BMML-20101117 SNC 11/23/10

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ORIGINAL

FILED/ACCEPTED

NOV 17 2010

Federal Communications Commission
Office of the Secretary

November 17, 2010

VIA HAND DELIVERY

Ms. Marlene Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

RECEIVED
2010 NOV 22 A 6:25
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Attn: Audio Division, Media Bureau

Re: Caron Broadcasting, Inc.
Station WLQV(AM), Detroit, Michigan (Facility Id. No. 42081)
FCC Form 302-AM License Application

Dear Ms. Dortch:

Transmitted herewith in triplicate, on Form 302-AM, is a license application for Station WLQV(AM), Detroit, Michigan (Facility Id. No. 42081). A copy of the FCC Form 159 demonstrating payment in full of the application filing fee of $1,320.00 is also enclosed.

Please date-stamp and return the enclosed additional copy of this application. Should you have any questions, please do not hesitate to contact the undersigned.

Very truly yours,

Davina S. Sashkin
Counsel for Caron Broadcasting, Inc.

Enclosures

Federal Communications Commission
Washington, D. C. 20554

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

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. BAML 20101117BHW

SECTION I - APPLICANT FEE INFORMATION

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

CARON BROADCASTING, INC.

MAILING ADDRESS (Line 1) (Maximum 35 characters)
4880 SANTA ROSA ROAD

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
CAMARILLO	CA	93012

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
805-987-0400	WLQV	42081

2. A. Is a fee submitted with this application? ☑ Yes ☐ No

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

☐ Governmental Entity ☐ Noncommercial educational licensee ☐ Other (Please explain):

C. If Yes, provide the following information:

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

(A) FEE TYPE CODE	(B) FEE MULTIPLE	(C) FEE DUE FOR FEE TYPE CODE IN COLUMN (A)	FOR FCC USE ONLY
MMR	0001	$ 615.00	

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

(A)	(B)	(C)	FOR FCC USE ONLY
MOR	0001	$ 705.00	

	TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
ADD ALL AMOUNTS SHOWN IN COLUMN C, AND ENTER THE TOTAL HERE. THIS AMOUNT SHOULD EQUAL YOUR ENCLOSED REMITTANCE.	$ 1,320.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT CARON BROADCASTING, INC.		
MAILING ADDRESS 4880 SANTA ROSA ROAD		
CITY CAMARILLO	STATE CA	ZIP CODE 93012

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
WLQV	DETROIT, MI	N/A	N/A	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. N/A

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. N/A

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. N/A

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. N/A

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. N/A

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

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

CERTIFICATION

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

☑ Yes ☐ No

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

Name	Signature	
CHRISTOPHER J. HENDERSON		
Title VICE PRESIDENT & SECRETARY	Date 11/12/2010	Telephone Number 805-987-0400

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

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

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

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

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

ENGINEERING EXHIBIT
IN SUPPORT OF AN
APPLICATION FOR LICENSE
WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW DAY/10 kW NIGHT -U-DA-2
Facility ID: 42081

Applicant: Caron Broadcasting, Inc.

November, 2010

CARL T. JONES
CORPORATION

TABLE OF CONTENTS

SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant
Caron Broadcasting, Inc.

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

☒ Station License
MoM Verification

☐ 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
WLQV	N/A	1500	Unlimited	10.0	50.0

2. Station location

State	City or Town
Michigan	Detroit

3. Transmitter location

State	County	City or Town	Street address (or other identification)
MI	Wayne	Lincoln Park	3700 Hazel Avenue

4. Main studio location

State	County	City or Town	Street address (or other identification)
MI	Oakland	Ferndale	2 Radio Plaza

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

State	County	City or Town	Street address (or other identification)
MI	Oakland	Ferndale	2 Radio Plaza

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. Stmt

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system	RF common point or antenna current (in amperes) without modulation for day system
14.51	32.45
Measured antenna or common point resistance (in ohms) at operating frequency	**Measured antenna or common point reactance (in ohms) at operating frequency**
Night: 50.0 Day: 50.0	Night: -j5.0 Day: -j5.0

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
See Figure 4 and 5 of Engineering Statement						

Manufacturer and type of antenna monitor: Potomac Instruments, Model 1901-9, Serial No. 693

SECTION III - Page 2

9. Description of antenna system (If 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.
Non-uniform, Cross-section, Guyed, Steel	73.2	74.4	75.4	Exhibit No. N/A

Excitation ☒ Series ☐ Shunt

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

North Latitude	West Longitude
42 ° 13 ' 52 "	83 ° 11 ' 58 "

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. N/A

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

No Change

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.

No change

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

Name (Please Print or Type)	Signature (check appropriate box below)
Carl T. Jones, Jr.	
Address (include ZIP Code)	Date
Carl T. Jones Corporation 7901 Yarnwood Court Springfield, Virginia 22153	November 10, 2010
	Telephone No. (Include Area Code) (703) 569-7704

☐ Technical Director

☐ Chief Operator

☐ Other (specify)

☒ Registered Professional Engineer

☐ Technical Consultant

CARL T. JONES
CORPORATION

ENGINEERING STATEMENT OF CARL T. JONES, JR., P.E.
IN SUPPORT OF
AN APPLICATION FOR STATION LICENSE
STATION WLQV(AM) – DETROIT, MICHIGAN
1500 kHz, 50 kW Day, 10 kW Night, DA-2, U
Facility ID: 42081

Applicant: Caron Broadcasting, Inc.

I am a Consulting Engineer, president in the firm of Carl T. Jones Corporation, with offices located in Springfield, Virginia. My education and experience are a matter of record with the Federal Communications Commission. I am a Registered Professional Engineer in the Commonwealth of Virginia, Registration No. 013391.

1.0 GENERAL

This office has been authorized by Caron Broadcasting, Inc. ("Caron"), licensee of AM Station WLQV(AM), to prepare this engineering statement and the associated figures and appendices in support of an Application for License. Computer modeling and sample system verification techniques, as described in Section 47 CFR 73.151(c) of the Commissions Rules and Regulations, were employed to verify performance of the WLQV daytime and nighttime directional antenna systems. The specific measurement and modeling techniques used in performing the proof of performance on the WLQV directional patterns are described in detail in this engineering statement. Impedance measurement data, sample system verification measurement data, and model derived operating parameters are tabulated in the figures attached to this engineering statement. Finally, all pertinent computer model input and output files are contained in the attached Appendices A, B, C and D.

2.0 IMPEDANCE MEASUREMENTS, COMPUTER MODELING AND SAMPLE SYSTEM VERIFICATION

The WLQV antenna array consists of nine identical, triangular, non-uniform cross-section, guyed, series-fed towers. The face width of each tower varies with height in an identical manner. Each tower has three distinct sections as a function of height: a lower section having a face width of 48 inches; a short middle section whose face width tapers from 48 inches to 24 inches; and a top section having a face width of 24 inches. The height of each tower is 73.15 meters (131.8 electrical degrees at the WLQV operating frequency of 1500 kHz).

Identical tower mounted, insulated, single-turn, rigid sample loops are employed to monitor the relative magnitude and phase of the current on each tower. The loops are mounted in an identical manner and at an identical height above the base insulator such that the tower cross-section is identical for all loop mounting locations. The loops are mounted 2 feet above the height at which the predicted current is at a minimum when the tower is detuned as determined by modeling (see Appendix D for details of the detuned tower model). The reason that the loops must be mounted slightly higher than the predicted current minimum height (77.5 feet above the base) is that the guy cable set that attaches to the tower 76 feet above the base insulator would obstruct the lower portion of the 4-foot loop. Therefore, it was decided to locate the center of the loop at 79.5 feet above the base insulator (1.1 electrical degrees above the predicted detuned tower current minimum) to resolve the obstruction issue and minimize the potential interaction with current flowing in the guy cable. Given that the modeling segment length is 8.5 electrical degrees at this height, it is believed that the slight difference in mounting height will have no material impact on the sampled currents. To minimize the potential impact of additional current paths impacting the sampled tower current, the loop on each tower is mounted on a tower leg that contains no other conductors, such as lighting conduit.

A detailed description of the impedance measurements, the computer models employed, and the sample system verification measurements, is contained below.

2.1 INDIVIDUAL TOWER IMPEDANCE MEASUREMENTS

Impedance measurements were performed at the base of each tower, by the undersigned, at the J-Plug located in the ATU network output branch. This measurement location corresponds to the input to the tower feed line.

The impedance measurements were performed using a Hewlett-Packard Model 4396A network analyzer; an Amplifier Research Model 5W1000 power amplifier; and a Tunwall Radio directional coupler. The impedance was measured for each tower in the array with the other eight towers open circuited with respect to ground at the same J-Plug location. The measured impedances are tabulated in Figure 3.

2.2 ISOLATION INDUCTOR IMPEDANCE MEASUREMENT

Identical isolation inductors are mounted at the base of each tower in outdoor aluminum enclosures. The individual tower impedance measurements described above include the shunting effects of the isolation inductor. Therefore, in order to be able to create an accurate model to replicate the measured tower impedance as modified by the isolation inductor, the measured isolation inductor reactance must be included in the model. The isolation inductor reactance was measured by the undersigned at 1500 kHz using the test equipment described in the previous section. The measured isolation inductor reactance was determined to be Z_{iso} = +j1,167.0 Ohms corresponding to 123.8 uH. This measured inductance value was used in the individual tower models to replicate measured impedances and, in addition, the measured reactance was used in the directional antenna circuit model.

2.3 INDIVIDUAL TOWER COMPUTER MODELS

A Method of Moments ("MoM") computer model was developed to model each element in the array using Expert MiniNEC Broadcast Professional (Version 23.0). Each tower was modeled using a three wire stepped-radius model. The lower wire consists of 8 segments, the short middle wire consists of 1 segment and the top wire

consists of 6 segments. The physical tower and the wire frame model of the tower are shown in the sketch of Figure 1.

To replicate the individual measured base impedances within FCC specified tolerances, each tower's physical height was adjusted in the MiniNEC model and shunt inductances, shunt capacitances and series inductances were employed in a separate circuit model. The actual equivalent physical radius was used in all computer models contained in this application (see note contained in Figure 2). Details of the modeled individual tower adjusted height are contained in Figure 2. The circuit model's lumped series and shunt inductance and shunt capacitance values are contained in Figure 3.

A comparison of the measured individual tower impedances, the modeled individual tower impedances, and the adjusted modeled (circuit model) individual tower impedances is contained in Figure 3. The adjusted tower height percentage change and the magnitude of the lumped series inductances and shunt capacitances are all within the corresponding tolerances set forth in the Rules.

As demonstrated by the data contained in Figure 3, the adjusted modeled individual tower resistances and reactances are well within ±2 ohms and ±4 percent of the respective measured individual tower resistances and reactances. The text files containing all necessary input and output data associated with the individual tower models are contained in Appendix A. Note that lumped impedances have been employed in the models at the base of the non-excited towers. These impedances correspond to the parallel combination of the measured lumped shunt inductance of the isolation inductor and the lumped shunt stray capacitance used in the circuit model to replicate each tower's measured impedance.

2.4 DIRECTIONAL ANTENNA COMPUTER MODELS AND ANTENNA MONITOR PARAMETERS

The theoretical directional antenna field parameters were used in combination with the individual tower computer models to produce the daytime and nighttime directional antenna computer models. From the computer model for each pattern, tower

currents were derived that, when numerically integrated and normalized to the appropriate reference tower, are essentially identical to the authorized relative field parameters of each theoretical directional antenna pattern. The antenna monitor parameters were determined by first recording the magnitude and phase of the current of the sixth tower segment (the height at which the current was determined to be minimum when the tower was detuned, see Appendix D), correcting the magnitude of the current based on the relative modeled tower height and normalizing the data with respect to the reference tower current. The model derived antenna monitor parameters for the daytime and nighttime directional patterns are tabulated in Figures 4 and 5, respectively. The text files containing all pertinent input and output data associated with the daytime and nighttime directional antenna computer models are contained in Appendices B and C, respectively.

2.5 SAMPLE SYSTEM DESCRIPTION AND VERIFICATION MEASURMENTS

The antenna sampling system utilizes nine identical Kintronic Labs, Model SLSS-4812I-N, stainless steel, insulated, single turn, rigid, sample loops mounted in an identical manner at the same height (79.5 feet above the base insulator) on each tower. The sample loops have dimensions of 48"H x 12"W. The outer conductor of the sample cable is electrically connected to the tower, as soon as practical, below the sample loop connector, and at the base of the tower and at one intermediate location on the tower.

An isolation inductor is mounted at the base of each tower to allow the sample cable to cross the base insulator. The sample transmission line employed between the sample loop and the transmitter building, including the isolation inductor, is Andrew, Type LDF4-50A, ½-inch, phase stabilized, foam dielectric, coaxial cable. Short jumper cables, comprised of Andrew, Type FSJ4-50B, ½-inch, superflex, foam dielectric, coaxial cable, are used to connect the sample line to the antenna monitor. The sample lines between each isolation inductor and the transmitter building, including excess lengths of line are buried to a depth of 48 inches and therefore, each sample line is subjected to the same environmental conditions.

Initial measurement of the sample line lengths revealed differences in electrical length of up to 10 degrees, although the majority of the sample lines were within 2 electrical degrees in length. In order to achieve a maximum length variation of no more than 1 electrical degree, as required by the Rules, short jumpers of Andrew Type LDF4-50A line were cut and inserted between the transmitter building end of the existing sample line and the short superflex jumpers to the antenna monitor.

The sample lines, including the lengths of cable comprising the isolation inductors and jumpers, were verified to be equal in length by measuring the open-circuit series resonate frequency closest to the carrier frequency. The characteristic impedance was verified by measuring the impedance at frequencies corresponding to odd multiples of 1/8 wavelength immediately above and below the open circuit series resonant frequency closest to the carrier frequency, while the line was open circuited at the sample loop end of the line. The characteristic impedance was calculated by the following formula:

$$Z = \sqrt{\sqrt{R_1^2 + X_1^2} \times \sqrt{R_2^2 + X_2^2}}$$

where: Z = Characteristic impedance and

$R_1 + X_1$ and $R_2 + X_2$ are the measured impedances at 45 degree offset frequencies.

A tabulation of the measured sample line lengths and characteristic impedances is contained in Figure 6. All sample line verification measurements were performed by the undersigned using a Hewlett-Packard Model 4396A network analyzer; an Amplifier Research Model 5W1000 power amplifier; and a Tunwall Radio directional coupler. As demonstrated by the measured values in Figure 6, the measured sample line lengths are within 1 electrical degree of each other and the measured characteristic

impedances are well within 2 Ohms of each other as required by Section CFR73.151(c)(2)(i) of the FCC's Rules and Regulation.

An impedance measurement was performed at the input to each sample line, at the antenna monitor end of the line, with the sample loop connected. Initial measurements at 1500 kHz revealed that the impedance was greater than 200 Ohms; therefore, these measurements were performed at 1370 kHz. The measured sample line impedances with the loops connected are tabulated in Figure 6 under the heading "Reference Impedance Sample Loop Connected".

The phase monitor that is employed at WLQV is a Potomac Instruments, Model 1901-9, Serial Number 693, last calibrated by the manufacturer in March, 2006. Measurements were performed, by the undersigned, using the network analyzer measurement system described above for performing the sample line verification measurements, to verify the relative magnitude and phase of the sampled current from all nine towers in the daytime operating mode. Comparison of the network analyzer measured sampled relative current magnitudes and phases with the antenna monitor measured relative values verified that the antenna monitor was operating within the manufacturer's stated tolerance on all nine channels.

3.0 COMMON POINT IMPEDANCE AND COMMON POINT CURRENT

The networks associated with the daytime and nighttime directional antenna systems were adjusted for proper impedance transformation and the common point impedance matching networks were set for Z = 50 – j5 ohms. The transmitter output power level was adjusted for a daytime common point current of 32.45 amperes and a nighttime common point current of 14.51 amperes, corresponding to daytime and nighttime input powers of 52,650 Watts and 10,530 Watts, respectively.

4.0 REFERENCE FIELD STRENGTH MEASUREMENTS

Reference field strength measurements were performed on the following five radial bearings in the daytime operating mode: 14°, 62°, 152°, 274° and 304°. In the

nighttime operating mode, reference field strength measurements were performed on the following eight radial bearings: 14°, 62°, 79°, 107°, 161°, 248°, 274° and 304°.

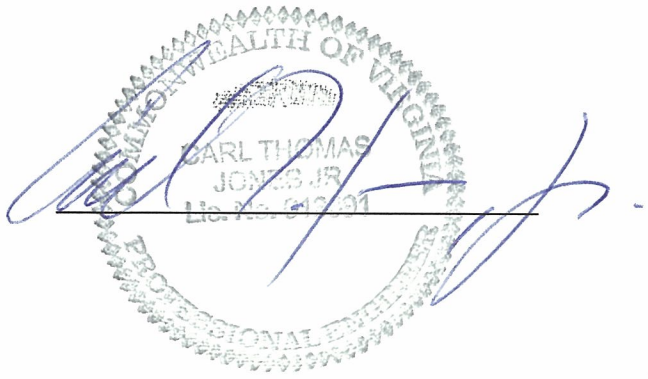
Three reference field strength measurements were performed on each of the selected radials. The measurements were performed by Mr. Scott Horner, National Project Manager for Salem Communications Corporation ("Salem"), the parent company of the licensee, and Mr. Hal Williams, a contract engineer to Salem. Mr. Horner and Mr. Williams are experienced in performing field strength measurements on AM directional patterns. Two field strength meters were used to perform the measurements: Potomac Instruments, Model FIM-41, Serial Number 1459, last calibrated by the manufacturer in June, 2010; and Potomac Instruments, Model FIM-41, Serial Number 582, last calibrated by the manufacturer in January, 2006. The performance of the two field strength meters was compared and the variation in measured value agreed with the manufacturers stated tolerance.

The measured field strength value for each established reference location is tabulated in Figure 7, Sheets 1 through 5. The tabulations contained in Figure 7 also include GPS coordinates (NAD83), distance from array center, and descriptions for each reference point location.

5.0 SUMMARY

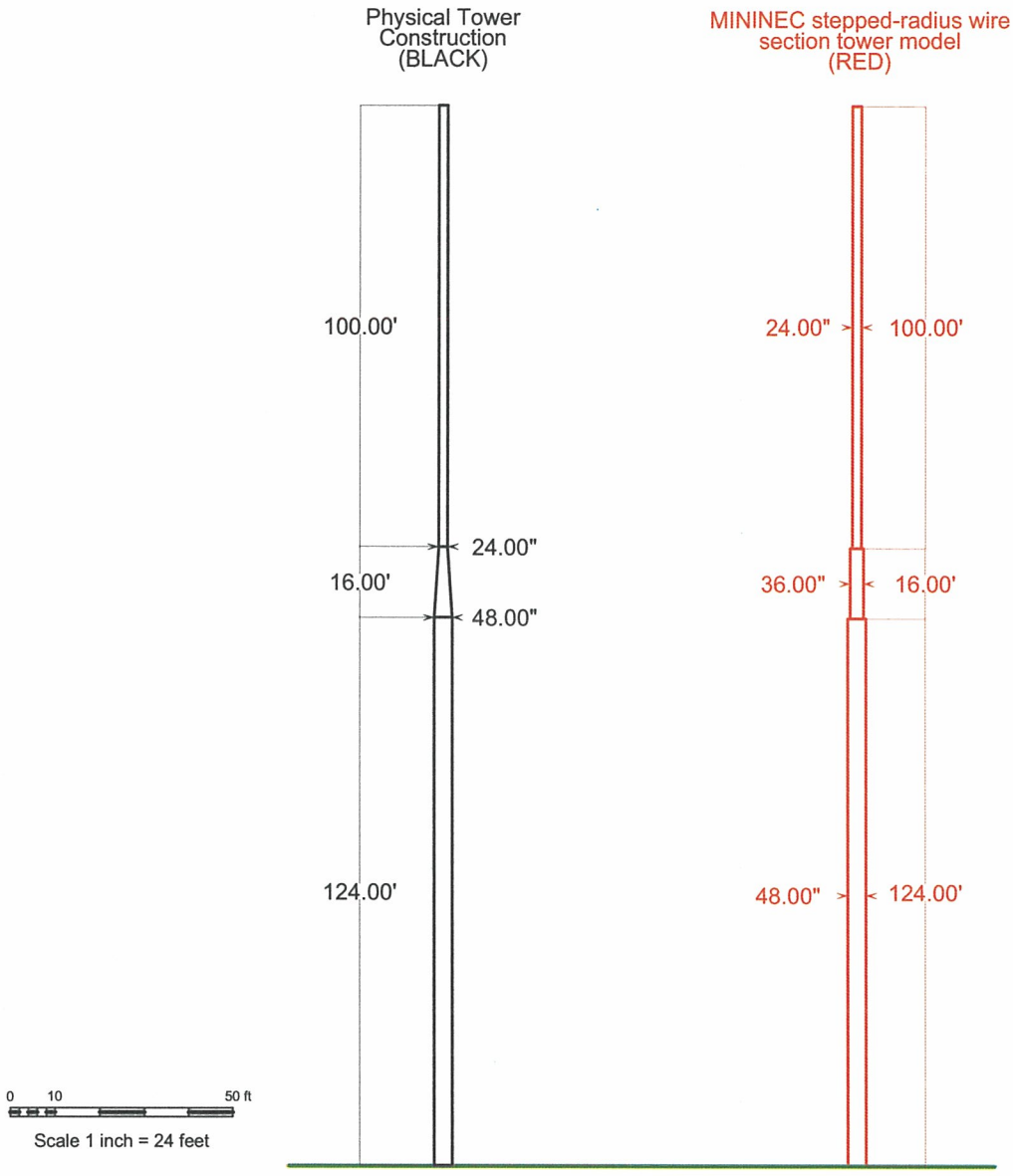
It is submitted that the WLQV daytime and nighttime directional antenna systems have been adjusted to conform to the technical specifications contained in the station's FCC Authorization. The daytime and nighttime pattern performance has been verified using computer modeling and sample system verification procedures in accordance with Section 47 CFR 73.151(c). It is believed that daytime and nighttime antenna systems, as adjusted, fully comply with the terms of the station's FCC Authorization and all applicable FCC Rules and Regulations. It is requested that a superseding license be issued reflecting the new model derived daytime and nighttime operating parameters as contained herein.

This engineering statement and the attached figures were prepared by the undersigned or under the direct supervision of the undersigned and are believed to be true and correct.



Dated: November 10, 2010

Figure 1



STEPPED-RADIUS WIRE SECTION TOWER MODEL

WIREFRAME TOWER MODEL

STATION WLQV - DETROIT, MICHIGAN

1500 kHz - 50 kW DAY, 10kW NIGHT, DA-2

NOVEMBER, 2010

Figure 2

TOWER MODEL HEIGHT AND RADIUS

STATION WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW DAY, 10kW NIGHT, DA-2
NOVEMBER, 2010

Tower	Physical Height (degrees)	Modeled Height (degrees)	Percent of Physical Height	Modeled Radius (degrees)	Percent of Equivalent Radius
1	131.8	138.4	105.0	See Note	See Note
2	131.8	138.4	105.0	See Note	See Note
3	131.8	138.4	105.0	See Note	See Note
4	131.8	138.4	105.0	See Note	See Note
5	131.8	138.4	105.0	See Note	See Note
6	131.8	138.4	105.0	See Note	See Note
7	131.8	138.4	105.0	See Note	See Note
8	131.8	138.4	105.0	See Note	See Note
9	131.8	138.4	105.0	See Note	See Note

Note: The physical face width of all nine triangular towers varies with height in an identical manner. Each tower has three distinct sections: a lower section having a face width of 1.219 meters (4 feet); a short middle section that tapers from 1.219 meters (4 feet) to 0.610 meters (2 feet); and a top section having a face width of 0.610 meters (2 feet). Each tower section is modeled by a separate wire. For the upper and lower sections, the wire models have an equivalent radius corresponding to the tower physical face width of each section. For the middle tower section, the wire model has an equivalent radius corresponding to the average tower physical face width. Therefore, the modeled radius of each tower section meets the requirements of section 73.151(c) of the Commission's Rules. Figure 1 contains a sketch of the physical tower with a modeled radius overlay.

MEASURED AND MODELED IMPEDANCES

STATION WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW DAY, 10kW NIGHT, DA-2
NOVEMBER, 2010

Tower	Measured Tower Base Impedance[1]	Modeled Tower Base Impedance	Shunt Capacitance (pF)	Measured Shunt Inductance (uH)	Modeled plus Shunt Reactance	Lumped Series Inductance (uH)	Total Adjusted Tower Base Impedance
1	235.1 +j 275.6	280.1 +j 188.4	43.0	123.8	234.7 +j 201.0	7.9	234.7 +j 275.5
2	208.6 +j 263.8	276.5 +j 170.0	9.0	123.8	208.6 +j 189.7	7.9	208.6 +j 264.1
3	232.2 +j 250.3	281.2 +j 161.5	32.0	123.8	232.0 +j 181.4	7.3	232.0 +j 250.2
4	180.5 +j 368.0	270.6 +j 312.5	19.0	123.8	180.1 +j 285.1	8.8	180.1 +j 368.0
5	217.3 +j 366.7	269.7 +j 283.8	49.0	123.8	216.1 +j 275.9	9.6	216.1 +j 366.4
6	178.8 +j 376.1	270.6 +j 300.1	15.0	123.8	178.8 +j 275.5	10.0	178.8 +j 369.8
7	252.0 +j 255.6	280.5 +j 162.9	58.0	123.8	252.4 +j 176.0	8.4	252.4 +j 255.1
8	219.6 +j 271.7	278.2 +j 174.4	23.0	123.8	219.5 +j 192.0	8.4	219.5 +j 271.2
9	234.6 +j 279.7	285.1 +j 192.9	39.0	123.8	234.2 +j 206.1	7.8	234.2 +j 279.6

[1] Measured at J-Plug in output branch of ATU networkng with other towers open-circuited

Figure 4

DAYTIME ANTENNA MONITOR PARAMETERS AND COMMON POINT DATA

STATION WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW DAY, 10 kW NIGHT, U, DA-2
NOVEMBER, 2010

DAYTIME MODELED PARAMETERS		
Tower	**Ratio**	**Phase (deg)**
1	0.232	-135.2
2	0.316	-116.3
3	0.108	-102.5
4	0.729	-18.7
5	1.000	0.0
6	0.342	13.4
7	0.615	90.3
8	0.843	108.9
9	0.288	122.4
Common Point Impedance = 50 -j 5 Ohms Common Point Current = 32.45 Amperes Antenna Input Power = 52,650 Watts		

Figure 5

NIGHTTIME ANTENNA MONITOR PARAMETERS AND COMMON POINT DATA

STATION WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW DAY, 10 kW NIGHT, U, DA-2
NOVEMBER, 2010

NIGHTTIME MODELED PARAMETERS		
Tower	**Ratio**	**Phase (deg)**
1	0.463	-8.0
2	1.000	0.0
3	0.577	15.6
4	0.710	70.3
5	1.568	81.8
6	0.885	92.4
7	0.374	161.0
8	0.815	177.9
9	0.475	-167.9
Common Point Impedance = 50 -j 5 Ohms Common Point Current = 14.51 Amperes Antenna Input Power = 10,530 Watts		

SAMPLE SYSTEM VERIFICATION MEASUREMENTS

STATION WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW Day, 10kW Night, U, DA-2
NOVEMBER, 2010

Tower	Open Circuit Series Resonant Frequency[1] (kHz)	Open Circuit Measured Line Length[2] (degrees)	Resonant Frequency -45 degree Offset Frequency (kHz)	Resonant Frequency -45 degree Offset Impedance (Ohms)	Resonant Frequency +45 degree Offset Frequency (kHz)	Resonant Frequency +45 degree Offset Impedance (Ohms)	Calculated Characteristic Impedance (Ohms)	Reference Impedance Sample Loop Connected[2] (Ohms)
1	1547.7	610.6	1437.1	10.33 -j 45.90	1658.2	6.79 +j 52.30	49.81	4.57 + j31.80
2	1548.1	610.4	1437.5	10.37 -j 46.09	1658.7	6.82 +j 52.71	50.11	4.58 + j31.99
3	1548.5	610.3	1437.9	10.59 -j 46.12	1659.1	7.23 +j 53.30	50.45	4.50 + J30.66
4	1548.8	610.1	1438.2	10.24 -j 46.07	1659.4	6.77 +j 53.04	50.23	4.59 + j31.41
5	1548.0	610.5	1437.4	10.39 -j 46.12	1658.6	6.92 +j 53.08	50.31	4.83 + j32.39
6	1547.8	610.5	1437.2	10.34 -j 46.12	1658.4	6.89 +j 52.79	50.16	4.64 + j32.52
7	1547.5	610.7	1437.0	10.33 -j 46.07	1658.0	6.84 +j 52.86	50.17	4.65 + j32.19
8	1547.6	610.6	1437.1	10.42 -j 45.95	1658.1	7.01 +j 52.59	50.00	4.73 + j32.19
9	1547.2	610.8	1436.7	10.33 -j 46.20	1657.7	6.87 +j 52.83	50.22	4.67 + j32.72

[1] At this frequency, the sample line electrical length is equal to 630°.
[2] Measurements performed at 1370 kHz.

Figure 6

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW DAY, 10kW NIGHT, DA-2
NOVEMBER, 2010

14 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	3.69	1420	680	42° 15' 47.5"	83° 11' 18.0"	On sidewalk, 10 feet east of driveway to 2121 Cicotte Avenue
2	4.80	1050	480	42° 16' 24.0"	83° 11' 08.5"	On sidewalk, center of driveway to 19184 Roger Street.
3	6.32	690	310	42° 17' 12.3"	83° 10' 51.3"	On sidewalk, center of yard at 17528 Reed Street.

62 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	3.94	76	55	42° 14' 55.9"	83° 09' 27.7"	In center of grass field, south of the ballpark, and south of the intersection of 12th Street and Pepper Street.
2	4.49	44	23	42° 15' 01.2"	83° 09' 03.9"	On sidewalk, on north side of Outer Drive, in front of flag pole at John F. Kennedy School.
3	5.54	62	27	42° 15' 14"	83° 08' 22.8"	On sidewalk on east side of Jefferson Street, 50 feet south of fire department driveway.

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW DAY, 10kW NIGHT, DA-2
NOVEMBER, 2010

79 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	2.33	___	51	42° 14' 06.5"	83° 10' 17.6"	10 ft East of street sign "Gowl and Buckingham"
2	3.06	___	36	42° 14' 09.4"	83° 09' 46.8"	Most South-West parking space in Council Point Park
3	4.51	___	5.4	42° 14' 17.8"	83° 08' 44.3"	Sidewalk outcropping at river, opposite end of Lebanc Street

107 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	2.83	___	44	42° 13' 24.5"	83° 09' 58.9"	100 ft North-West into park from N.W. corner of Goddard & River Road
2	3.69	___	17.5	42° 13' 18.1"	83° 09' 23.6"	Center of street, opposite driveway at 1136 5th Street
3	4.25	___	24.5	42° 13' 10.6"	83° 09' 01.3"	South-West corner of Antoine and Biddle Avenue

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW DAY, 10kW NIGHT, DA-2
NOVEMBER, 2010

152 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	3.49	74	___	42° 12' 13.4"	83° 10' 47.5"	On sidewalk, West end of parking lot at 2300 Oak Street
2	5.01	45	___	42° 11' 28.8"	83° 10' 16.3"	On sidewalk, East side of 16th Street, opposite 4070 16th Street
3	6.32	14.5	___	42° 10' 53.2"	83° 09' 49.4"	Center driveway near gate 7; 150 ft North of RR tracks on Bridge Street

161 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	3.38	___	44	42° 12' 09.2"	83° 11' 10.7"	On sidewalk, center of driveway at 13297 Veronica Street
2	4.59	___	23.5	42° 11' 31.8"	83° 10' 53.4"	On curb on South side of street, opposite driveway at 12836 Leroy Street
3	6.45	___	21	42° 10' 35.3"	83° 10' 27.0"	On curb, East side of Kruese Street, opposite most North-East fence corner of athletic field

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW DAY, 10kW NIGHT, DA-2
NOVEMBER, 2010

248 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	2.93	___	11	42° 13' 16"	83° 13' 55"	Mailbox 1695 Jackson Street
2	4.60	___	17.8	42° 12' 56"	83° 15' 03"	Heritage Park, parking space next to walkway to Victorian house (parking lot C)
3	6.58	___	7.1	42° 12' 32"	83° 16' 23"	Parking area opposite hydrant at building 13170 Princeton Ave

274 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	3.41	117	42	42° 13' 59"	83° 14' 26"	Mortenview Drive at Little Rose Chapel opposite box 10095
2	4.14	67	28.2	42° 14' 01"	83° 14' 57"	Driveway at 10140 Monroe - stand on grate drain
3	6.68	37.5	14.9	42° 14' 07"	83° 16' 49"	corner of Baker and Cherokee at sign

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION WLQV - DETROIT, MICHIGAN
1500 kHz - 50 kW DAY, 10kW NIGHT, DA-2
NOVEMBER, 2010

304 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	3.61	67	33	42° 14' 54"	83° 14' 12"	Driveway at 8252 Huron Street
2	4.99	24	21.5	42° 15' 17"	83° 15' 02"	Driveway at 22040 Charles Court
3	6.23	25	9.7	42° 15' 39"	83° 15' 48"	Driveway at 6541 Oak Street

APPENDIX A

INDIVIDUAL TOWER MODELING

IMPEDANCE - TOWER 1
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.5	280.06	188.42	337.54	33.9	8.1929	-2.131	-4.1141

GEOMETRY - TOWER 1
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8
		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1

		550.2	124.4	80.703		
27	none	550.2	124.4	80.703	.2911	6
		550.2	124.4	138.348		

Number of wires = 27
current nodes = 135

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - TOWER 1
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.5	0	1	.0248208	.0266875

Sources

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

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	1.E-03	0	0	0	0
2	16	1.E-03	1,294.95	0	0	0
3	31	1.E-03	1,800.31	0	0	0
4	46	1.E-03	1,474.96	0	0	0
5	61	1.E-03	2,530.11	0	0	0
6	76	1.E-03	1,397.27	0	0	0
7	91	1.E-03	3,221.47	0	0	0
8	106	1.E-03	1,561.81	0	0	0
9	121	1.E-03	2,042.95	0	0	0

IMPEDANCE - TOWER 2
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 16, sector 1							
1.5	276.47	170.04	324.58	31.6	7.6716	-2.2774	-3.8925

GEOMETRY - TOWER 2
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8
		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1

		550.2	124.4	80.703		
27	none	550.2	124.4	80.703	.2911	6
		550.2	124.4	138.348		

Number of wires = 27
current nodes = 135

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - TOWER 2
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.5	0	1	.0248208	.0266875

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	1.E-03	2,213.42	0	0	0
2	16	1.E-03	0	0	0	0
3	31	1.E-03	1,800.31	0	0	0
4	46	1.E-03	1,474.96	0	0	0
5	61	1.E-03	2,530.11	0	0	0
6	76	1.E-03	1,397.27	0	0	0
7	91	1.E-03	3,221.47	0	0	0
8	106	1.E-03	1,561.81	0	0	0
9	121	1.E-03	2,042.95	0	0	0

IMPEDANCE - TOWER 3
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 31, sector 1							
1.5	281.17	161.48	324.24	29.9	7.523	-2.3229	-3.8273

GEOMETRY - TOWER 3
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8
		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1

		550.2	124.4	80.703			
27	none	550.2	124.4	80.703	.2911	6	
		550.2	124.4	138.348			

Number of wires = 27
current nodes = 135

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - TOWER 3
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.5	0	1	.0248208	.0266875

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	1.E-03	2,213.42	0	0	0
2	16	1.E-03	1,294.95	0	0	0
3	31	1.E-03	0	0	0	0
4	46	1.E-03	1,474.96	0	0	0
5	61	1.E-03	2,530.11	0	0	0
6	76	1.E-03	1,397.27	0	0	0
7	91	1.E-03	3,221.47	0	0	0
8	106	1.E-03	1,561.81	0	0	0
9	121	1.E-03	2,042.95	0	0	0

IMPEDANCE - TOWER 4
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 46, sector 1							
1.5	270.58	312.46	413.33	49.1	12.734	-1.367	-5.6858

GEOMETRY - TOWER 4
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8
		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1

		550.2	124.4	80.703		
27	none	550.2	124.4	80.703	.2911	6
		550.2	124.4	138.348		

Number of wires = 27
current nodes = 135

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - TOWER 4
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.5	0	1	.0248208	.0266875

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	1.E-03	2,213.42	0	0	0
2	16	1.E-03	1,294.95	0	0	0
3	31	1.E-03	1,800.31	0	0	0
4	46	1.E-03	0	0	0	0
5	61	1.E-03	2,530.11	0	0	0
6	76	1.E-03	1,397.27	0	0	0
7	91	1.E-03	3,221.47	0	0	0
8	106	1.E-03	1,561.81	0	0	0
9	121	1.E-03	2,042.95	0	0	0

IMPEDANCE - TOWER 5
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 61, sector 1							
1.5	269.72	283.81	391.54	46.5	11.465	-1.519	-5.2997

GEOMETRY - TOWER 5
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8
		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1

		550.2	124.4	80.703		
27	none	550.2	124.4	80.703	.2911	6
		550.2	124.4	138.348		

Number of wires = 27
current nodes = 135

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - TOWER 5
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.5	0	1	.0248208	.0266875

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	1.E-03	2,213.42	0	0	0
2	16	1.E-03	1,294.95	0	0	0
3	31	1.E-03	1,800.31	0	0	0
4	46	1.E-03	1,474.96	0	0	0
5	61	1.E-03	0	0	0	0
6	76	1.E-03	1,397.27	0	0	0
7	91	1.E-03	3,221.47	0	0	0
8	106	1.E-03	1,561.81	0	0	0
9	121	1.E-03	2,042.95	0	0	0

IMPEDANCE - TOWER 6
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 76, sector 1							
1.5	270.59	300.08	404.06	48.	12.17	-1.4306	-5.5183

GEOMETRY - TOWER 6
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8
		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1

		550.2	124.4	80.703		
27	none	550.2	124.4	80.703	.2911	6
		550.2	124.4	138.348		

Number of wires = 27
current nodes = 135

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - TOWER 6
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.5	0	1	.0248208	.0266875

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	1.E-03	2,213.42	0	0	0
2	16	1.E-03	1,294.95	0	0	0
3	31	1.E-03	1,800.31	0	0	0
4	46	1.E-03	1,474.96	0	0	0
5	61	1.E-03	2,530.11	0	0	0
6	76	1.E-03	0	0	0	0
7	91	1.E-03	3,221.47	0	0	0
8	106	1.E-03	1,561.81	0	0	0
9	121	1.E-03	2,042.95	0	0	0

IMPEDANCE - TOWER 7
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 91, sector 1							
1.5	280.46	162.9	324.34	30.1	7.5474	-2.3153	-3.8381

GEOMETRY - TOWER 7
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8
		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1

		550.2	124.4	80.703		
27	none	550.2	124.4	80.703	.2911	6
		550.2	124.4	138.348		

Number of wires = 27
current nodes = 135

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - TOWER 7
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.5	0	1	.0248208	.0266875

Sources

source	node	sector	magnitude	phase	type
1	91	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	1.E-03	2,213.42	0	0	0
2	16	1.E-03	1,294.95	0	0	0
3	31	1.E-03	1,800.31	0	0	0
4	46	1.E-03	1,474.96	0	0	0
5	61	1.E-03	2,530.11	0	0	0
6	76	1.E-03	1,397.27	0	0	0
7	91	1.E-03	0	0	0	0
8	106	1.E-03	1,561.81	0	0	0
9	121	1.E-03	2,042.95	0	0	0

IMPEDANCE - TOWER 8
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 106, sector 1							
1.5	278.15	174.37	328.29	32.1	7.8007	-2.2393	-3.9484

GEOMETRY - TOWER 8
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8
		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1

		550.2	124.4	80.703		
27	none	550.2	124.4	80.703	.2911	6
		550.2	124.4	138.348		

Number of wires = 27
current nodes = 135

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - TOWER 8
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.5	0	1	.0248208	.0266875

Sources

source	node	sector	magnitude	phase	type
1	106	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	1.E-03	2,213.42	0	0	0
2	16	1.E-03	1,294.95	0	0	0
3	31	1.E-03	1,800.31	0	0	0
4	46	1.E-03	1,474.96	0	0	0
5	61	1.E-03	2,530.11	0	0	0
6	76	1.E-03	1,397.27	0	0	0
7	91	1.E-03	3,221.47	0	0	0
8	106	1.E-03	0	0	0	0
9	121	1.E-03	2,042.95	0	0	0

IMPEDANCE - TOWER 9
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 121, sector 1							
1.5	285.12	192.87	344.23	34.1	8.3677	-2.086	-4.186

GEOMETRY - TOWER 9
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8
		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1

		550.2	124.4	80.703		
27	none	550.2	124.4	80.703	.2911	6
		550.2	124.4	138.348		

Number of wires = 27
current nodes = 135

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - TOWER 9
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.5	0	1	.0248208	.0266875

Sources

source	node	sector	magnitude	phase	type
1	121	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	1.E-03	2,213.42	0	0	0
2	16	1.E-03	1,294.95	0	0	0
3	31	1.E-03	1,800.31	0	0	0
4	46	1.E-03	1,474.96	0	0	0
5	61	1.E-03	2,530.11	0	0	0
6	76	1.E-03	1,397.27	0	0	0
7	91	1.E-03	3,221.47	0	0	0
8	106	1.E-03	1,561.81	0	0	0
9	121	1.E-03	0	0	0	0

APPENDIX B

DAYTIME DIRECTIONAL ARRAY MODEL

LOOP CURRENT CALCULATION - DAYTIME

Tower #	Segment #	Peak Current Mag.	Peak Current Phase	RMS Current Mag.	RMS Current Phase	Height Scale	Scaled Current Mag.	Scaled Current Phase	Relative Currents Ratio	Relative Currents Phase
1	6	5.364	134.5	3.793	134.5	1.05	3.983	134.5	0.232	-135.2
2	21	7.311	153.4	5.170	153.4	1.05	5.428	153.4	0.316	-116.3
3	36	2.504	167.2	1.771	167.2	1.05	1.859	167.2	0.108	-102.5
4	51	16.866	251	11.926	251	1.05	12.522	251	0.729	-18.7
5	66	23.123	269.7	16.350	269.7	1.05	17.168	269.7	1.000	0.0
6	81	7.900	283.1	5.586	283.1	1.05	5.866	283.1	0.342	13.4
7	96	14.213	360	10.050	360	1.05	10.552	360	0.615	90.3
8	111	19.491	18.6	13.782	18.6	1.05	14.471	18.6	0.843	108.9
9	126	6.655	32.1	4.706	32.1	1.05	4.941	32.1	0.288	122.4

IMPEDANCE - DAYTIME
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.5	472.23	-215.86	519.23	335.4	11.437	-1.5229	-5.2904
source = 2; node 16, sector 1							
1.5	302.96	-419.9	517.79	305.8	17.808	-.97654	-6.9601
source = 3; node 31, sector 1							
1.5	164.53	-363.98	399.44	294.3	19.648	-.88491	-7.3438
source = 4; node 46, sector 1							
1.5	237.48	259.	351.39	47.5	10.514	-1.6572	-4.9864
source = 5; node 61, sector 1							
1.5	337.71	232.57	410.05	34.6	10.006	-1.742	-4.8093
source = 6; node 76, sector 1							
1.5	314.25	123.93	337.8	21.5	7.2843	-2.4	-3.7206
source = 7; node 91, sector 1							
1.5	-11.442	266.11	266.36	92.5	****	****	****
source = 8; node 106, sector 1							
1.5	79.069	283.7	294.51	74.4	22.528	-.77164	-7.8838
source = 9; node 121, sector 1							
1.5	56.358	261.09	267.1	77.8	26.166	-.66422	-8.4826

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8

		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1
		550.2	124.4	80.703		
27	none	550.2	124.4	80.703	.2911	6
		550.2	124.4	138.348		

Number of wires = 27
current nodes = 135

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - DAYTIME
Frequencies (MHz)

frequency			no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.5	0	1	.0248208	.0266875

Sources

source	node	sector	magnitude	phase	type
1	1	1	1,759.77	196.	voltage
2	16	1	3,263.35	219.2	voltage
3	31	1	1,508.62	226.9	voltage
4	46	1	3,113.73	323.3	voltage
5	61	1	4,753.54	339.1	voltage
6	76	1	1,612.08	344.5	voltage
7	91	1	2,157.13	91.1	voltage
8	106	1	3,131.51	101.4	voltage
9	121	1	1,017.27	116.1	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	1.E-03	0	0	0	0
2	16	1.E-03	0	0	0	0
3	31	1.E-03	0	0	0	0
4	46	1.E-03	0	0	0	0
5	61	1.E-03	0	0	0	0
6	76	1.E-03	0	0	0	0
7	91	1.E-03	0	0	0	0
8	106	1.E-03	0	0	0	0
9	121	1.E-03	0	0	0	0

PEAK CURRENTS - DAYTIME
Frequency = 1.5 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	0	0	0	3.38919	220.6	-2.5737	-2.20515
2	0	0	8.9355	3.21172	178.3	-3.21038	.0926143
3	0	0	17.871	3.76773	158.6	-3.50888	1.37242
4	0	0	26.8065	4.40065	147.	-3.69035	2.39729
5	0	0	35.742	4.95168	139.6	-3.77024	3.21004
6	0	0	44.6775	5.36424	134.5	-3.7577	3.82815
7	0	0	53.613	5.6126	130.7	-3.65877	4.25613
8	0	0	62.5485	5.68419	127.7	-3.47881	4.49532
J1	0	0	71.484	5.56957	125.3	-3.21806	4.54579
2J1	0	0	71.484	5.56957	125.3	-3.21806	4.54579
J2	0	0	80.703	5.28332	123.4	-2.90997	4.40971
2J1	0	0	80.703	5.28332	123.4	-2.90997	4.40971
11	0	0	90.3105	4.85151	122.	-2.56926	4.11534
12	0	0	99.918	4.23148	120.7	-2.16005	3.63863
13	0	0	109.526	3.44309	119.6	-1.69856	2.99495
14	0	0	119.133	2.49941	118.5	-1.19393	2.19581
15	0	0	128.741	1.40251	117.6	-.649382	1.24312
END	0	0	138.348	0	0	0	0
GND	-62.8599	-205.606	0	6.30245	273.4	.369583	-6.2916
17	-62.8599	-205.606	8.9355	3.7197	229.6	-2.41156	-2.83205
18	-62.8599	-205.606	17.871	4.00585	192.3	-3.91454	-.850417
19	-62.8599	-205.606	26.8065	5.13308	171.1	-5.07149	.792768
20	-62.8599	-205.606	35.742	6.3182	160.	-5.93803	2.15856
21	-62.8599	-205.606	44.6775	7.31147	153.4	-6.53988	3.26918
22	-62.8599	-205.606	53.613	8.02912	149.1	-6.88748	4.12666
23	-62.8599	-205.606	62.5485	8.43666	145.9	-6.98746	4.72785
J4	-62.8599	-205.606	71.484	8.51639	143.4	-6.84121	5.07215
2J1	-62.8599	-205.606	71.484	8.51639	143.4	-6.84121	5.07215
J5	-62.8599	-205.606	80.703	8.26225	141.6	-6.47692	5.12974
2J1	-62.8599	-205.606	80.703	8.26225	141.6	-6.47692	5.12974
26	-62.8599	-205.606	90.3105	7.71808	140.2	-5.93392	4.93531

27	-62.8599	-205.606	99.918	6.83457	139.1	-5.1621	4.47929
28	-62.8599	-205.606	109.526	5.63661	138.	-4.18881	3.77163
29	-62.8599	-205.606	119.133	4.14212	137.1	-3.03215	2.82192
30	-62.8599	-205.606	128.741	2.35112	136.2	-1.69643	1.62785
END	-62.8599	-205.606	138.348	0	0	0	0
GND	-125.72	-411.211	0	3.77685	292.6	1.45297	-3.48618
32	-125.72	-411.211	8.9355	2.0722.	268.8	-.042783	-2.07176
33	-125.72	-411.211	17.871	1.52119	235.	-.87149	-1.24681
34	-125.72	-411.211	26.8065	1.62615	199.7	-1.53109	-.547829
35	-125.72	-411.211	35.742	2.05101	178.6	-2.05041	.0494516
36	-125.72	-411.211	44.6775	2.50389	167.2	-2.44199	.553282
37	-125.72	-411.211	53.613	2.87618	160.4	-2.70999	.963525
38	-125.72	-411.211	62.5485	3.12927	155.9	-2.85648	1.27782
J7	-125.72	-411.211	71.484	3.24761	152.6	-2.88246	1.49612
2J1	-125.72	-411.211	71.484	3.24761	152.6	-2.88246	1.49612
J8	-125.72	-411.211	80.703	3.21558	150.2	-2.79092	1.5971
2J1	-125.72	-411.211	80.703	3.21558	150.2	-2.79092	1.5971
41	-125.72	-411.211	90.3105	3.04953	148.5	-2.60048	1.59284
42	-125.72	-411.211	99.918	2.73571	147.1	-2.29577	1.4878
43	-125.72	-411.211	109.526	2.28151	145.8	-1.88698	1.28241
44	-125.72	-411.211	119.133	1.69311	144.7	-1.38164	.978619
45	-125.72	-411.211	128.741	.969605	143.7	-.781165	.574381
END	-125.72	-411.211	138.348	0	0	0	0
GND	-92.5652	-21.3704	0	8.86121	275.9	.903607	-8.81501
47	-92.5652	-21.3704	8.9355	12.241	262.4	-1.61219	-12.1344
48	-92.5652	-21.3704	17.871	14.1244	257.8	-2.98903	-13.8045
49	-92.5652	-21.3704	26.8065	15.4991	254.8	-4.06646	-14.9561
50	-92.5652	-21.3704	35.742	16.4055	252.6	-4.89274	-15.6589
51	-92.5652	-21.3704	44.6775	16.8655	251.	-5.48862	-15.9474
52	-92.5652	-21.3704	53.613	16.8878	249.7	-5.86085	-15.8382
53	-92.5652	-21.3704	62.5485	16.48	248.6	-6.0127	-15.344
J10	-92.5652	-21.3704	71.484	15.6329	247.7	-5.94388	-14.4588
2J1	-92.5652	-21.3704	71.484	15.6329	247.7	-5.94388	-14.4588
J11	-92.5652	-21.3704	80.703	14.4526	246.9	-5.6711	-13.2935
2J1	-92.5652	-21.3704	80.703	14.4526	246.9	-5.6711	-13.2935
56	-92.5652	-21.3704	90.3105	13.007	246.3	-5.22805	-11.91
57	-92.5652	-21.3704	99.918	11.1433	245.8	-4.57426	-10.1612
58	-92.5652	-21.3704	109.526	8.92545	245.3	-3.73156	-8.10796
59	-92.5652	-21.3704	119.133	6.38914	244.9	-2.71471	-5.78372
60	-92.5652	-21.3704	128.741	3.54	244.5	-1.52626	-3.19408
END	-92.5652	-21.3704	138.348	0	0	0	0
GND	-155.422	-226.989	0	11.5927	304.5	6.56939	-9.55159
62	-155.422	-226.989	8.9355	16.0581	285.3	4.23647	-15.4892
63	-155.422	-226.989	17.871	18.789	278.8	2.8728	-18.5681
64	-155.422	-226.989	26.8065	20.8671	274.7	1.71364	-20.7966
65	-155.422	-226.989	35.742	22.3071	271.8	.717955	-22.2955
66	-155.422	-226.989	44.6775	23.1225	269.7	-.129099	-23.1221
67	-155.422	-226.989	53.613	23.3161	268.	-.82873	-23.3014
68	-155.422	-226.989	62.5485	22.8921	266.5	-1.37859	-22.8505
J13	-155.422	-226.989	71.484	21.835	265.3	-1.78093	-21.7622
2J1	-155.422	-226.989	71.484	21.835	265.3	-1.78093	-21.7622
J14	-155.422	-226.989	80.703	20.278	264.3	-1.998	-20.1793
2J1	-155.422	-226.989	80.703	20.278	264.3	-1.998	-20.1793
71	-155.422	-226.989	90.3105	18.3167	263.6	-2.04997	-18.2016
72	-155.422	-226.989	99.918	15.7455	262.9	-1.95252	-15.624
73	-155.422	-226.989	109.526	12.6508	262.3	-1.70593	-12.5352
74	-155.422	-226.989	119.133	9.08185	261.7	-1.31423	-8.98625
75	-155.422	-226.989	128.741	5.04559	261.1	-.776495	-4.98548
END	-155.422	-226.989	138.348	0	0	0	0
GND	-218.45	-432.458	0	4.77228	323.	3.80948	-2.87445
77	-218.45	-432.458	8.9355	5.90045	302.9	3.204	-4.95476
78	-218.45	-432.458	17.871	6.66622	295.	2.81886	-6.0409
79	-218.45	-432.458	26.8065	7.26461	289.8	2.46046	-6.83525

80	-218.45	-432.458	35.742	7.67805	286.	2.11938	-7.37974
81	-218.45	-432.458	44.6775	7.90015	283.1	1.79321	-7.69394
82	-218.45	-432.458	53.613	7.9261	280.8	1.48332	-7.78606
83	-218.45	-432.458	62.5485	7.75382	278.8	1.19212	-7.66163
J16	-218.45	-432.458	71.484	7.37557	277.1	.917926	-7.31822
2J1	-218.45	-432.458	71.484	7.37557	277.1	.917926	-7.31822
J17	-218.45	-432.458	80.703	6.83652	275.8	.689798	-6.80163
2J1	-218.45	-432.458	80.703	6.83652	275.8	.689798	-6.80163
86	-218.45	-432.458	90.3105	6.16686	274.7	.506509	-6.14602
87	-218.45	-432.458	99.918	5.29517	273.7	.344415	-5.28395
88	-218.45	-432.458	109.526	4.25033	272.8	.210705	-4.2451
89	-218.45	-432.458	119.133	3.04871	272.	.107849	-3.0468
90	-218.45	-432.458	128.741	1.69248	271.3	.0372707	-1.69207
END	-218.45	-432.458	138.348	0	0	0	0
GND	-185.13	-42.7407	0	8.09864	358.6	8.09637	-.191552
92	-185.13	-42.7407	8.9355	10.9619	359.3	10.9611	-.132986
93	-185.13	-42.7407	17.871	12.3987	359.6	12.3983	-.095776
94	-185.13	-42.7407	26.8065	13.3847	359.7	13.3845	-.0616565
95	-185.13	-42.7407	35.742	13.9795	359.9	13.9795	-.0303667
96	-185.13	-42.7407	44.6775	14.2128	360.	14.2128	-2.41E-03
97	-185.13	-42.7407	53.613	14.0986	.1	14.0986	.0214042
98	-185.13	-42.7407	62.5485	13.6474	.2	13.6473	.0402873
J19	-185.13	-42.7407	71.484	12.853	.2	12.8529	.0538437
2J1	-185.13	-42.7407	71.484	12.853	.2	12.8529	.0538437
J20	-185.13	-42.7407	80.703	11.814	.3	11.8138	.0605659
2J1	-185.13	-42.7407	80.703	11.814	.3	11.8138	.0605659
101	-185.13	-42.7407	90.3105	10.5837	.3	10.5835	.0613279
102	-185.13	-42.7407	99.918	9.03042	.4	9.03023	.057001
103	-185.13	-42.7407	109.526	7.20735	.4	7.20719	.0481508
104	-185.13	-42.7407	119.133	5.14325	.4	5.14312	.0356
105	-185.13	-42.7407	128.741	2.8419	.4	2.84183	.0200695
END	-185.13	-42.7407	138.348	0	0	0	0
GND	-248.195	-248.195	0	10.6329	27.	9.47572	4.82374
107	-248.195	-248.195	8.9355	14.6875	22.5	13.5647	5.63226
108	-248.195	-248.195	17.871	16.7575	21.	15.6454	6.00287
109	-248.195	-248.195	26.8065	18.2012	20.	17.1069	6.21602
110	-248.195	-248.195	35.742	19.0991	19.2	18.0339	6.28924
111	-248.195	-248.195	44.6775	19.4906	18.6	18.4675	6.23158
112	-248.195	-248.195	53.613	19.3937	18.2	18.4265	6.04814
113	-248.195	-248.195	62.5485	18.8223	17.8	17.9246	5.74333
J22	-248.195	-248.195	71.484	17.7677	17.4	16.9545	5.31368
2J1	-248.195	-248.195	71.484	17.7677	17.4	16.9545	5.31368
J23	-248.195	-248.195	80.703	16.3616	17.1	15.6385	4.81026
2J1	-248.195	-248.195	80.703	16.3616	17.1	15.6385	4.81026
116	-248.195	-248.195	90.3105	14.6791	16.8	14.0492	4.2538
117	-248.195	-248.195	99.918	12.5411	16.6	12.0181	3.58388
118	-248.195	-248.195	109.526	10.0207	16.4	9.61414	2.8254
119	-248.195	-248.195	119.133	7.15805	16.2	6.8753	1.99196
120	-248.195	-248.195	128.741	3.9587	15.9	3.80644	1.08734
END	-248.195	-248.195	138.348	0	0	0	0
GND	-310.845	-453.978	0	3.80857	38.3	2.98887	2.36047
122	-310.845	-453.978	8.9355	5.13702	35.1	4.20457	2.95136
123	-310.845	-453.978	17.871	5.80721	33.9	4.82073	3.23794
124	-310.845	-453.978	26.8065	6.26796	33.1	5.25076	3.42298
125	-310.845	-453.978	35.742	6.54624	32.5	5.51992	3.51905
126	-310.845	-453.978	44.6775	6.65537	32.1	5.64051	3.53249
127	-310.845	-453.978	53.613	6.60168	31.7	5.61828	3.46656
128	-310.845	-453.978	62.5485	6.38996	31.3	5.4574	3.3239
J25	-310.845	-453.978	71.484	6.0173	31.	5.15558	3.10288
2J1	-310.845	-453.978	71.484	6.0173	31.	5.15558	3.10288
J26	-310.845	-453.978	80.703	5.5299	30.8	4.75065	2.83038
2J1	-310.845	-453.978	80.703	5.5299	30.8	4.75065	2.83038
131	-310.845	-453.978	90.3105	4.95297	30.6	4.2645	2.51911

132	-310.845	-453.978	99.918	4.22487	30.4	3.64535	2.13564
133	-310.845	-453.978	109.526	3.37075	30.2	2.91427	1.6938
134	-310.845	-453.978	119.133	2.40435	30.	2.08279	1.20119
135	-310.845	-453.978	128.741	1.32782	29.8	1.15243	.659543
END	-310.845	-453.978	138.348	0	0	0	0

APPENDIX C

NIGHTTIME DIRECTIONAL ARRAY MODEL

LOOP CURRENT CALCULATION - NIGHTTIME

Tower #	Segment #	Peak Current Mag.	Peak Current Phase	RMS Current Mag.	RMS Current Phase	Height Scale	Scaled Current Mag.	Scaled Current Phase	Relative Currents Ratio	Relative Currents Phase
1	6	2.94	270.2	2.078	270.2	1.05	2.182	270.2	0.463	-8.0
2	21	6.35	278.2	4.492	278.2	1.05	4.716	278.2	1.000	0.0
3	36	3.67	293.8	2.592	293.8	1.05	2.721	293.8	0.577	15.6
4	51	4.51	348.5	3.190	348.5	1.05	3.350	348.5	0.710	70.3
5	66	9.96	360	7.045	360	1.05	7.397	360	1.568	81.8
6	81	5.62	10.6	3.974	10.6	1.05	4.172	10.6	0.885	92.4
7	96	2.38	79.2	1.679	79.2	1.05	1.763	79.2	0.374	161.0
8	111	5.18	96.1	3.663	96.1	1.05	3.846	96.1	0.815	177.9
9	126	3.02	110.3	2.135	110.3	1.05	2.242	110.3	0.475	-167.9

IMPEDANCE - NIGHTTIME
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.5	233.58	80.622	247.1	19.	5.2518	-3.3486	-2.6964
source = 2; node 16, sector 1							
1.5	350.73	-13.72	351.	357.8	7.0255	-2.4896	-3.6021
source = 3; node 31, sector 1							
1.5	299.85	-100.07	316.11	341.5	6.6821	-2.6194	-3.4399
source = 4; node 46, sector 1							
1.5	49.902	186.79	193.34	75.	15.921	-1.0926	-6.5281
source = 5; node 61, sector 1							
1.5	169.9	231.7	287.32	53.7	9.9111	-1.7587	-4.7756
source = 6; node 76, sector 1							
1.5	242.29	190.41	308.15	38.2	7.9186	-2.2056	-3.9989
source = 7; node 91, sector 1							
1.5	-211.56	363.24	420.36	120.2	****	****	****
source = 8; node 106, sector 1							
1.5	1.2982	365.99	365.99	89.8	2,101.9	-8.3E-03	-27.21
source = 9; node 121, sector 1							
1.5	99.71	270.08	287.9	69.7	17.068	-1.0189	-6.7959

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	71.484		
2	none	0	0	71.484	.4366	1
		0	0	80.703		
3	none	0	0	80.703	.2911	6
		0	0	138.348		
4	none	215.	107.	0	.5821	8

		215.	107.	71.484		
5	none	215.	107.	71.484	.4366	1
		215.	107.	80.703		
6	none	215.	107.	80.703	.2911	6
		215.	107.	138.348		
7	none	430.	107.	0	.5821	8
		430.	107.	71.484		
8	none	430.	107.	71.484	.4366	1
		430.	107.	80.703		
9	none	430.	107.	80.703	.2911	6
		430.	107.	138.348		
10	none	95.	167.	0	.5821	8
		95.	167.	71.484		
11	none	95.	167.	71.484	.4366	1
		95.	167.	80.703		
12	none	95.	167.	80.703	.2911	6
		95.	167.	138.348		
13	none	275.1	124.4	0	.5821	8
		275.1	124.4	71.484		
14	none	275.1	124.4	71.484	.4366	1
		275.1	124.4	80.703		
15	none	275.1	124.4	80.703	.2911	6
		275.1	124.4	138.348		
16	none	484.5	116.8	0	.5821	8
		484.5	116.8	71.484		
17	none	484.5	116.8	71.484	.4366	1
		484.5	116.8	80.703		
18	none	484.5	116.8	80.703	.2911	6
		484.5	116.8	138.348		
19	none	190.	167.	0	.5821	8
		190.	167.	71.484		
20	none	190.	167.	71.484	.4366	1
		190.	167.	80.703		
21	none	190.	167.	80.703	.2911	6
		190.	167.	138.348		
22	none	351.	135.	0	.5821	8
		351.	135.	71.484		
23	none	351.	135.	71.484	.4366	1
		351.	135.	80.703		
24	none	351.	135.	80.703	.2911	6
		351.	135.	138.348		
25	none	550.2	124.4	0	.5821	8
		550.2	124.4	71.484		
26	none	550.2	124.4	71.484	.4366	1
		550.2	124.4	80.703		
27	none	550.2	124.4	80.703	.2911	6
		550.2	124.4	138.348		

Number of wires = 27
current nodes = 135

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	8.9355	3	9.6075
radius	3	.2911	1	.5821

ELECTRICAL DESCRIPTION - NIGHTTIME
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.5	0	1	.0248208	.0266875

Sources

source	node	sector	magnitude	phase	type
1	1	1	531.229	324.2	voltage
2	16	1	1,567.8	331.8	voltage
3	31	1	1,029.54	338.5	voltage
4	46	1	583.354	69.9	voltage
5	61	1	1,651.34	73.	voltage
6	76	1	1,015.74	77.4	voltage
7	91	1	453.058	180.7	voltage
8	106	1	905.328	186.1	voltage
9	121	1	483.352	190.9	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	1.E-03	0	0	0	0
2	16	1.E-03	0	0	0	0
3	31	1.E-03	0	0	0	0
4	46	1.E-03	0	0	0	0
5	61	1.E-03	0	0	0	0
6	76	1.E-03	0	0	0	0
7	91	1.E-03	0	0	0	0
8	106	1.E-03	0	0	0	0
9	121	1.E-03	0	0	0	0

PEAK CURRENTS - NIGHTTIME
Frequency = 1.5 MHz
Input power = 10,000. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	2.14983	305.1	1.23677	-1.75846
2	0	0	8.9355	2.46536	289.2	.809513	-2.32866
3	0	0	17.871	2.66974	282.1	.560083	-2.61033
4	0	0	26.8065	2.82029	277.1	.34837	-2.79869
5	0	0	35.742	2.91096	273.3	.166831	-2.90617
6	0	0	44.6775	2.93926	270.2	.0126883	-2.93923
7	0	0	53.613	2.9036	267.7	-.114379	-2.90134
8	0	0	62.5485	2.80348	265.6	-.214095	-2.79529
J1	0	0	71.484	2.63594	263.7	-.287074	-2.62026
2J1	0	0	71.484	2.63594	263.7	-.287074	-2.62026
J2	0	0	80.703	2.4204	262.2	-.326796	-2.39823
2J1	0	0	80.703	2.4204	262.2	-.326796	-2.39823
11	0	0	90.3105	2.16686	261.	-.337267	-2.14045
12	0	0	99.918	1.8477	260.	-.321829	-1.81945
13	0	0	109.526	1.47373	259.	-.280952	-1.4467
14	0	0	119.133	1.05089	258.1	-.215855	-1.02848
15	0	0	128.741	.580139	257.4	-.126997	-.566068
END	0	0	138.348	0	0	0	0
GND	-62.8599	-205.606	0	4.46671	334.	4.01549	-1.95635
17	-62.8599	-205.606	8.9355	4.84106	308.1	2.98907	-3.80805
18	-62.8599	-205.606	17.871	5.33431	296.4	2.37028	-4.77876
19	-62.8599	-205.606	26.8065	5.78908	288.4	1.82589	-5.49359
20	-62.8599	-205.606	35.742	6.13833	282.6	1.33905	-5.99049
21	-62.8599	-205.606	44.6775	6.35234	278.2	.904588	-6.2876
22	-62.8599	-205.606	53.613	6.41444	274.7	.523495	-6.39304
23	-62.8599	-205.606	62.5485	6.31558	271.8	.198338	-6.31246
J4	-62.8599	-205.606	71.484	6.04551	269.3	-.0720277	-6.04508
2J1	-62.8599	-205.606	71.484	6.04551	269.3	-.0720277	-6.04508
J5	-62.8599	-205.606	80.703	5.63429	267.4	-.260142	-5.62828
2J1	-62.8599	-205.606	80.703	5.63429	267.4	-.260142	-5.62828
26	-62.8599	-205.606	90.3105	5.10544	265.8	-.372816	-5.09181

27	-62.8599	-205.606	99.918	4.40233	264.4	-.427436	-4.38153
28	-62.8599	-205.606	109.526	3.54738	263.2	-.420434	-3.52237
29	-62.8599	-205.606	119.133	2.55358	262.1	-.352022	-2.5292
30	-62.8599	-205.606	128.741	1.42233	261.	-.221499	-1.40498
END	-62.8599	-205.606	138.348	0	0	0	0
GND	-125.72	-411.211	0	3.25689	357.	3.2524	-.170933
32	-125.72	-411.211	8.9355	3.09061	331.8	2.72259	-1.46266
33	-125.72	-411.211	17.871	3.21567	317.8	2.38383	-2.15821
34	-125.72	-411.211	26.8065	3.39317	307.5	2.06729	-2.6907
35	-125.72	-411.211	35.742	3.555	299.8	1.76528	-3.08574
36	-125.72	-411.211	44.6775	3.66546	293.8	1.47636	-3.35499
37	-125.72	-411.211	53.613	3.70359	288.9	1.2024	-3.50297
38	-125.72	-411.211	62.5485	3.65698	285.	.946221	-3.53244
J7	-125.72	-411.211	71.484	3.51514	281.6	.707001	-3.4433
2J1	-125.72	-411.211	71.484	3.51514	281.6	.707001	-3.4433
J8	-125.72	-411.211	80.703	3.29036	278.9	.51064	-3.25049
2J1	-125.72	-411.211	80.703	3.29036	278.9	.51064	-3.25049
41	-125.72	-411.211	90.3105	2.99373	276.8	.356169	-2.97247
42	-125.72	-411.211	99.918	2.59224	275.	.223777	-2.58256
43	-125.72	-411.211	109.526	2.09746	273.3	.119768	-2.09404
44	-125.72	-411.211	119.133	1.51603	271.8	.0463472	-1.51532
45	-125.72	-411.211	128.741	.847877	270.3	4.98E-03	-.847863
END	-125.72	-411.211	138.348	0	0	0	0
GND	-92.5652	-21.3704	0	3.01725	354.9	3.00517	-.269751
47	-92.5652	-21.3704	8.9355	3.76585	351.8	3.72718	-.538275
48	-92.5652	-21.3704	17.871	4.13146	350.5	4.07528	-.679017
49	-92.5652	-21.3704	26.8065	4.36847	349.7	4.29779	-.782635
50	-92.5652	-21.3704	35.742	4.49247	349.	4.41043	-.854638
51	-92.5652	-21.3704	44.6775	4.51151	348.5	4.4213	-.897675
52	-92.5652	-21.3704	53.613	4.42985	348.1	4.33475	-.91295
53	-92.5652	-21.3704	62.5485	4.25089	347.8	4.15423	-.901323
J10	-92.5652	-21.3704	71.484	3.97248	347.5	3.87766	-.862732
2J1	-92.5652	-21.3704	71.484	3.97248	347.5	3.87766	-.862732
J11	-92.5652	-21.3704	80.703	3.62828	347.2	3.53838	-.802679
2J1	-92.5652	-21.3704	80.703	3.62828	347.2	3.53838	-.802679
56	-92.5652	-21.3704	90.3105	3.23396	347.	3.15152	-.725554
57	-92.5652	-21.3704	99.918	2.74653	346.9	2.67479	-.62365
58	-92.5652	-21.3704	109.526	2.18284	346.7	2.12464	-.500679
59	-92.5652	-21.3704	119.133	1.55167	346.6	1.50959	-.358923
60	-92.5652	-21.3704	128.741	.854262	346.5	.830761	-.198997
END	-92.5652	-21.3704	138.348	0	0	0	0
GND	-155.422	-226.989	0	5.74738	19.2	5.4269	1.89237
62	-155.422	-226.989	8.9355	7.62604	9.3	7.52641	1.22866
63	-155.422	-226.989	17.871	8.62673	5.6	8.58551	.84241
64	-155.422	-226.989	26.8065	9.33322	3.2	9.31897	.515574
65	-155.422	-226.989	35.742	9.7736	1.4	9.77075	.236094
66	-155.422	-226.989	44.6775	9.96248	360.	9.96248	-7.24E-04
67	-155.422	-226.989	53.613	9.90648	358.9	9.90455	-.195722
68	-155.422	-226.989	62.5485	9.61097	357.9	9.60464	-.348729
J13	-155.422	-226.989	71.484	9.07066	357.1	9.05895	-.460814
2J1	-155.422	-226.989	71.484	9.07066	357.1	9.05895	-.460814
J14	-155.422	-226.989	80.703	8.35216	356.4	8.33584	-.521917
2J1	-155.422	-226.989	80.703	8.35216	356.4	8.33584	-.521917
71	-155.422	-226.989	90.3105	7.49324	355.9	7.4739	-.537941
72	-155.422	-226.989	99.918	6.40202	355.4	6.38138	-.51363
73	-155.422	-226.989	109.526	5.11565	355.	5.09588	-.449257
74	-155.422	-226.989	119.133	3.65443	354.6	3.638	-.346152
75	-155.422	-226.989	128.741	2.02114	354.2	2.01078	-.204384
END	-155.422	-226.989	138.348	0	0	0	0
GND	-218.45	-432.458	0	3.29623	39.2	2.55341	2.08452
77	-218.45	-432.458	8.9355	4.26259	24.6	3.87655	1.77257
78	-218.45	-432.458	17.871	4.82043	19.	4.55663	1.57277
79	-218.45	-432.458	26.8065	5.22903	15.4	5.04213	1.38551

80	-218.45	-432.458	35.742	5.49425	12.7	5.36027	1.20591
81	-218.45	-432.458	44.6775	5.61979	10.6	5.52409	1.03266
82	-218.45	-432.458	53.613	5.60682	8.9	5.53946	.86645
83	-218.45	-432.458	62.5485	5.45673	7.5	5.41054	.708493
J16	-218.45	-432.458	71.484	5.16562	6.2	5.13541	.557795
2J1	-218.45	-432.458	71.484	5.16562	6.2	5.13541	.557795
J17	-218.45	-432.458	80.703	4.76892	5.2	4.74946	.430345
2J1	-218.45	-432.458	80.703	4.76892	5.2	4.74946	.430345
86	-218.45	-432.458	90.3105	4.2879	4.4	4.2755	.325786
87	-218.45	-432.458	99.918	3.67106	3.6	3.66379	.230834
88	-218.45	-432.458	109.526	2.93908	2.9	2.93526	.149678
89	-218.45	-432.458	119.133	2.10334	2.3	2.10167	.0838717
90	-218.45	-432.458	128.741	1.16527	1.7	1.16476	.0342776
END	-218.45	-432.458	138.348	0	0	0	0
GND	-185.13	-42.7407	0	1.07779	60.5	.53063	.938114
92	-185.13	-42.7407	8.9355	1.62962	71.4	.520118	1.54439
93	-185.13	-42.7407	17.871	1.92789	74.7	.50761	1.85986
94	-185.13	-42.7407	26.8065	2.14624	76.8	.490672	2.0894
95	-185.13	-42.7407	35.742	2.29382	78.2	.469378	2.24528
96	-185.13	-42.7407	44.6775	2.37509	79.2	.443929	2.33323
97	-185.13	-42.7407	53.613	2.39187	80.	.414571	2.35567
98	-185.13	-42.7407	62.5485	2.34544	80.6	.381511	2.3142
J19	-185.13	-42.7407	71.484	2.23466	81.1	.344229	2.20799
2J1	-185.13	-42.7407	71.484	2.23466	81.1	.344229	2.20799
J20	-185.13	-42.7407	80.703	2.07363	81.5	.306477	2.05086
2J1	-185.13	-42.7407	80.703	2.07363	81.5	.306477	2.05086
101	-185.13	-42.7407	90.3105	1.8721	81.8	.268542	1.85274
102	-185.13	-42.7407	99.918	1.60885	81.9	.225439	1.59298
103	-185.13	-42.7407	109.526	1.29259	82.1	.178084	1.28026
104	-185.13	-42.7407	119.133	.928118	82.2	.126471	.919461
105	-185.13	-42.7407	128.741	.515861	82.2	.0698976	.511103
END	-185.13	-42.7407	138.348	0	0	0	0
GND	-248.195	-248.195	0	2.47362	96.3	-.270099	2.45883
107	-248.195	-248.195	8.9355	3.68188	96.2	-.397734	3.66033
108	-248.195	-248.195	17.871	4.30235	96.2	-.463118	4.27735
109	-248.195	-248.195	26.8065	4.74457	96.2	-.509349	4.71715
110	-248.195	-248.195	35.742	5.03323	96.1	-.538797	5.0043
111	-248.195	-248.195	44.6775	5.18002	96.1	-.552465	5.15047
112	-248.195	-248.195	53.613	5.1901	96.1	-.550733	5.16079
113	-248.195	-248.195	62.5485	5.06699	96.	-.53394	5.03878
J22	-248.195	-248.195	71.484	4.80858	96.	-.501908	4.78231
2J1	-248.195	-248.195	71.484	4.80858	96.	-.501908	4.78231
J23	-248.195	-248.195	80.703	4.44757	95.9	-.458978	4.42382
2J1	-248.195	-248.195	80.703	4.44757	95.9	-.458978	4.42382
116	-248.195	-248.195	90.3105	4.00472	95.8	-.408034	3.98388
117	-248.195	-248.195	99.918	3.4332	95.8	-.344351	3.41588
118	-248.195	-248.195	109.526	2.75212	95.7	-.270957	2.73875
119	-248.195	-248.195	119.133	1.97202	95.5	-.19001	1.96284
120	-248.195	-248.195	128.741	1.09393	95.4	-.10281	1.08909
END	-248.195	-248.195	138.348	0	0	0	0
GND	-310.845	-453.978	0	1.67889	121.2	-.868686	1.43668
122	-310.845	-453.978	8.9355	2.29238	115.5	-.986874	2.06908
123	-310.845	-453.978	17.871	2.60694	113.5	-1.03826	2.39126
124	-310.845	-453.978	26.8065	2.82608	112.1	-1.06427	2.61802
125	-310.845	-453.978	35.742	2.96154	111.1	-1.06755	2.76243
126	-310.845	-453.978	44.6775	3.01912	110.3	-1.04954	2.83082
127	-310.845	-453.978	53.613	3.00157	109.7	-1.01117	2.82612
128	-310.845	-453.978	62.5485	2.91092	109.1	-.953292	2.7504
J25	-310.845	-453.978	71.484	2.74585	108.6	-.875404	2.60257
2J1	-310.845	-453.978	71.484	2.74585	108.6	-.875404	2.60257
J26	-310.845	-453.978	80.703	2.52691	108.1	-.786855	2.40128
2J1	-310.845	-453.978	80.703	2.52691	108.1	-.786855	2.40128
131	-310.845	-453.978	90.3105	2.26574	107.8	-.691216	2.15773

132	-310.845	-453.978	99.918	1.93456	107.4	-.578239	1.84612
133	-310.845	-453.978	109.526	1.5448	107.	-.452451	1.47705
134	-310.845	-453.978	119.133	1.10275	106.7	-.316444	1.05637
135	-310.845	-453.978	128.741	.609422	106.3	-.171244	.584868
END	-310.845	-453.978	138.348	0	0	0	0

APPENDIX D

DETUNED TOWER MODEL

ELECTRICAL DESCRIPTION - UNMODIFIED TOWER STRUCTURE
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.5	0	1	.0236389	.0254167

Plane wave source

zenith angle (deg)	= 90
increment (deg)	= 0
number of angles	= 1
azimuth angle (deg)	= 0
increment (deg)	= 1
number of angles	= 1
polarization angle (deg)	= 0
magnitude (v/m)	= 1

Lumped loads

passive load circuit	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	
1	1	1.E-04	0	.026	0	0

GEOMETRY - UNMODIFIED TOWER STRUCTURE
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.5821	8
		0	0	68.08		
2	none	0	0	68.08	.4366	1
		0	0	76.86		
3	none	0	0	76.86	.2911	6
		0	0	131.76		

Number of wires = 3
current nodes = 15

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	8.51	3	9.15
radius	3	.2911	1	.5821

PEAK CURRENTS - UNMODIFIED TOWER STRUCTURE
Frequency = 1.5 MHz
Plane wave zenith (deg) = 90
Plane wave azimuth (deg) = 0
Polarization angle (deg) = 0
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	.354905	270.9	5.45E-03	-.354863
2	0	0	8.51	.237717	270.9	3.67E-03	-.237689
3	0	0	17.02	.169276	270.9	2.65E-03	-.169255
4	0	0	25.53	.110146	270.9	1.79E-03	-.110131
5	0	0	34.04	.0583347	271.1	1.07E-03	-.0583249
6	0	0	42.55	.0131249	272.	4.6E-04	-.0131168

7	0	0	51.06	.0254616	90.1	-3.99E-05	.0254616
8	0	0	59.57	.0571465	90.4	-4.33E-04	.0571449
J1	0	0	68.08	.0819432	90.5	-7.26E-04	.08194
2J1	0	0	68.08	.0819432	90.5	-7.26E-04	.08194
J2	0	0	76.86	.0971394	90.5	-8.94E-04	.0971353
2J1	0	0	76.86	.0971394	90.5	-8.94E-04	.0971353
11	0	0	86.01	.103439	90.5	-9.56E-04	.103435
12	0	0	95.16	.101803	90.5	-9.3E-04	.101799
13	0	0	104.31	.0916893	90.5	-8.2E-04	.0916856
14	0	0	113.46	.0727646	90.5	-6.32E-04	.0727619
15	0	0	122.61	.0443429	90.5	-3.71E-04	.0443413
END	0	0	131.76	0	0	0	0