0.15	-0.29	0.33	-63.13
OUTPUT CURRENT (AMPS) :	0.15	-0.30	0.33	-63.89

INPUT/OUTPUT CURRENT RATIO = 0.9783  
INPUT/OUTPUT PHASE = 0.76 DEGREES

**FIGURE 12C CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER OPEN CIRCUITED)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 3 (TV TOWER OPEN CIRCUITED)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 15.80 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
 TOWER IMPEDANCE (R,X) : 118.30, 222.90 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	127.07	228.59
1		2	0.00	15.80

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	94.95	-1.60

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	123.32	241.72	271.36	62.97
INPUT CURRENT (AMPS) :	0.17	-0.33	0.37	-62.97
OUTPUT CURRENT (AMPS) :	0.17	-0.34	0.38	-63.64

INPUT/OUTPUT CURRENT RATIO = 0.9794  
 INPUT/OUTPUT PHASE = 0.67 DEGREES

**FIGURE 12C CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER OPEN CIRCUITED)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 4 (TV TOWER OPEN CIRCUITED)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 19.50 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
 TOWER IMPEDANCE (R,X) : 143.00, 207.90 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	152.82	211.40
1		2	0.00	19.50

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	94.21	-2.36

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	148.55	229.04	273.00	57.03
INPUT CURRENT (AMPS) :	0.20	-0.31	0.37	-57.03
OUTPUT CURRENT (AMPS) :	0.20	-0.32	0.37	-57.84

INPUT/OUTPUT CURRENT RATIO = 0.9811  
 INPUT/OUTPUT PHASE = 0.81 DEGREES

**FIGURE 12C CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER OPEN CIRCUITED)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 5 (TV TOWER OPEN CIRCUITED)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 21.60 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -3609.00 OHMS  
 TOWER IMPEDANCE (R,X) : 395.50, 368.80 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	483.45	351.77
1		2	0.00	21.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	97.88	-1.64

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	461.60	378.40	596.88	39.34
INPUT CURRENT (AMPS) :	0.13	-0.11	0.17	-39.34
OUTPUT CURRENT (AMPS) :	0.13	-0.13	0.18	-44.64

INPUT/OUTPUT CURRENT RATIO = 0.9256  
 INPUT/OUTPUT PHASE = 5.29 DEGREES

**FIGURE 12C CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS**  
**(TV TOWER OPEN CIRCUITED)**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 6 (TV TOWER OPEN CIRCUITED)

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 10.00 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -3947.30 OHMS  
 TOWER IMPEDANCE (R,X) : 398.40, 303.60 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	462.03	278.38
1		2	0.00	10.00

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	100.00	0.00
2	99.04	-0.90

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	445.72	295.80	534.94	33.57
INPUT CURRENT (AMPS) :	0.16	-0.10	0.19	-33.57
OUTPUT CURRENT (AMPS) :	0.16	-0.12	0.20	-38.21

INPUT/OUTPUT CURRENT RATIO = 0.9454  
 INPUT/OUTPUT PHASE = 4.64 DEGREES

# **FIGURE 13** **WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL DAY MODE**

CUSTOMER : WSUA  
NETWORK ID : TOWER 1 DAY

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 35.60 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : 312.44, 300.30 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	343.49	297.45
1		2	0.00	35.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	3565.02	-53.38
2	3385.72	303.40

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	329.70	333.19	468.74	45.30
INPUT CURRENT (AMPS) :	-1.15	-7.52	7.61	-98.68
OUTPUT CURRENT (AMPS) :	-1.42	-7.68	7.81	-100.46

INPUT/OUTPUT CURRENT RATIO = 0.9735  
INPUT/OUTPUT PHASE = 1.79 DEGREES

# **FIGURE 13 CONTINUED** **WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL DAY MODE**

CUSTOMER : WSUA  
NETWORK ID : TOWER 2 DAY

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 28.60 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : 116.64, 166.22 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	122.99	168.38
1		2	0.00	28.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	3059.87	71.47
2	2747.47	67.30

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	120.05	195.52	229.44	58.45
INPUT CURRENT (AMPS) :	12.99	3.00	13.34	13.02
OUTPUT CURRENT (AMPS) :	13.22	2.90	13.53	12.36

INPUT/OUTPUT CURRENT RATIO = 0.9857  
INPUT/OUTPUT PHASE = 0.66 DEGREES

# **FIGURE 13 CONTINUED** **WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL DAY MODE**

CUSTOMER : WSUA  
NETWORK ID : TOWER 3 DAY

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 15.80 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : 128.46, 297.10 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	141.39	308.75
1		2	0.00	15.80

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	2315.44	162.46
2	2221.08	161.40

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	135.90	319.36	347.07	66.95
INPUT CURRENT (AMPS) :	-0.64	6.64	6.67	95.52
OUTPUT CURRENT (AMPS) :	-0.57	6.84	6.86	94.78

INPUT/OUTPUT CURRENT RATIO = 0.9722  
INPUT/OUTPUT PHASE = 0.73 DEGREES

# **FIGURE 13 CONTINUED** **WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL DAY MODE**

CUSTOMER : WSUA  
NETWORK ID : TOWER 4 DAY

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 19.50 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : 47.24, 152.16 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	49.59	155.54
1		2	0.00	19.50

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	1040.61	-70.33
2	933.79	287.80

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	48.54	173.32	179.99	74.35
INPUT CURRENT (AMPS) :	-4.72	-3.34	5.78	-144.69
OUTPUT CURRENT (AMPS) :	-4.80	-3.37	5.86	-144.95

INPUT/OUTPUT CURRENT RATIO = 0.9864  
INPUT/OUTPUT PHASE = 0.27 DEGREES

**FIGURE 13 CONTINUED**  
**WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL DAY MODE**

CUSTOMER : WSUA  
 NETWORK ID : TOWER 5 DAY

FREQUENCY : 1260.00 kHz  
 ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
 TOWER FEED IMPEDANCE (R,X) : 0.00, 21.60 OHMS  
 TOWER SHUNT IMPEDANCE (R,X) : 0.00, -3609.00 OHMS  
 TOWER IMPEDANCE (R,X) : 177.94, -312.42 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	150.41	-294.35
1		2	0.00	21.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	1101.88	-52.79
2	1169.38	305.40

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	155.57	-275.94	316.78	-60.59
INPUT CURRENT (AMPS) :	3.45	0.47	3.48	7.80
OUTPUT CURRENT (AMPS) :	3.24	0.33	3.25	5.74

INPUT/OUTPUT CURRENT RATIO = 1.0695  
 INPUT/OUTPUT PHASE = 2.06 DEGREES

# **FIGURE 14** **WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL NIGHT MODE**

CUSTOMER : WSUA  
NETWORK ID : TOWER 1 NIGHT

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 35.60 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : 164.03, 316.09 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	181.63	327.78
1		2	0.00	35.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	1902.26	-62.37
2	1754.73	295.20

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	173.76	357.33	397.34	64.07
INPUT CURRENT (AMPS) :	-2.84	-3.85	4.79	-126.43
OUTPUT CURRENT (AMPS) :	-2.99	-3.92	4.93	-127.37

INPUT/OUTPUT CURRENT RATIO = 0.9716  
INPUT/OUTPUT PHASE = 0.94 DEGREES

# **FIGURE 14 CONTINUED** **WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL NIGHT MODE**

CUSTOMER : WSUA  
NETWORK ID : TOWER 2 NIGHT

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 28.60 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : 35.36, 244.97 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	38.27	254.63
1		2	0.00	28.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	3049.73	85.95
2	2747.60	85.10

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	36.97	278.47	280.91	82.44
INPUT CURRENT (AMPS) :	10.84	0.67	10.86	3.52
OUTPUT CURRENT (AMPS) :	11.08	0.64	11.10	3.31

INPUT/OUTPUT CURRENT RATIO = 0.9780  
INPUT/OUTPUT PHASE = 0.20 DEGREES

# **FIGURE 14 CONTINUED** **WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL NIGHT MODE**

CUSTOMER : WSUA  
NETWORK ID : TOWER 3 NIGHT

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 15.80 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : -215.72, 285.74 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	-236.35	290.83
1		2	0.00	15.80

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	1167.35	-155.67
2	1129.99	205.80

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	-227.63	304.20	379.94	126.81
INPUT CURRENT (AMPS) :	0.66	3.00	3.07	77.52
OUTPUT CURRENT (AMPS) :	0.62	3.10	3.16	78.75

INPUT/OUTPUT CURRENT RATIO = 0.9735  
INPUT/OUTPUT PHASE = -1.23 DEGREES

# **FIGURE 14 CONTINUED** **WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL NIGHT MODE**

CUSTOMER : WSUA  
NETWORK ID : TOWER 4 NIGHT

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 19.50 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -6315.70 OHMS  
TOWER IMPEDANCE (R,X) : 30.41, 176.21 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	32.18	181.11
1		2	0.00	19.50

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	881.82	31.26
2	798.37	30.30

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	31.40	198.22	200.70	81.00
INPUT CURRENT (AMPS) :	2.84	-3.35	4.39	-49.74
OUTPUT CURRENT (AMPS) :	2.88	-3.42	4.46	-49.91

INPUT/OUTPUT CURRENT RATIO = 0.9841  
INPUT/OUTPUT PHASE = 0.17 DEGREES

# **FIGURE 14 CONTINUED** **WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL NIGHT MODE**

CUSTOMER : WSUA  
NETWORK ID : TOWER 5 NIGHT

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 21.60 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -3609.00 OHMS  
TOWER IMPEDANCE (R,X) : 622.96, 227.58 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	686.34	116.45
1		2	0.00	21.60

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	2345.83	-66.56
2	2332.64	291.70

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	673.65	165.09	693.59	13.77
INPUT CURRENT (AMPS) :	0.57	-3.33	3.38	-80.33
OUTPUT CURRENT (AMPS) :	0.10	-3.52	3.52	-88.37

INPUT/OUTPUT CURRENT RATIO = 0.9616  
INPUT/OUTPUT PHASE = 8.04 DEGREES

# **FIGURE 14 CONTINUED** **WSUA CIRCUIT ANALYSIS FOR DIRECTIONAL NIGHT MODE**

CUSTOMER : WSUA  
NETWORK ID : TOWER 6 NIGHT

FREQUENCY : 1260.00 kHz  
ATU SHUNT IMPEDANCE (R,X) : 0.00, 16260.00 OHMS  
TOWER FEED IMPEDANCE (R,X) : 0.00, 10.00 OHMS  
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -3947.30 OHMS  
TOWER IMPEDANCE (R,X) : 289.11, 241.65 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS)	
			R	X
1		GROUND	0.00	16260.00
2		GROUND	326.06	231.97
1		2	0.00	10.00

NODE	VOLTAGE	
	MAGNITUDE	PHASE
1	1667.07	-16.05
2	1642.93	342.80

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	316.45	244.67	400.00	37.71
INPUT CURRENT (AMPS) :	2.46	-3.36	4.17	-53.76
OUTPUT CURRENT (AMPS) :	2.37	-3.66	4.36	-57.09

INPUT/OUTPUT CURRENT RATIO = 0.9558  
INPUT/OUTPUT PHASE = 3.33 DEGREES

**FIGURE 15**  
**WSUA REFERENCE FIELD INTENSITY MEASUREMENTS**  
**APRIL, 2014**

**Field Strength Readings, WSUA Miami, Florida. December 17, 2013**

<b>Radial</b>	<b>Time</b>	<b>Signal</b>	<b>D.F.Tx</b>	<b>Coordinates</b>		<b>address</b>
40 - Day	11:00am	1660mv	1.80km	25°47'08.6"	80°24'32.7"	NW 14 ST NW 132 Av
	11:03am	1100mv	2.45km	25°47'24.6"	80°24'18.6"	NW 129Av NW 17 st
	11:10am	845mv	3.03km	25°47'38.6"	80°24'05.1"	NW 127AV
108 - Day	3:20pm	1270mv	2.30km	25°46'00.1"	80°23'56.9"	101 sw 125 st
	3:22pm	1080mv	2.52km	25°45'57.3"	80°23'49.5"	12405 sw 124
	3:32pm	940Mv	2.76km	25°45'56.3"	80°23'41.2"	12261 sw 2st
172.5 - Day	2:40pm	132mv	1.70km	25°45'28.7"	80°25'07.3"	13770 SW 9th Terrace
	2:50pm	155mv	1.86km	25°45'23.6"	80°25'06.5"	13764 sw 11th st
	2:57pm	150mv	2.04km	25°45'17.9"	80°25'05.8"	13729 sw
212 - Day	11:38am	90mv	3.65km	25°44'42.7"	80°26'24.2"	15150 SW
	11:35am	84mv	3.8km	25°44'37.4"	80°26'27.5"	2401 SW 25
	11:34am	80mv	3.96km	25°44'34.6"	80°26'29.9"	15250 SW 25th terrace
266 - Day	11:47am	44mv	6.16km	25°46'11.3"	80°28'57.7"	Krome Av.
	11:45am	46mv	6.24km	25°46'11.3"	80°28'56.3"	Krome Av.
	2:33pm	11.8mv	20.1km	25°45'37.9"	80°37'13.6"	HWY 41
301 - Day	2:45pm	1620mv	0.32km	25°46'28.7"	80°25'25.2"	swamp
	12:00pm	54mv	7.2km	25°48'24.1"	80°28'56.8"	Krome Av.
	12:01pm	53mv	7.22km	25°48'24.2"	80°28'57.4"	Krome Av.
340 - Day	4:10pm	1480mv	0.40km	25°46'35.9"	80°25'20.0"	swamp
	4:02pm	800mv	0.61km	25°46'42.1"	80°25'23.0"	swamp
	12:28pm	5.9mv	15.5km	25°54'14.0"	80°28'23.9"	Krome Av.
	12:27pm	7.5mv	15.6km	25°54'14.6"	80°28'27.3"	Krome Av.
147 - Night	3:07pm	110mv	2.17km	25°45'23.9"	80°24'33.1"	13177 SW 10 Ln
	3:12pm	800mv	2.36km	25°45'19.4"	80°24'28.5"	13130 sw 13 st
	3:15pm	640mv	2.84km	25°45'06.4"	80°24'18.8"	12900 sw 17 st
223 - Night	1:06pm	87mv	2.75km	25°45'17.9"	80°26'21.9"	
	1:05pm	107mv	2.98km	25°45'11.6"	80°26'26.4"	SW 14 ST
	1:17pm	77mv	3.35km	25°45'04.1"	80°26'37.3"	
294 - Night	4:35pm	1900mv	0.32km	25°46'28.2"	80°25'25.4"	swamp
	12:55pm	44mv	6.80km	25°47'53.3"	80°28'58.1"	Krome Ave.
	12:56pm	43mv	6.82km	25°47'53.6"	80°28'58.7"	Krome Ave.
344 - Night	3:50pm	660mv	0.39km	25°46'35.8"	80°25'18.8"	swamp
	4:25pm	320mv	0.59km	25°46'42.0"	80°25'21.1"	swamp
	12:41pm	3.9mv	16.2km	25°54'46.4"	80°27'54.7"	Krome Av. (East)
	12:40pm	4.0mv	16.3km	25°54'47.1"	80°27'55.0"	Krome Av. (west)

**GPS setting: NAD 27 Conus, True North**