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-20140924AGQ

SECTION I - APPLICANT FEE INFORMATION

1. PAYOR NAME (Last, First, Middle Initial)
WBLS-WLIB LICENSE LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)
ONE EMMIS PLAZA

MAILING ADDRESS (Line 2) (Maximum 35 characters)
40 MONUMENT CIRCLE, SUITE 700

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
INDIANAPOLIS	IN	46204

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
317-684-6574	WLIB	28204

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	$690	

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	$790	

	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.	$1480	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT WBLS-WLIB LICENSE LLC		
MAILING ADDRESS ONE EMMIS PLAZA, 40 MONUMENT CIRCLE, SUITE 700		
CITY INDIANAPOLIS	STATE IN	ZIP CODE 46204

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
WLIB	NEW YORK, NY	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. ENG STMT

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.

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

☐ Yes ☑ No

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

Exhibit No.

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

☐ Yes ☑ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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

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

CERTIFICATION

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

☑ Yes ☐ No

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

Name	Signature	
J SCOTT ENRIGHT		
Title	Date	Telephone Number
EXECUTIVE VP OF MANAGER	09/08/2014	317-684-6574

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
WBLS - WLIB License LLC

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

☑ Station License ☐ Direct Measurement of Power
BMML-

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
WLIB		1190	Unlimited	30	10

2. Station location

State	City or Town
New York	New York

3. Transmitter location

State	County	City or Town	Street address (or other identification)
NJ	Bergen	Lyndhurst	1400 Valley Brook Avenue

4. Main studio location

State	County	City or Town	Street address (or other identification)
NY	New York	New York	395 Hudson Street

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

State	County	City or Town	Street address (or other identification)
NY	New York	New York	395 Hudson Street

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
25.14	14.51

Measured antenna or common point resistance (in ohms) at operating frequency		Measured antenna or common point reactance (in ohms) at operating frequency	
Night	Day	Night	Day
50.0	50.0	-j20	+j20

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	+137.2	+110.5	0.630	0.765	----	----
2	0.0	0.0	1.000	1.000	----	----
3	----	-127.2	----	0.630	----	----
4	50.2	----	0.730	----	----	----
5	-148.1	----	0.972	----	----	----

Manufacturer and type of antenna monitor: Potomac Instruments, Model 1901-5, S/N 324

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.
uniform cross-section, guyed, base insulated	#1,2,3 120.4 #4,5 115.8	#1,2,3 121.9 #4,5 117.3	#1,2,3 122.8 #4,5 118.3	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
40 ° 47 ' 48 "	74 ° 06 ' 06 "

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 Stmt

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

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)	Signature (check appropriate box below)
James D. Sadler	
Address (include ZIP Code) Carl T. Jones Corporation 7901 Yarnwood Court Springfield, Virginia 22153	Date September 9, 2014 Telephone No. (Include Area Code) (703) 569-7704

☐ Technical Director

☐ Registered Professional Engineer

☐ Chief Operator

☑ Technical Consultant

☐ Other (specify)

SCIARRINO & SHUBERT, PLLC
BROADCAST & MEDIA LEGAL SERVICES

Dawn M. Sciarrino	Lee W. Shubert	Christine McLaughlin*†	Shelley Sadowsky*†‡
dawn@sciarrinolaw.com	lee@sciarrinolaw.com	christine@sciarrinolaw.com	shelley@sciarrinolaw.com
(202) 350-9658	(202) 350-9658	(202) 441-1556	(202) 997-9392.

January 31, 2014

VIA U.S.P.S

MDCL Waivers
Federal Communications Commission
Audio Division, Media Bureau
445 Twelfth Street, S.W., Room 2-B450
Washington, DC 20554

Re: Radio Station WLIB(AM), New York, NY,
(FCC Facility ID No. 28204)

Dear Sir or Madam:

On behalf of **YMF MEDIA NEW YORK LICENSEE, LLC** ("*YMFNYL*"), the licensee of Radio Station WLIB(AM), New York, NY, (FCC Facility ID No. 28204), this is to respectfully request waiver of Section 73.1560(a) of the Commission's Rules (47 C.F.R. § 73.1560(a)) to allow implementation of MDCL operation by WLIB. Should such be authorized, operation with MDCL will be implemented via WLIB's main transmitter, a Harris 3DX, which is supplied by the manufacturer with MDCL capability. That capability is an integrated equipment feature that is promoted by the manufacturer as Harris Broadcast's Power Smart® technology utilizing the so-called AMC+ algorithm.

The undersigned counsel is authorized to represent that neither YMFNYL nor any party holding an attributable interest in YMFNYL is subject to a denial of federal benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. Section 862.

It further is requested that the enclosed copy of this letter kindly be date stamped, thereby acknowledging its receipt by your office, and that the date-stamped copy be returned to me in the enclosed self-addressed stamped envelope.

Should there be any questions, or should further information be desired in connection with this request, please communicate directly with the undersigned.

Very truly yours,

Lee W. Shubert, LC

Enclosures (2)

cc(w/o encs.): Ms. Susan Crawford – *via email – susan.crawford@fcc.gov*

Consulting Engineers
CTJC
CARL T. JONES CORPORATION

ENGINEERING EXHIBIT
IN SUPPORT OF AN
APPLICATION FOR STATION LICENSE
STATION WLIB – NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
FACILITY ID: 28204

Applicant: WBLS-WLIB LICENSE LLC

SEPTEMBER, 2014

7901 Yarnwood Court
Springfield, VA 22153-2899

tel: (703) 569-7704
fax: (703) 569-6417

email: info@ctjc.com
www.ctjc.com

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ENGINEERING STATEMENT OF JAMES D. SADLER

FIGURE

Consulting Engineers
CTJC
CARL T. JONES CORPORATION

ENGINEERING STATEMENT OF JAMES D. SADLER
IN SUPPORT OF AN
APPLICATION FOR STATION LICENSE
STATION WLIB – NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
FACILITY ID: 28204

Applicant: WBLS-WLIB LICENSE LLC

I am a Technical Consultant, an employee 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.

1.0 GENERAL

This office has been authorized by WBLS-WLIB License LLC, licensee of AM Station WLIB, to prepare this engineering statement and the associated figures and appendices in support of an Application for License. Station WLIB is licensed for operation on 1190 kilohertz at a power of 10 kilowatts during daytime hours and 30 kilowatts during nighttime hours. Computer modeling and sample system verification techniques, as described in Section 47 CFR 73.151(c) of the Commission's Rules and Regulations, were employed to verify performance of the directional antenna pattern for the daytime and nighttime hour's operations. The specific measurement and modeling techniques used in performing the proof of performance on the WLIB directional patterns are described in detail in this engineering statement. Impedance measurement

7901 Yarnwood Court
Springfield, VA 22153-2899
tel: (703) 569-7704
fax: (703) 569-6417
email: info@ctjc.com
www.ctjc.com

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 proof of performance contained herein is based on the computer modeling and sample system verification procedures described in Section 47 CFR 73.151(c) of the FCC's Rules and Regulations. The WLIB antenna array consists of five, triangular, uniform cross-section, guyed towers. Towers 1 through 3 have an electrical height of 172 degrees and a face width of 25 inches. Towers 4 and 5 have an electrical height of 165.5 degrees and a face width of 25 inches. Tower 3 has an auxiliary FM antenna mounted near the top of the tower. An FM isocoupler is used to allow the transmission line to cross the base insulator. All five towers have sampling loops mounted at the 1/3 tower height level and isolation inductors at the base of the tower that are parallel resonated at 1190 kilohertz. The new sampling system employs identical Kintronic Labs, Model VSU-1, voltage sampling devices located on the tower side of the series filters and detune circuits immediately prior to the series inductor. Filters and detune circuits are installed at the base of each tower to prevent adverse interaction with the nearby operations of WSNR, 620 kHz; WOR, 710 kHz; WINS 1010 kHz; and WEPN,

1050 kHz. A fixed series inductor located at the base of each tower is employed to reduce the voltage across the filter circuits and improve the bandwidth performance of the antenna system. A block diagram of the circuitry located at the base of each tower is included as Figure 3. A detailed description of the impedance and sample system measurements and the computer models employed is contained below.

2.1 INDIVIDUAL TOWER IMPEDANCE MEASUREMENTS

Impedance measurements were performed at the base of each tower, by the undersigned, at the input to the series inductor on the tower side of the series filters and detune circuits. This location is immediately adjacent to the voltage sampling units and is shown on the schematic diagram of Figure 3. The impedance measurements were performed using a Delta Electronics, Model OIB-1, operating impedance bridge. The bridge was modified by Delta Electronics to allow for impedance measurements with extended range similar to the Model OIB-3. Measurement of a precision resistor using the impedance bridge verified that the measurement accuracy was well within the manufacturers stated tolerance.

The impedance was measured by applying power to the tower under test with the impedance bridge connected between the series filter/detune circuit feed and the series inductor with the other four towers shorted at the identical location. The measured impedance data for each tower is tabulated in Figure 2.

2.2 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). A wire model consisting of 30 segments was developed for each tower in the array. To replicate the individual measured base impedances to within FCC specified tolerances, each tower's physical height and equivalent physical radius was adjusted in the MiniNEC model and measured series inductances, lumped feed line inductances and capacitances were employed in a separate circuit model. Details of the modeled individual tower adjusted heights and radii are contained in Figure 1.

The values of the measured series inductances, lumped series feed line inductances and shunt capacitances used in the circuit model are contained in Figure 2. A comparison of the measured individual tower impedances, the modeled individual tower impedances, and the modeled individual tower impedances as modified by the series inductances and shunt capacitances is also contained in Figure 2. The adjusted modeled tower height and radius are within the tolerances set forth in the Rules. In addition, the magnitude of the lumped feed line inductances and shunt capacitances that were used in the circuit models are also within the tolerances set forth in the Rules. The inductance of the series inductors located between the impedance measurement location and each tower was accurately measured by the undersigned and these measured values are also tabulated in Figure 2.

As demonstrated by the data contained in Figure 2, the adjusted modeled individual tower resistance and reactance for each tower is well within ± 2 ohms and ± 4 percent tolerance of the corresponding measured individual tower resistance and reactance. The text files containing all pertinent input and output data associated with the individual tower models are contained in Appendix A.

2.3 DIRECTIONAL ANTENNA COMPUTER MODEL AND ANTENNA MONITOR PARAMETERS

The theoretical directional field parameters and the licensed tower spacings and orientations were used in combination with the adjusted individual tower models to produce the daytime and nighttime directional antenna computer models. From the directional computer models, tower currents were derived for each wire segment of each antenna. Each segment current was multiplied by the segment length and numerically integrated and normalized to the appropriate reference tower to verify that the modeled current moments are essentially identical to the authorized relative directional field parameters.

A tabulation of the modeled and adjusted base voltages for both the daytime and nighttime antenna systems is contained in Figure 4. The new daytime and nighttime directional array operating parameters were determined from the modeled base voltages as adjusted by the circuit model and are tabulated in Figure 5 and 6, respectively. The text files containing all pertinent input and output data associated with

the daytime and nighttime directional antenna computer models are contained in Appendix B and Appendix C, respectively. As indicated in Appendix B and C, the unused towers in the daytime array (tower Nos. 4 and 5) and in the nighttime array (tower No. 3) are included in the model. The unused towers are detuned at their base using a detuning impedance determined by modeling each tower using its adjusted height and radius as described in Figure 1. Details of the models for each of the three detuned towers are contained in Appendix D.

2.4 SAMPLE SYSTEM DESCRIPTION AND VERIFICATION MEASUREMENTS

The WLIB antenna sampling system is comprised of: 1) Kintronic Labs, Model VSU-1, voltage sampling devices mounted in an identical manner at a location corresponding to the output of the series filters and detune circuits and the input to the series inductor for each tower; 2) equal lengths of Cablewave, Type FLC 12-50J, phase stabilized, 1/2-inch, foam dielectric, coaxial cable between each voltage sampling unit and the antenna monitor; and 3) a Potomac Instruments, Model 1901-5, antenna monitor. Each sample line between the ATU building and the transmitter building, including excess lengths, is buried; therefore, each sample line is subjected to the same environmental conditions.

The sample lines 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 element 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:

$\boldsymbol{Z}$ = *Characteristic impedance and*

$\boldsymbol{R_1 + j\,X_1}$ *and* $\boldsymbol{R_2 + j\,X_2}$ *are the measured impedances at* ± 45 *degrees offset frequencies.*

A tabulation of the measured sample line lengths and the characteristic impedance of each line is contained in Figure 7. All sample line verification measurements were performed by the undersigned using a Hewlett-Packard, Model 4396A, network analyzer; an ENI, Model 240L, power amplifier; and a Tunwall Radio directional coupler. As demonstrated by the measured values in Figure 7, the measured sample line lengths are within 1 electrical degree with respect to each other and the calculated characteristic impedances are well within 2 ohms of each other, as required by Section 47 CFR 73.151(c)(2)(i) of the FCC Rules and Regulations.

An impedance measurement was performed at the input to each sample line, at the antenna monitor end of the line, with the voltage sampling unit connected. The measurement was performed at the WLIB operating frequency of 1190 kilohertz. The

measured sample line impedances with the voltage sampling devices connected are tabulated in Figure 7 under the heading "Reference Impedance Voltage Sampler Connected." The performance of the voltage sampling units was performed by Kintronic Labs immediately prior to shipping the units. The test confirmed that the performance of all five of the WLIB voltage samplers is within the manufacturer's stated accuracy. A test report prepared by Kintronic Labs is included herein as Figure 8.

The antenna monitor that is employed at WLIB is a Potomac Instruments, Model 1901-5, Serial Number 324. The unit was returned to the manufacturer and calibrated immediately prior to the performance of this proof in June, 2014.

3.0 COMMON POINT IMPEDANCE AND COMMON POINT CURRENT

The networks associated with the directional antenna systems were adjusted for proper impedance transformation and the common point impedance matching network was set for Z = 50 +j 20 Ohms for the daytime directional antenna system and Z = 50 –j 20 Ohms for the nighttime directional antenna system. The transmitter output power level was adjusted for a daytime common point current of 14.51 amperes and a nighttime common point current of 25.14 amperes.

4.0 REFERENCE FIELD STRENGTH MEASUREMENTS

Reference field strength measurements for the daytime pattern were performed on the 100° radial bearing, corresponding to the daytime pattern main radiation lobe,

and on the 250°, and 310° radial bearings, corresponding to the daytime directional pattern minima. Reference field strength measurements for the nighttime pattern were performed on the 111° radial bearing, corresponding to the nighttime pattern main radiation lobe, and on the 49.5°, 179°, 218.5°, 271°, and 323.5° radial bearings, corresponding to the nighttime directional antenna pattern minima. Three reference field strength measurements were performed on each of the selected radial bearings.

The measurements were performed by Mr. Tim Braddock, Assistant Chief Engineer of Emmis Communications New York, parent company of the licensee. The meter that was employed to perform the measurements is a Potomac Instruments, Model FIM-21, Serial Number 1031, last calibrated by the manufacturer in March 2013.

The measured field strength value for each established reference point location is tabulated in Figure 9, Sheets 1 through 5. The tabulations contained in Figure 9 also include for each reference location; GPS coordinates (NAD83), distance from the WLIB array center, and a description of the measurement location.

SUMMARY

It is submitted that the performance of the WLIB directional patterns has been verified using computer modeling and sample system verification procedures in accordance with 47 CFR 73.151(c). It is believed that the 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 to WBLS-WLIB License LLC, reflecting the new MoM model derived operating parameters as contained herein.

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

Dated: September 9, 2014

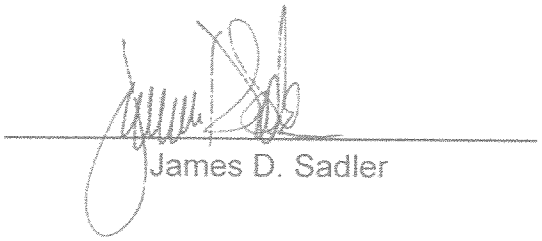


Figure 1

TOWER MODEL HEIGHT AND RADIUS

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

Tower	Physical Height (meters)	Modeled Height (meters)	Percent of Physical Height	Physical Face Width (inches)	Modeled Radius (meters)	Percent of Equivalent Radius
1	120.4	137.8	114.5	25.0	0.3032	100.0
2	120.4	137.2	114.0	25.0	0.3032	100.0
3	120.4	139.6	116.0	25.0	0.3638	120.0
4	115.8	133.8	115.5	25.0	0.2426	80.0
5	115.8	136.1	117.5	25.0	0.2426	80.0

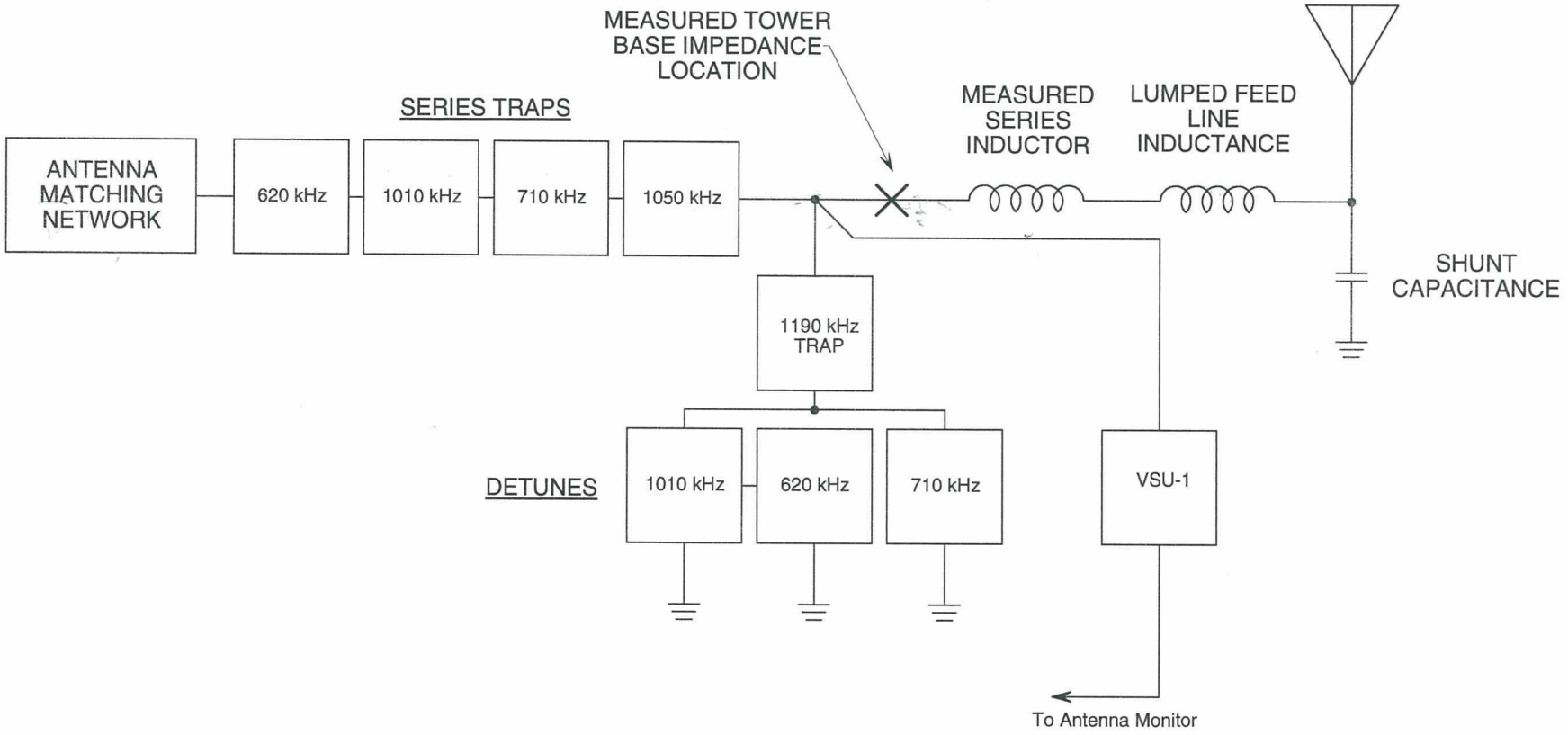
MEASURED AND MODELED IMPEDANCES

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

Tower	Measured Tower Base Impedance[1]	Modeled Tower Base Impedance	Shunt Capacitance (pF)	Modeled Impedance Adjusted for Shunt Capacitance	Measured Series Inductance (uH)	Lumped Feed Line Inductance (uH)	Adjusted Modeled Tower Base Impedance
1	142.0 -j 91.0	152.3 -j 396.1	12.0	142.0 -j 384.3	33.5	5.7	142.0 -j 91.1
2	137.0 -j 182.1	140.0 -j 392.1	4.0	136.8 -j 388.1	21.9	5.7	136.8 -j 182.1
3	103.0 -j 234.4	116.7 -j 369.4	24.0	102.6 -j 348.4	6.0	9.2	102.6 -j 234.6
4	211.0 -j 159.5	233.1 -j 497.0	13.5	211.3 -j 477.9	35.3	7.1	211.3 -j 160.9
5	135.0 -j 162.4	165.1 -j 491.5	29.0	134.7 -j 448.5	36.4	1.9	134.7 -j 162.5

[1] Measured at the input of series inductor with the other towers shorted at the same location. See Figure 3.

Figure 2



CIRCUIT MODEL BLOCK DIAGRAM - ALL TOWERS

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

CTJC
Consulting Engineers
CARL T. JONES CORPORATION

Figure 3

MODELED AND ADJUSTED BASE VOLTAGES

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

DAYTIME PATTERN						
	Modeled Base Voltage (RMS)		Adjusted Base Voltage (RMS) (Circuit Model)		Normalized Adjusted Base Voltage	
Tower	Magnitude	Phase (degrees)	Magnitude	Phase (degrees)	Ratio	Phase (degrees)
1	2080.820	291.2	975.841	-45.4	0.765	110.5
2	2495.290	183.1	1275.604	-155.9	1.000	0.0
3	1502.680	67.5	803.621	76.9	0.630	-127.2

NIGHTTIME PATTERN						
	Modeled Base Voltage (RMS)		Adjusted Base Voltage (RMS) (Circuit Model)		Normalized Adjusted Base Voltage	
Tower	Magnitude	Phase (degrees)	Magnitude	Phase (degrees)	Ratio	Phase (degrees)
1	3310.990	82.9	1502.716	98.3	0.630	137.2
2	4975.420	307.5	2383.922	-38.8	1.000	0.0
4	5824.160	14.3	1739.098	11.4	0.730	50.2
5	6775.970	158.8	2316.006	173.1	0.972	-148.1

DAYTIME ANTENNA MONITOR PARAMETERS AND COMMON POINT DATA

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

Tower	MiniNEC Modeled Parameters	
	Ratio	Phase (degrees)
1	0.765	110.5
2	1.000	0.0
3	0.630	-127.2
Common Point Impedance = 50 +j 20 ohms Common Point Current = 14.5 amperes Antenna Input Power = 10,530 Watts		

NIGHTTIME ANTENNA MONITOR PARAMETERS AND COMMON POINT DATA

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

Tower	MiniNEC Modeled Parameters	
	Ratio	Phase (degrees)
1	0.630	137.2
2	1.000	0.0
4	0.730	50.2
5	0.972	-148.1
Common Point Impedance = 50 -j 20 ohms Common Point Current = 25.14 amperes Antenna Input Power = 31,590 Watts		

SAMPLE LINE VERIFICATION MEASUREMENTS

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

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 Voltage Sampler Connected[2] (Ohms)
1	1031.2	519.3	928.08	6.79 -j 47.80	1134.32	8.38 +j 47.63	48.32	4.70 -j 14.74
2	1031.4	519.2	928.26	6.80 -j 47.82	1134.54	8.42 +j 47.78	48.41	4.64 -j 15.45
3	1031.0	519.4	927.90	6.81 -j 47.96	1134.10	8.40 +j 47.70	48.44	4.61 -j 14.95
4	1031.2	519.3	928.08	6.78 -j 47.88	1134.32	8.41 +j 47.81	48.45	4.72 -j 15.13
5	1030.6	519.6	927.54	6.84 -j 47.78	1133.66	8.33 +j 47.40	48.20	4.64 -j 15.29

[1] At this frequency, the sample line electrical length is equal to 450°.
[2] At carrier frequency (1190 kHz)

Figure 7

Figure 8

Kintronic Labs

Date: August 25, 2014

Product Report: **VSU-1 RF Sampling System for WLIB Radio in New York**
Prepared by: **Larry F. Arnold, Kintronic R&D Staff Engineer**
Requested by: **Jim Sadler and Tim Braddock**

Preliminary Information:

Radio Station: WLIB AM Radio, Frequency 1190 kHz, New York, NY

Application: 30 kW, AM, Five Tower Array with tower #2 as the reference.

Shipping Date: July 28, 2014 KTL Product: VSU-1 Voltage Sampling Units/ with custom designs.

Serial Numbers: NY-0714-001, NY-0714-002 (Ref.), NY-0714-003, NY-0714-004, and NY-0714-005.

Kintronic Job Number: 11415, dated May 6, 2014, Carl T. Jones Corporation / P.O. #05062014-TJ

(VSU-1) Voltage Sampling System – Test Data – WLIB Radio:

Test RF Power: Approximately 25 Watts RMS

VSU-1 Input Capacitance: 30 to 35 pF

VSU-1 Voltage Ratio: Approximately 335:1 (Hi-Z Insulator bowl input to N-type 50+j0 output)

Pseudo Bandwidth: (+/-30 kHz) as tuned at 1190 KHz VSU Range: 500 KHz – 1700 KHz

Temperature Range Standard VSU-1: -50° C to +77° C

TRACKING PERFORMANCE Unit-to-Unit with VSU-1 S/N 002 as the reference:

Ref.	Serial Number	Amplitude Out	Amp. Delta	Phase	Input Voltage
1.0	NY-0714-001	105.36 mVRMS	- 0.67%	- 0.1 deg.	35.4 VRMS
2.0	NY-0714-002	106.07 mVRMS	(Ref. VSU unit)	(-/+ 0)	35.4 VRMS
3.0	NY-0714-003	105.35 mVRMS	- 0.68%	+ 0.15 deg.	35.4 VRMS
4.0	NY-0714-004	105.12 mVRMS	- 0.89%	+ 0.2 deg.	35.4 VRMS
5.0	NY-0714-005	105.60 mVRMS	- 0.44%	+ 0.2 deg.	35.4 VRMS

Amplitude Tracking Accuracy: < 1.0% Phase Tracking Accuracy: < 1.0 Degree

Bowl Arc Gaps: Preset to 0.35" for approximately 18 KV RMS/60Hz and to be field adjusted, as needed.

Note: If needed, additional data is available and also reference product photos.

Validation Signature: Larry F Arnold Date: 8-27-14

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

49.5 Degree Radial

Point Number	Distance (km)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
			Latitude	Longitude	
1	4.28	68.2	40° 49' 17.4"	74° 03' 42.0"	The point is located on the north edge of the entrance to "Consolodated Carpet", #455 Washington Avenue, Caltstadt.
2	6.03	54	40° 49' 55.5"	74° 02' 46.2"	The point is located on the curb south of flag pole, midpoint of building, #17 Empire Boulevard.
3	9.27	68	40° 51' 03.7"	74° 01' 00.9"	The point is located in the south handicap parking space at the east end of Christie Street in the parking lot for #299 Christie Street, Ridgefield Park.

100 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Geographic Coordinates (NAD83)		Description
			Latitude	Longitude	
1	3.20	688	40° 47' 29.5"	74° 03' 45.5"	The point is located on the north side of Centre Avenue opposite utility pole #60090 and #229 Centre Avenue.
2	5.02	374	40° 47' 19.5"	74° 02' 28.9"	The point is located atop manhole cover, near apex of sidewalk on the north side of the entrance for warehouse loading dock, southwest side of Park Plaza Drive.
3	7.34	392	40° 47' 07.0"	74° 00' 51.0"	The point is located on the sidewalk, west corner of intersection of Hudson Street and 56th Street..

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

111 Degree Radial

Point Number	Distance (km)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
			Latitude	Longitude	
1	3.85	560	40° 47' 03.4"	74° 03' 26.5"	The point is located on the sidewalk eastside of the entrance to visitor parking area, south side of Dorigo Lane at #593 County Avenue.
2	6.46	520	40° 46' 31.2"	74° 01' 42.9"	The point is located on the sidewalk between the gates across street from #528 37th Street, Union City
3	7.53	540	40° 46' 19.3"	74° 01' 00.1"	The point is located on the sidewalk northside of Hudson Place opposite #9 Hudson Place in front of two car garage door, #803 JF Kennedy Boulevard East.

179 Degree Radial

Point Number	Distance (km)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
			Latitude	Longitude	
1	4.96	52.2	40° 45' 06.5"	74° 06' 03.8"	The point is located in the center of the access road south of the building structure located 0.2 mile east of #1195 Belleville Turnpike.
2	5.63	37.0	40° 44' 44.8"	74° 05' 58.8"	The point is located in the driveway entrance to the New Jersey Transit, Route 7, east of Delores Drive overpass.
3	9.17	18.2	40° 42' 50.3"	74° 05' 52.1"	The point is located on the sidewalk at the southwest corner of the parking area near the administration building for the Jersey City Incinerator Authority.

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

218.5 Degree Radial

Point Number	Distance (km)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
			Latitude	Longitude	
1	3.57	50	40° 46' 18.6"	74° 07' 39.2"	The point is located in the enter of the parking lot in front of "Newrent", #520 Belleville Turnpike, Kearny.
2	5.53	48.4	40° 45' 29.4"	74° 08' 32.2"	The point is located in the center of the street, south end of 2nd Avenue, across from #9 (Multitex), Kearny.
3	6.57	47.2	40° 45' 03.2"	74° 08' 59.8"	The point is located at the 7th visitor parking spot north side of parking lot and east of the entrance, parking lot of apartment complex, #669 Central Avenue.

250 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Geographic Coordinates (NAD83)		Description
			Latitude	Longitude	
1	4.58	52.4	40° 46' 58.9"	74° 09' 05.9"	The point is located on the sidewalk, southeast corner of Cortlandt Street and Bayard Street, Belleville.
2	5.41	49.0	40° 46' 48.9"	74° 09' 38.9"	The point is located on the sidewalk in front of #826 Summer Avenue.
3	8.30	52.2	40° 46' 16.5"	74° 11' 34.8"	The point is located on the sidewalk in front of "96" sign, east corner of intersection Leslie Street and First Avenue.

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

271 Degree Radial

Point Number	Distance (km)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
			Latitude	Longitude	
1	3.64	54	40° 47' 50.3"	74° 08' 36.0"	The point is located on the sidewalk in front of #300 Ralph Street (Wheal Grace Printing Co.)
2	5.13	38.2	40° 47' 51.8"	74° 09' 40.1"	The point is located near shrub at west corner of garage for #2 Belle Oak Lane.
3	6.64	52	40° 47' 52.2"	74° 10' 44.7"	Northern most parking space, east side of parking lot at rear of strip mall (Walgreens), #17 Belleville Avenue.

310 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Geographic Coordinates (NAD83)		Description
			Latitude	Longitude	
1	2.16	54	40° 48' 31.0"	74° 07' 12.2"	The point is located on the sidewalk north corner of intersection of Laurel Avenue and Millburn Avenue across from #314 Millburn Avenue.
2	4.11	58.0	40° 49' 11.0"	74° 08' 17.0"	The point is located in the visitor parking lot in front of apartment #107/108, #50 Cambridge Drive (Gated Community).
3	6.63	62	40° 50' 03.6"	74° 09' 39.2"	The point is located on the sidewalk in front of #482 Kingsland Street, northwest of the intersection with Windsor Place.

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION WLIB - NEW YORK, NEW YORK
1190 kHz - 10 kW-D, 30 kW-N, U, DA-2
SEPTEMBER, 2014

323.5 Degree Radial

Point Number	Distance (km)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
			Latitude	Longitude	
1	2.61	58.2	40° 48' 53.0"	74° 07' 10.0"	The point is located in the center of Layfayette Street, 50 feet northeast of intersection with Second Avenue adjacent to utility pole #60574LH.
2	5.37	62.2	40° 50' 05.0"	74° 08' 20.0"	The point is located in front of two large trees at the end of road on southeast side of circular grave stone layout. Enter main entrance of Ridgelawn Cemetary vere left at fork and turn left at the next turn (Schacht masoleum).
3	7.29	18.8	40° 50' 55.0"	74° 09' 09.0"	The point is located in the center of parking lot near entrance in front of #775 Bloomfield Avenue.

Figure 9
Sheet 5 of 5

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							
1.19	152.25	-396.05	424.31	291.	23.937	-.72615	-8.1256

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	.3032	30
		0	0	196.94		
2	none	106.	100.	0	.3032	30
		106.	100.	196.08		
3	none	212.	100.	0	.3638	30
		212.	100.	199.52		
4	none	313.8	109.8	0	.2426	30
		313.8	109.8	191.153		
5	none	248.	111.	0	.2426	30
		248.	111.	194.463		

Number of wires = 5
current nodes = 150

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	6.37177	3	6.65067
radius	4	.2426	3	.3638

ELECTRICAL DESCRIPTION - TOWER 1
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0176994	.0184741

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	.01	0	0	0	0
2	31	.01	207.3	0	0	0
3	61	.01	116.2	0	0	0
4	91	.01	327.6	0	0	0
5	121	.01	304.9	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 31, sector 1							
1.19	139.98	-392.12	416.36	289.6	25.086	-.69285	-8.3132

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	.3032	30
		0	0	196.94		
2	none	106.	100.	0	.3032	30
		106.	100.	196.08		
3	none	212.	100.	0	.3638	30
		212.	100.	199.52		
4	none	313.8	109.8	0	.2426	30
		313.8	109.8	191.153		
5	none	248.	111.	0	.2426	30
		248.	111.	194.463		

Number of wires = 5
current nodes = 150

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	6.37177	3	6.65067
radius	4	.2426	3	.3638

ELECTRICAL DESCRIPTION - TOWER 2
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0176994	.0184741

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	.01	301.1	0	0	0
2	31	.01	0	0	0	0
3	61	.01	116.2	0	0	0
4	91	.01	327.6	0	0	0
5	121	.01	304.9	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 61, sector 1							
1.19	116.72	-369.37	387.37	287.5	26.102	-.66587	-8.4726

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	.3032	30
		0	0	196.94		
2	none	106.	100.	0	.3032	30
		106.	100.	196.08		
3	none	212.	100.	0	.3638	30
		212.	100.	199.52		
4	none	313.8	109.8	0	.2426	30
		313.8	109.8	191.153		
5	none	248.	111.	0	.2426	30
		248.	111.	194.463		

Number of wires = 5
current nodes = 150

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	6.37177	3	6.65067
radius	4	.2426	3	.3638

ELECTRICAL DESCRIPTION - TOWER 3
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0176994	.0184741

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	.01	301.1	0	0	0
2	31	.01	207.3	0	0	0
3	61	.01	0	0	0	0
4	91	.01	327.6	0	0	0
5	121	.01	304.9	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 91, sector 1							
1.19	233.14	-496.95	548.92	295.1	26.025	-.66784	-8.4608

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	.3032	30
		0	0	196.94		
2	none	106.	100.	0	.3032	30
		106.	100.	196.08		
3	none	212.	100.	0	.3638	30
		212.	100.	199.52		
4	none	313.8	109.8	0	.2426	30
		313.8	109.8	191.153		
5	none	248.	111.	0	.2426	30
		248.	111.	194.463		

Number of wires = 5
current nodes = 150

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	6.37177	3	6.65067
radius	4	.2426	3	.3638

ELECTRICAL DESCRIPTION - TOWER 4
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0176994	.0184741

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	.01	301.1	0	0	0
2	31	.01	207.3	0	0	0
3	61	.01	116.2	0	0	0
4	91	.01	0	0	0	0
5	121	.01	304.9	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 121, sector 1							
1.19	165.12	-491.46	518.46	288.6	32.83	-.5293	-9.4028

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	.3032	30
		0	0	196.94		
2	none	106.	100.	0	.3032	30
		106.	100.	196.08		
3	none	212.	100.	0	.3638	30
		212.	100.	199.52		
4	none	313.8	109.8	0	.2426	30
		313.8	109.8	191.153		
5	none	248.	111.	0	.2426	30
		248.	111.	194.463		

Number of wires = 5
current nodes = 150

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	6.37177	3	6.65067
radius	4	.2426	3	.3638

ELECTRICAL DESCRIPTION - TOWER 5
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0176994	.0184741

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	.01	301.1	0	0	0
2	31	.01	207.3	0	0	0
3	61	.01	116.2	0	0	0
4	91	.01	327.6	0	0	0
5	121	.01	0	0	0	0

APPENDIX B

DAYTIME
DIRECTIONAL ARRAY MODEL

IMPEDANCE - DAYTIME DIRECTIONAL ARRAY
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.19	165.64	-483.12	510.72	288.9	31.765	-.54706	-9.2681
source = 2; node 31, sector 1							
1.19	125.55	-354.44	376.02	289.5	22.877	-.75983	-7.9451
source = 3; node 61, sector 1							
1.19	46.604	-242.82	247.25	280.9	27.27	-.63731	-8.6491

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.3032	30
		0	0	196.94		
2	none	106.	100.	0	.3032	30
		106.	100.	196.08		
3	none	212.	100.	0	.3638	30
		212.	100.	199.52		
4	none	313.8	109.8	0	.2426	30
		313.8	109.8	191.153		
5	none	248.	111.	0	.2426	30
		248.	111.	194.463		

Number of wires = 5
current nodes = 150

	minimum wire	minimum value	maximum wire	maximum value
Individual wires				
segment length	4	6.37177	3	6.65067
radius	4	.2426	3	.3638

ELECTRICAL DESCRIPTION - DAYTIME DIRECTIONAL ARRAY
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0176994	.0184741

Sources

source	node	sector	magnitude	phase	type
1	1	1	2,942.72	291.2	voltage
2	31	1	3,528.87	183.1	voltage
3	61	1	2,125.11	67.5	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	.01	0	0	0	0
2	31	.01	0	0	0	0
3	61	.01	0	0	0	0
4	91	.01	0	.024	0	0
5	121	.01	0	.022	0	0

PEAK CURRENT - DAYTIME DIRECTIONAL ARRAY
Frequency = 1.19 MHz
Input power = 10,000. watts
Efficiency = 99.99 %
coordinates in degrees

current	mag	phase	real	imaginary

no.	X	Y	Z	(amps)	(deg)	(amps)	(amps)
GND	0	0	0	5.76187	2.3	5.75743	.226235
2	0	0	6.56467	3.6659	350.6	3.61648	-.599877
3	0	0	13.1293	2.43539	331.5	2.14021	-1.16216
4	0	0	19.694	1.84695	295.4	.793194	-1.66795
5	0	0	26.2587	2.18975	257.4	-.47648	-2.13728
6	0	0	32.8233	3.07799	236.8	-1.68449	-2.57614
7	0	0	39.388	4.11508	226.5	-2.83252	-2.98508
8	0	0	45.9527	5.16188	220.6	-3.91649	-3.36246
9	0	0	52.5173	6.16714	216.9	-4.92968	-3.70565
10	0	0	59.082	7.10511	214.4	-5.86424	-4.01164
11	0	0	65.6467	7.95906	212.5	-6.71198	-4.27737
12	0	0	72.2113	8.71635	211.1	-7.46494	-4.49994
13	0	0	78.776	9.36675	210.	-8.11566	-4.67676
14	0	0	85.3407	9.90186	209.	-8.65751	-4.80566
15	0	0	91.9053	10.3149	208.3	-9.08482	-4.88496
16	0	0	98.47	10.6006	207.6	-9.39306	-4.91351
17	0	0	105.035	10.7552	207.	-9.57891	-4.89077
18	0	0	111.599	10.7767	206.5	-9.64032	-4.81678
19	0	0	118.164	10.6643	206.1	-9.57661	-4.69218
20	0	0	124.729	10.4191	205.7	-9.38841	-4.51823
21	0	0	131.293	10.0432	205.3	-9.07766	-4.29675
22	0	0	137.858	9.54056	205.	-8.64758	-4.03009
23	0	0	144.423	8.91616	204.7	-8.10254	-3.72111
24	0	0	150.987	8.1761	204.4	-7.44791	-3.37302
25	0	0	157.552	7.32734	204.1	-6.68983	-2.98933
26	0	0	164.117	6.37721	203.8	-5.83482	-2.57366
27	0	0	170.681	5.33271	203.5	-4.8891	-2.12942
28	0	0	177.246	4.199	203.3	-3.85725	-1.65929
29	0	0	183.811	2.97577	203.	-2.73877	-1.16377
30	0	0	190.375	1.64739	202.8	-1.51903	-.637517
END	0	0	196.94	0	0	0	0
GND	-18.4067	-104.39	0	9.38484	253.6	-2.64502	-9.00439
32	-18.4067	-104.39	6.536	6.85009	246.	-2.78652	-6.25772
33	-18.4067	-104.39	13.072	5.21193	236.7	-2.86415	-4.3544
34	-18.4067	-104.39	19.608	3.91161	221.8	-2.91585	-2.6074
35	-18.4067	-104.39	26.144	3.09536	197.9	-2.94582	-.950472
36	-18.4067	-104.39	32.68	3.02355	167.9	-2.95587	.636123
37	-18.4067	-104.39	39.216	3.65034	143.8	-2.94705	2.15404
38	-18.4067	-104.39	45.752	4.63346	129.1	-2.92016	3.59744
39	-18.4067	-104.39	52.288	5.73086	120.1	-2.87597	4.95697
40	-18.4067	-104.39	58.824	6.82906	114.3	-2.8153	6.22175
41	-18.4067	-104.39	65.36	7.87231	110.4	-2.73907	7.38043
42	-18.4067	-104.39	71.896	8.82842	107.5	-2.64832	8.42184
43	-18.4067	-104.39	78.432	9.67597	105.2	-2.54419	9.3355
44	-18.4067	-104.39	84.968	10.3993	103.5	-2.4279	10.1119
45	-18.4067	-104.39	91.504	10.9865	102.1	-2.30082	10.7429
46	-18.4067	-104.39	98.04	11.4284	100.9	-2.16435	11.2216
47	-18.4067	-104.39	104.576	11.7183	99.9	-2.02	11.5429
48	-18.4067	-104.39	111.112	11.8517	99.1	-1.86931	11.7033
49	-18.4067	-104.39	117.648	11.8259	98.3	-1.71387	11.701
50	-18.4067	-104.39	124.184	11.6406	97.7	-1.55527	11.5362
51	-18.4067	-104.39	130.72	11.2972	97.1	-1.39513	11.2107
52	-18.4067	-104.39	137.256	10.7987	96.6	-1.23502	10.7278
53	-18.4067	-104.39	143.792	10.15	96.1	-1.07649	10.0928
54	-18.4067	-104.39	150.328	9.35738	95.6	-.92103	9.31194
55	-18.4067	-104.39	156.864	8.42804	95.2	-.770044	8.39279
56	-18.4067	-104.39	163.4	7.36991	94.9	-.624827	7.34337
57	-18.4067	-104.39	169.936	6.19057	94.5	-.486518	6.17142
58	-18.4067	-104.39	176.472	4.89556	94.2	-.356022	4.8826
59	-18.4067	-104.39	183.008	3.48401	93.8	-.233806	3.47616
60	-18.4067	-104.39	189.544	1.93692	93.5	-.119353	1.93324
END	-18.4067	-104.39	196.08	0	0	0	0

GND	-36.8134	-208.779	0	8.59509	146.6	-7.17575	4.73118
62	-36.8134	-208.779	6.65067	6.81782	143.8	-5.50018	4.02873
63	-36.8134	-208.779	13.3013	5.61016	141.	-4.35779	3.5332
64	-36.8134	-208.779	19.952	4.4989	137.2	-3.29938	3.05846
65	-36.8134	-208.779	26.6027	3.45344	131.4	-2.28581	2.58869
66	-36.8134	-208.779	33.2533	2.48915	121.6	-1.30512	2.11956
67	-36.8134	-208.779	39.904	1.68969	102.2	-.356628	1.65163
68	-36.8134	-208.779	46.5547	1.31117	64.9	.555663	1.1876
69	-36.8134	-208.779	53.2053	1.60215	27.2	1.42552	.731293
70	-36.8134	-208.779	59.856	2.26395	7.3	2.24567	.28715
71	-36.8134	-208.779	66.5067	3.01176	357.3	3.0085	-.140102
72	-36.8134	-208.779	73.1573	3.7464	351.6	3.70645	-.545645
73	-36.8134	-208.779	79.808	4.42992	348.	4.33233	-.924721
74	-36.8134	-208.779	86.4587	5.04277	345.4	4.87951	-1.27276
75	-36.8134	-208.779	93.1093	5.57244	343.5	5.34212	-1.58549
76	-36.8134	-208.779	99.76	6.00993	342.	5.71518	-1.85901
77	-36.8134	-208.779	106.411	6.34851	340.8	5.99467	-2.08985
78	-36.8134	-208.779	113.061	6.58322	339.8	6.17762	-2.27504
79	-36.8134	-208.779	119.712	6.71072	338.9	6.2622	-2.41218
80	-36.8134	-208.779	126.363	6.72905	338.2	6.24765	-2.49939
81	-36.8134	-208.779	133.013	6.63767	337.5	6.13436	-2.53541
82	-36.8134	-208.779	139.664	6.43736	337.	5.92381	-2.51954
83	-36.8134	-208.779	146.315	6.13008	336.4	5.61849	-2.45162
84	-36.8134	-208.779	152.965	5.71886	335.9	5.22179	-2.33201
85	-36.8134	-208.779	159.616	5.20759	335.5	4.73783	-2.16148
86	-36.8134	-208.779	166.267	4.60068	335.	4.17115	-1.94108
87	-36.8134	-208.779	172.917	3.90246	334.6	3.5262	-1.67186
88	-36.8134	-208.779	179.568	3.116	334.2	2.80628	-1.35435
89	-36.8134	-208.779	186.219	2.2401	333.9	2.01084	-.987191
90	-36.8134	-208.779	192.869	1.26205	333.5	1.12914	-.563748
END	-36.8134	-208.779	199.52	0	0	0	0
GND	-106.296	-295.248	0	3.26435	40.5	2.48171	2.12063
92	-106.296	-295.248	6.37177	2.84758	40.6	2.16298	1.85209
93	-106.296	-295.248	12.7435	2.53917	40.8	1.92292	1.65824
94	-106.296	-295.248	19.1153	2.24436	41.2	1.68962	1.47727
95	-106.296	-295.248	25.4871	1.95348	41.8	1.4559	1.30248
96	-106.296	-295.248	31.8588	1.66427	42.8	1.22019	1.13178
97	-106.296	-295.248	38.2306	1.37742	44.5	.983096	.964785
98	-106.296	-295.248	44.6024	1.09534	47.1	.746218	.801833
99	-106.296	-295.248	50.9741	.822221	51.5	.511667	.643618
100	-106.296	-295.248	57.3459	.566159	60.1	.281833	.491026
101	-106.296	-295.248	63.7177	.350086	80.3	.0592495	.345036
102	-106.296	-295.248	70.0894	.257444	126.6	-.15351	.206669
103	-106.296	-295.248	76.4612	.362168	167.7	-.353899	.0769503
104	-106.296	-295.248	82.833	.54118	184.6	-.539459	-.0431218
105	-106.296	-295.248	89.2047	.724126	192.2	-.707865	-.152595
106	-106.296	-295.248	95.5765	.892855	196.3	-.85697	-.250582
107	-106.296	-295.248	101.948	1.04066	198.9	-.984833	-.336276
108	-106.296	-295.248	108.32	1.16396	200.6	-1.08975	-.408962
109	-106.296	-295.248	114.692	1.2604	201.8	-1.17028	-.468025
110	-106.296	-295.248	121.064	1.3283	202.7	-1.22526	-.512961
111	-106.296	-295.248	127.435	1.36647	203.4	-1.25379	-.543377
112	-106.296	-295.248	133.807	1.37414	204.	-1.2553	-.558995
113	-106.296	-295.248	140.179	1.35083	204.5	-1.22944	-.559649
114	-106.296	-295.248	146.551	1.29643	204.9	-1.17618	-.545277
115	-106.296	-295.248	152.922	1.21105	205.2	-1.09567	-.515905
116	-106.296	-295.248	159.294	1.095	205.5	-.988228	-.47162
117	-106.296	-295.248	165.666	.948574	205.8	-.854184	-.412508
118	-106.296	-295.248	172.038	.771833	206.	-.693631	-.338528
119	-106.296	-295.248	178.409	.5638	206.2	-.505744	-.249186
120	-106.296	-295.248	184.781	.320328	206.4	-.286853	-.142568
END	-106.296	-295.248	191.153	0	0	0	0
GND	-88.8753	-231.528	0	4.06171	103.5	-.948217	3.94948

122	-88.8753	-231.528	6.4821	3.58321	103.6	-.841509	3.48299
123	-88.8753	-231.528	12.9642	3.2327	103.9	-.774395	3.13858
124	-88.8753	-231.528	19.4463	2.90155	104.4	-.720865	2.81058
125	-88.8753	-231.528	25.9284	2.57824	105.2	-.677208	2.48771
126	-88.8753	-231.528	32.4105	2.25967	106.5	-.641375	2.16674
127	-88.8753	-231.528	38.8926	1.94618	108.3	-.611871	1.84749
128	-88.8753	-231.528	45.3747	1.63995	111.	-.587426	1.53113
129	-88.8753	-231.528	51.8568	1.34488	114.9	-.566902	1.21956
130	-88.8753	-231.528	58.3389	1.06726	121.	-.549267	.915069
131	-88.8753	-231.528	64.821	.818146	130.7	-.533589	.620198
132	-88.8753	-231.528	71.3031	.619169	147.	-.519029	.337608
133	-88.8753	-231.528	77.7852	.509672	172.1	-.504843	.0699917
134	-88.8753	-231.528	84.2673	.522369	200.2	-.49038	-.179991
135	-88.8753	-231.528	90.7494	.627388	220.8	-.475081	-.409773
136	-88.8753	-231.528	97.2315	.768639	233.4	-.458479	-.61693
137	-88.8753	-231.528	103.714	.91243	241.2	-.440199	-.79922
138	-88.8753	-231.528	110.196	1.04291	246.3	-.419959	-.954621
139	-88.8753	-231.528	116.678	1.15213	249.8	-.397568	-1.08136
140	-88.8753	-231.528	123.16	1.23555	252.4	-.372925	-1.17793
141	-88.8753	-231.528	129.642	1.29036	254.4	-.346023	-1.2431
142	-88.8753	-231.528	136.124	1.31472	256.1	-.316944	-1.27594
143	-88.8753	-231.528	142.606	1.30742	257.4	-.285857	-1.27579
144	-88.8753	-231.528	149.088	1.26775	258.5	-.253014	-1.24225
145	-88.8753	-231.528	155.57	1.19535	259.5	-.218745	-1.17516
146	-88.8753	-231.528	162.053	1.09003	260.3	-.183442	-1.07448
147	-88.8753	-231.528	168.535	.951722	261.1	-.147537	-.940217
148	-88.8753	-231.528	175.017	.780079	261.8	-.111457	-.772075
149	-88.8753	-231.528	181.499	.573718	262.4	-.0755262	-.568725
150	-88.8753	-231.528	187.981	.327997	263.	-.0397143	-.325584
END	-88.8753	-231.528	194.463	0	0	0	0

APPENDIX C

NIGHTTIME
DIRECTIONAL ARRAY MODEL

IMPEDANCE - NIGHTTIME DIRECTIONAL ARRAY
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.19	117.53	-520.34	533.45	282.7	48.83	-.35581	-11.042
source = 2; node 31, sector 1							
1.19	79.774	-372.88	381.32	282.1	37.054	-.46894	-9.8991
source = 3; node 91, sector 1							
1.19	-11.192	-473.16	473.29	268.6	****	****	****
source = 4; node 121, sector 1							
1.19	64.511	-462.45	466.92	277.9	68.352	-.25417	-12.453

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.3032	30
		0	0	196.94		
2	none	106.	100.	0	.3032	30
		106.	100.	196.08		
3	none	212.	100.	0	.3638	30
		212.	100.	199.52		
4	none	313.8	109.8	0	.2426	30
		313.8	109.8	191.153		
5	none	248.	111.	0	.2426	30
		248.	111.	194.463		

Number of wires = 5
current nodes = 150

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	6.37177	3	6.65067
radius	4	.2426	3	.3638

ELECTRICAL DESCRIPTION - NIGHTTIME DIRECTIONAL ARRAY
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0176994	.0184741

Sources

source	node	sector	magnitude	phase	type
1	1	1	4,682.44	82.9	voltage
2	31	1	7,036.31	307.5	voltage
3	91	1	8,236.61	14.3	voltage
4	121	1	9,582.67	158.8	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	.01	0	0	0	0
2	31	.01	0	0	0	0
3	61	.01	0	.019	0	0
4	91	.01	0	0	0	0
5	121	.01	0	0	0	0

PEAK CURRENT - NIGHTTIME DIRECTIONAL ARRAY
Frequency = 1.19 MHz
Input power = 30,000. watts

Efficiency = 99.98 %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	8.7777	160.2	-8.25877	2.97333
2	0	0	6.56467	5.27553	151.4	-4.63386	2.5216
3	0	0	13.1293	3.07038	134.1	-2.13586	2.20575
4	0	0	19.694	1.9184	85.8	.141713	1.91316
5	0	0	26.2587	2.80951	35.5	2.2864	1.6327
6	0	0	32.8233	4.53334	17.5	4.32427	1.36082
7	0	0	39.388	6.35302	9.9	6.25762	1.09686
8	0	0	45.9527	8.12261	5.9	8.07892	.841376
9	0	0	52.5173	9.79429	3.5	9.77617	.595461
10	0	0	59.082	11.3411	1.8	11.3354	.360503
11	0	0	65.6467	12.7432	.6	12.7424	.138013
12	0	0	72.2113	13.9832	359.7	13.983	-.0704661
13	0	0	78.776	15.0467	359.	15.0444	-.263405
14	0	0	85.3407	15.9212	358.4	15.9151	-.439335
15	0	0	91.9053	16.5963	357.9	16.5855	-.596873
16	0	0	98.47	17.0638	357.5	17.048	-.734752
17	0	0	105.035	17.3182	357.2	17.2972	-.851829
18	0	0	111.599	17.3562	356.9	17.3303	-.947114
19	0	0	118.164	17.1768	356.6	17.1465	-1.01978
20	0	0	124.729	16.7819	356.3	16.7478	-1.06917
21	0	0	131.293	16.1756	356.1	16.1385	-1.09482
22	0	0	137.858	15.3641	355.9	15.3249	-1.09645
23	0	0	144.423	14.3557	355.7	14.3155	-1.07394
24	0	0	150.987	13.161	355.5	13.1208	-1.0274
25	0	0	157.552	11.7912	355.3	11.7523	-.957043
26	0	0	164.117	10.2587	355.2	10.2223	-.863216
27	0	0	170.681	8.5751	355.	8.54257	-.746263
28	0	0	177.246	6.74914	354.8	6.72186	-.606308
29	0	0	183.811	4.78073	354.7	4.76019	-.442667
30	0	0	190.375	2.64523	354.5	2.63317	-.252239
END	0	0	196.94	0	0	0	0
GND	-18.4067	-104.39	0	18.4525	25.4	16.6666	7.91943
32	-18.4067	-104.39	6.536	13.1332	20.5	12.3054	4.58898
33	-18.4067	-104.39	13.072	9.5434	13.9	9.26235	2.29901
34	-18.4067	-104.39	19.608	6.45281	1.9	6.44926	.214242
35	-18.4067	-104.39	26.144	4.14747	335.1	3.76192	-1.74626
36	-18.4067	-104.39	32.68	3.7921	288.	1.17007	-3.60707
37	-18.4067	-104.39	39.216	5.53257	256.1	-1.32765	-5.37091
38	-18.4067	-104.39	45.752	7.9552	242.1	-3.72052	-7.03157
39	-18.4067	-104.39	52.288	10.4642	235.1	-5.99206	-8.57868
40	-18.4067	-104.39	58.824	12.8837	230.9	-8.12324	-10.0001
41	-18.4067	-104.39	65.36	15.1395	228.2	-10.0941	-11.2833
42	-18.4067	-104.39	71.896	17.1874	226.3	-11.8849	-12.416
43	-18.4067	-104.39	78.432	18.9958	224.8	-13.4771	-13.3869
44	-18.4067	-104.39	84.968	20.5393	223.7	-14.8534	-14.1858
45	-18.4067	-104.39	91.504	21.7974	222.8	-15.9988	-14.8042
46	-18.4067	-104.39	98.04	22.7542	222.	-16.9006	-15.2355
47	-18.4067	-104.39	104.576	23.3972	221.4	-17.5487	-15.4748
48	-18.4067	-104.39	111.112	23.7179	220.9	-17.9356	-15.5194
49	-18.4067	-104.39	117.648	23.712	220.4	-18.0571	-15.3688
50	-18.4067	-104.39	124.184	23.3786	220.	-17.9116	-15.0244
51	-18.4067	-104.39	130.72	22.7207	219.6	-17.5006	-14.4899
52	-18.4067	-104.39	137.256	21.7447	219.3	-16.8285	-13.7707
53	-18.4067	-104.39	143.792	20.4605	219.	-15.9023	-12.8744
54	-18.4067	-104.39	150.328	18.8808	218.7	-14.7314	-11.8097
55	-18.4067	-104.39	156.864	17.0202	218.5	-13.3268	-10.5869
56	-18.4067	-104.39	163.4	14.8949	218.2	-11.7009	-9.21664
57	-18.4067	-104.39	169.936	12.5203	218.	-9.86548	-7.70903
58	-18.4067	-104.39	176.472	9.90762	217.8	-7.82921	-6.07161

59	-18.4067	-104.39	183.008	7.05521	217.6	-5.59035	-4.30394
60	-18.4067	-104.39	189.544	3.9246	217.4	-3.11795	-2.38345
END	-18.4067	-104.39	196.08	0	0	0	0
GND	-36.8134	-208.779	0	8.00843	251.5	-2.54308	-7.59393
62	-36.8134	-208.779	6.65067	7.04312	251.5	-2.23513	-6.67906
63	-36.8134	-208.779	13.3013	6.39764	251.5	-2.02606	-6.06836
64	-36.8134	-208.779	19.952	5.80892	251.6	-1.8323	-5.51236
65	-36.8134	-208.779	26.6027	5.25016	251.7	-1.64534	-4.98568
66	-36.8134	-208.779	33.2533	4.7096	251.9	-1.46146	-4.4771
67	-36.8134	-208.779	39.904	4.18173	252.2	-1.279	-3.98133
68	-36.8134	-208.779	46.5547	3.664	252.6	-1.09726	-3.49584
69	-36.8134	-208.779	53.2053	3.15568	253.1	-.9162	-3.01975
70	-36.8134	-208.779	59.856	2.65741	253.9	-.736262	-2.55338
71	-36.8134	-208.779	66.5067	2.17097	255.1	-.558268	-2.09796
72	-36.8134	-208.779	73.1573	1.69926	257.	-.38336	-1.65545
73	-36.8134	-208.779	79.808	1.24669	260.2	-.212929	-1.22837
74	-36.8134	-208.779	86.4587	.821098	266.6	-.0485625	-.819661
75	-36.8134	-208.779	93.1093	.445836	284.	.108004	-.432556
76	-36.8134	-208.779	99.76	.264503	344.5	.254936	-.0704925
77	-36.8134	-208.779	106.411	.470675	34.	.39034	.263
78	-36.8134	-208.779	113.061	.762207	47.8	.512299	.564366
79	-36.8134	-208.779	119.712	1.03542	53.3	.618901	.830091
80	-36.8134	-208.779	126.363	1.27215	56.2	.708264	1.05675
81	-36.8134	-208.779	133.013	1.46503	57.9	.778553	1.24103
82	-36.8134	-208.779	139.664	1.60914	59.	.827994	1.37977
83	-36.8134	-208.779	146.315	1.70048	59.8	.854876	1.46997
84	-36.8134	-208.779	152.965	1.73543	60.4	.857551	1.50875
85	-36.8134	-208.779	159.616	1.71068	60.8	.83442	1.49337
86	-36.8134	-208.779	166.267	1.62301	61.1	.783899	1.42115
87	-36.8134	-208.779	172.917	1.46921	61.4	.704344	1.28937
88	-36.8134	-208.779	179.568	1.24561	61.5	.593846	1.09494
89	-36.8134	-208.779	186.219	.946827	61.6	.449621	.83326
90	-36.8134	-208.779	192.869	.562374	61.7	.266369	.495289
END	-36.8134	-208.779	199.52	0	0	0	0
GND	-106.296	-295.248	0	17.4027	105.6	-4.68402	16.7605
92	-106.296	-295.248	6.37177	11.6173	106.3	-3.26589	11.1488
93	-106.296	-295.248	12.7435	7.50161	107.6	-2.27269	7.14906
94	-106.296	-295.248	19.1153	3.73084	111.6	-1.37473	3.46832
95	-106.296	-295.248	25.4871	.53658	183.1	-.535814	-.0286522
96	-106.296	-295.248	31.8588	3.38872	274.3	.255844	-3.37905
97	-106.296	-295.248	38.2306	6.65959	278.7	1.00312	-6.58361
98	-106.296	-295.248	44.6024	9.77759	280.	1.70522	-9.62775
99	-106.296	-295.248	50.9741	12.7109	280.7	2.35963	-12.4899
100	-106.296	-295.248	57.3459	15.4327	281.1	2.96301	-15.1456
101	-106.296	-295.248	63.7177	17.9171	281.3	3.51169	-17.5696
102	-106.296	-295.248	70.0894	20.1389	281.5	4.00198	-19.7372
103	-106.296	-295.248	76.4612	22.0748	281.6	4.43031	-21.6256
104	-106.296	-295.248	82.833	23.7041	281.7	4.79341	-23.2144
105	-106.296	-295.248	89.2047	25.009	281.7	5.08839	-24.4859
106	-106.296	-295.248	95.5765	25.9751	281.8	5.31284	-25.4259
107	-106.296	-295.248	101.948	26.5912	281.9	5.46485	-26.0236
108	-106.296	-295.248	108.32	26.8506	281.9	5.54311	-26.2722
109	-106.296	-295.248	114.692	26.75	282.	5.54685	-26.1686
110	-106.296	-295.248	121.064	26.2903	282.	5.47596	-25.7137
111	-106.296	-295.248	127.435	25.4762	282.1	5.33087	-24.9122
112	-106.296	-295.248	133.807	24.3162	282.1	5.11263	-23.7726
113	-106.296	-295.248	140.179	22.8219	282.2	4.8228	-22.3065
114	-106.296	-295.248	146.551	21.0086	282.3	4.46339	-20.529
115	-106.296	-295.248	152.922	18.8932	282.3	4.03674	-18.4569
116	-106.296	-295.248	159.294	16.4941	282.4	3.54534	-16.1086
117	-106.296	-295.248	165.666	13.8293	282.5	2.99139	-13.5019
118	-106.296	-295.248	172.038	10.9117	282.6	2.37605	-10.6499
119	-106.296	-295.248	178.409	7.74068	282.7	1.69736	-7.55229

120	-106.296	-295.248	184.781	4.27473	282.8	.944296	-4.16912
END	-106.296	-295.248	191.153	0	0	0	0
GND	-88.8753	-231.528	0	20.523	240.9	-9.9891	-17.9279
122	-88.8753	-231.528	6.4821	13.8116	237.	-7.52624	-11.5808
123	-88.8753	-231.528	12.9642	9.10512	230.7	-5.76161	-7.05032
124	-88.8753	-231.528	19.4463	5.0399	214.9	-4.13216	-2.88545
125	-88.8753	-231.528	25.9284	2.78962	157.5	-2.57793	1.06595
126	-88.8753	-231.528	32.4105	4.96456	102.6	-1.08168	4.84528
127	-88.8753	-231.528	38.8926	8.46057	87.6	.358029	8.45299
128	-88.8753	-231.528	45.3747	11.9987	81.7	1.73597	11.8724
129	-88.8753	-231.528	51.8568	15.3833	78.6	3.04374	15.0792
130	-88.8753	-231.528	58.3389	18.5443	76.7	4.27143	18.0456
131	-88.8753	-231.528	64.821	21.4368	75.4	5.40855	20.7433
132	-88.8753	-231.528	71.3031	24.0253	74.4	6.44463	23.1448
133	-88.8753	-231.528	77.7852	26.2793	73.7	7.3696	25.2248
134	-88.8753	-231.528	84.2673	28.1723	73.1	8.17414	26.9604
135	-88.8753	-231.528	90.7494	29.6827	72.7	8.84987	28.3327
136	-88.8753	-231.528	97.2315	30.7927	72.2	9.38958	29.3262
137	-88.8753	-231.528	103.714	31.4896	71.9	9.78734	29.9299
138	-88.8753	-231.528	110.196	31.765	71.6	10.0386	30.137
139	-88.8753	-231.528	116.678	31.6156	71.3	10.1403	29.9453
140	-88.8753	-231.528	123.16	31.0431	71.	10.091	29.3572
141	-88.8753	-231.528	129.642	30.0536	70.8	9.89052	28.3795
142	-88.8753	-231.528	136.124	28.6579	70.6	9.54033	27.0233
143	-88.8753	-231.528	142.606	26.871	70.3	9.04322	25.3036
144	-88.8753	-231.528	149.088	24.7114	70.1	8.40321	23.2387
145	-88.8753	-231.528	155.57	22.2003	69.9	7.6253	20.8496
146	-88.8753	-231.528	162.053	19.3605	69.7	6.71498	18.1587
147	-88.8753	-231.528	168.535	16.2142	69.5	5.67755	15.1877
148	-88.8753	-231.528	175.017	12.7779	69.3	4.51651	11.9531
149	-88.8753	-231.528	181.499	9.05226	69.1	3.22957	8.45656
150	-88.8753	-231.528	187.981	4.99042	68.9	1.7972	4.65557
END	-88.8753	-231.528	194.463	0	0	0	0

APPENDIX D

DETUNED TOWER MODEL

ELECTRICAL DESCRIPTION - TOWER 3 DETUNE MODEL
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0184736	.0184736

Plane wave source

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

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	0	.019	0	0

GEOMETRY - TOWER 3 DETUNE MODEL
Dimensions in meters
Environment: perfect ground

wire	caps	X	Y	Z	radius	segs
1	none	0	0	0	.3638	30
		0	0	139.623		

Number of wires = 1
current nodes = 30

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	4.6541	1	4.6541
segment/radius ratio	1	12.793	1	12.793
radius	1	.3638	1	.3638

PEAK CURRENT - TOWER 3 DETUNE MODEL
Frequency = 1.19 MHz
Plane wave zenith (deg) = 90
Plane wave azimuth (deg) = 0
Polarization angle (deg) = 0
coordinates in meters

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	.831372	271.9	.0270752	-.830931
2	0	0	4.6541	.728969	271.9	.0238864	-.728578
3	0	0	9.3082	.655508	271.9	.0219294	-.655141
4	0	0	13.9623	.584024	272.	.0203173	-.58367
5	0	0	18.6164	.512271	272.1	.0189623	-.51192
6	0	0	23.2705	.439682	272.3	.0178255	-.439321
7	0	0	27.9246	.366407	272.6	.0168864	-.366018
8	0	0	32.5787	.29292	273.2	.0161299	-.292476
9	0	0	37.2328	.219878	274.1	.0155419	-.219328
10	0	0	41.8869	.14807	275.9	.0151075	-.147297
11	0	0	46.541	.0785645	280.9	.0148099	-.077156
12	0	0	51.1951	.0175521	326.5	.0146307	-9.7E-03
13	0	0	55.8492	.0562084	75.	.0145489	.0542928
14	0	0	60.5033	.114966	82.7	.0145419	.114043
15	0	0	65.1574	.169448	85.1	.0145853	.168819
16	0	0	69.8115	.218426	86.2	.0146532	.217934
17	0	0	74.4656	.261172	86.8	.0147188	.260757

18	0	0	79.1197	.297094	87.2	.0147548	.296727
19	0	0	83.7738	.325687	87.4	.0147333	.325354
20	0	0	88.4279	.346536	87.6	.0146267	.346227
21	0	0	93.082	.359311	87.7	.0144083	.359022
22	0	0	97.7361	.363768	87.8	.0140517	.363497
23	0	0	102.39	.359748	87.8	.0135321	.359493
24	0	0	107.044	.347167	87.9	.0128257	.34693
25	0	0	111.698	.326012	87.9	.0119101	.325794
26	0	0	116.353	.296312	87.9	.0107635	.296116
27	0	0	121.007	.258099	87.9	9.36E-03	.257929
28	0	0	125.661	.211324	87.9	7.69E-03	.211184
29	0	0	130.315	.155625	87.9	5.69E-03	.155521
30	0	0	134.969	.0897833	87.9	3.31E-03	.0897223
END	0	0	139.623	0	0	0	0

ELECTRICAL DESCRIPTION - TOWER 4 DETUNE MODEL
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0176989	.0176989

Plane wave source

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

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	0	.024	0	0

GEOMETRY - TOWER 4 DETUNE MODEL
Dimensions in meters
Environment: perfect ground

wire	caps	X	Y	Z	radius	segs
1	none	0	0	0	.2426	30
		0	0	133.768		

Number of wires = 1
current nodes = 30

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	4.45893	1	4.45893
segment/radius ratio	1	18.3798	1	18.3798
radius	1	.2426	1	.2426

PEAK CURRENT - TOWER 4 DETUNE MODEL
Frequency = 1.19 MHz
Plane wave zenith (deg) = 90
Plane wave azimuth (deg) = 0
Polarization angle (deg) = 0
coordinates in meters

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	.695369	271.6	.0190378	-.695108
2	0	0	4.45893	.606503	271.6	.0166826	-.606274
3	0	0	8.91787	.540539	271.6	.0151083	-.540328
4	0	0	13.3768	.477287	271.7	.0137577	-.477089
5	0	0	17.8357	.414669	271.7	.0125662	-.414479
6	0	0	22.2947	.352159	271.9	.011509	-.351971
7	0	0	26.7536	.28982	272.1	.0105747	-.289627
8	0	0	31.2125	.227982	272.5	9.76E-03	-.227773
9	0	0	35.6715	.167111	273.1	9.05E-03	-.166866
10	0	0	40.1304	.107769	274.5	8.45E-03	-.107438
11	0	0	44.5893	.0506788	279.	7.94E-03	-.0500527
12	0	0	49.0483	8.88E-03	32.	7.53E-03	4.71E-03
13	0	0	53.5072	.0567301	82.7	7.2E-03	.0562717
14	0	0	57.9661	.104308	86.2	6.94E-03	.104077
15	0	0	62.4251	.147749	87.4	6.74E-03	.147595
16	0	0	66.884	.186447	88.	6.59E-03	.18633
17	0	0	71.3429	.219927	88.3	6.48E-03	.219832

18	0	0	75.8019	.247783	88.5	6.39E-03	.247701
19	0	0	80.2608	.269665	88.7	6.3E-03	.269591
20	0	0	84.7197	.285284	88.8	6.21E-03	.285216
21	0	0	89.1787	.294413	88.8	6.09E-03	.29435
22	0	0	93.6376	.296888	88.9	5.93E-03	.296829
23	0	0	98.0965	.292605	88.9	5.72E-03	.292549
24	0	0	102.555	.281515	88.9	5.44E-03	.281462
25	0	0	107.014	.263615	88.9	5.08E-03	.263566
26	0	0	111.473	.238935	88.9	4.62E-03	.23889
27	0	0	115.932	.207502	88.9	4.04E-03	.207463
28	0	0	120.391	.169277	88.9	3.34E-03	.169244
29	0	0	124.85	.123989	88.9	2.48E-03	.123964
30	0	0	129.309	.0706525	88.8	1.44E-03	.0706378
END	0	0	133.768	0	0	0	0

ELECTRICAL DESCRIPTION - TOWER 5 DETUNE MODEL
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.19	0	1	.0180053	.0180053

Plane wave source

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

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	0	.022	0	0

GEOMETRY - TOWER 5 DETUNE MODEL
Dimensions in meters
Environment: perfect ground

wire	caps	X	Y	Z	radius	segs
1	none	0	0	0	.2426	30
		0	0	136.084		

Number of wires = 1
current nodes = 30

	minimum wire	minimum value	maximum wire	maximum value
Individual wires				
segment length	1	4.53613	1	4.53613
segment/radius ratio	1	18.698	1	18.698
radius	1	.2426	1	.2426

PEAK CURRENT - TOWER 5 DETUNE MODEL
Frequency = 1.19 MHz
Plane wave zenith (deg) = 90
Plane wave azimuth (deg) = 0
Polarization angle (deg) = 0
coordinates in meters

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	.709608	272.2	.0277886	-.709064
2	0	0	4.53613	.625258	272.3	.0245824	-.624775
3	0	0	9.07227	.56179	272.3	.022386	-.561344
4	0	0	13.6084	.500285	272.3	.0204528	-.499867
5	0	0	18.1445	.438824	272.4	.018698	-.438425
6	0	0	22.6807	.376962	272.6	.017091	-.376574
7	0	0	27.2168	.31482	272.8	.0156199	-.314432
8	0	0	31.7529	.252774	273.2	.0142794	-.25237
9	0	0	36.2891	.191338	273.9	.0130664	-.190891
10	0	0	40.8252	.131117	275.2	.0119783	-.130569
11	0	0	45.3613	.0728513	278.7	.0110113	-.0720143
12	0	0	49.8975	.0188288	302.7	.0101607	-.0158519
13	0	0	54.4336	.0384684	75.8	9.42E-03	.0372972
14	0	0	58.9697	.0872714	84.2	8.78E-03	.0868285
15	0	0	63.5059	.132422	86.4	8.24E-03	.132166
16	0	0	68.042	.172946	87.4	7.77E-03	.172771
17	0	0	72.5781	.208281	88.	7.37E-03	.20815

18	0	0	77.1143	.237968	88.3	7.03E-03	.237864
19	0	0	81.6504	.261615	88.5	6.73E-03	.261528
20	0	0	86.1865	.278899	88.7	6.45E-03	.278824
21	0	0	90.7227	.289562	88.8	6.19E-03	.289496
22	0	0	95.2588	.293415	88.8	5.91E-03	.293355
23	0	0	99.7949	.290329	88.9	5.61E-03	.290275
24	0	0	104.331	.280243	88.9	5.27E-03	.280194
25	0	0	108.867	.263143	88.9	4.87E-03	.263098
26	0	0	113.403	.239052	88.9	4.39E-03	.239012
27	0	0	117.939	.207997	88.9	3.82E-03	.207962
28	0	0	122.476	.169942	88.9	3.15E-03	.169913
29	0	0	127.012	.124624	88.9	2.34E-03	.124602
30	0	0	131.548	.0710607	88.9	1.36E-03	.0710478
END	0	0	136.084	0	0	0	0