ORIGINAL

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. BMML-20150203ADR

SECTION I - APPLICANT FEE INFORMATION

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

MAILING ADDRESS (Line 1) (Maximum 35 characters)
1800 K St NW Suite 920

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Washington	DC	20006

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
(202) 457-4515	WWJ(AM)	FAC ID. 7621

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
M M R	0 0 0 1	$ 690.00	

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
M O R	0 0 0 1	$ 790.00	

	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.	$ 1480.00	

2015 FEB -6 P 2:43

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT CBS RADIO EAST		
MAILING ADDRESS 1800 K Street NW, Suite 920		
CITY Washington	STATE DC	ZIP CODE 20006

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
WWJ	Detroit			

3. Is the station now operating pursuant to automatic program test authority in accordance with 47 C.F.R. Section 73.1620? ☑ Yes ☐ No

If No, explain in an Exhibit. Exhibit No.

4. Have all the terms, conditions, and obligations set forth in the above described construction permit been fully met? ☐ Yes ☐ No

If No, state exceptions in an Exhibit. Exhibit No.

5. Apart from the changes already reported, has any cause or circumstance arisen since the grant of the underlying construction permit which would result in any statement or representation contained in the construction permit application to be now incorrect? ☐ Yes ☐ No

If Yes, explain in an Exhibit. Exhibit No.

6. Has the permittee filed its Ownership Report (FCC Form 323) or ownership certification in accordance with 47 C.F.R. Section 73.3615(b)? ☑ Yes ☐ No ☐ Does not apply

If No, explain in an Exhibit. Exhibit No.

7. Has an adverse finding been made or an adverse final action been taken by any court or administrative body with respect to the applicant or parties to the application in a civil or criminal proceeding, brought under the provisions of any law relating to the following: any felony; mass media related antitrust or unfair competition; fraudulent statements to another governmental unit; or discrimination? ☐ Yes ☑ No

If the answer is Yes, attach as an Exhibit a full disclosure of the persons and matters involved, including an identification of the court or administrative body and the proceeding (by dates and file numbers), and the disposition of the litigation. Where the requisite information has been earlier disclosed in connection with another application or as required by 47 U.S.C. Section 1.65(c), the applicant need only provide: (i) an identification of that previous submission by reference to the file number in the case of an application, the call letters of the station regarding which the application or Section 1.65 information was filed, and the date of filing; and (ii) the disposition of the previously reported matter. Exhibit No.

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

☐ Yes ☑ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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

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

CERTIFICATION

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

☑ Yes ☐ No

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

Name	Signature	
Jo Ann Haller	Jo Ann Haller	
Title	Date	Telephone Number
Senior Vice President	1/28/2015	212 649 9655

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 E-1

APPLICATION FOR STATION LICENSE

(METHOD OF MOMENTS PROOF)

WWJ(AM) - DETROIT, MI

CBS Radio East Inc.
Detroit, MI

January 19, 2015

Prepared For: Mr. Bob Ostazewski
Market Chief Engineer
CBS Radio East Inc.
26495 American Drive
Detroit, MI 48034

CARL E. SMITH CONSULTING ENGINEERS

2324 N. CLEVE-MASS RD., BOX 807 330/659-4440 FAX: 330/659-9234 BATH, OHIO 44210-0807

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CONTENTS (Cont'd)

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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	#1, #4 - 147.3 #2,#3,#5,#6 -121.0	#1,#4 - 148.1 #2,#3,#5,#6 - 122.1	#1,#4 - 149.1 #2,#3,#5,#6 - 123.1	Exhibit No. N/A

Excitation ☑ Series ☐ Shunt

ASRN's: #1 - 1029784 #4 - 1029787
#2 - 1029786 #5 - 1029788
#3 - 1029789 #6 - 1029785

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 ° 01 ' 09 "	83 ° 14 ' 23 "

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. N/A

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.

Guy wire/base insulator replacement, sample system modification, and modification of feeder system.

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)
Derek R. Gorman	
Address (include ZIP Code) P. O. Box 807 2324 North Cleveland-Massillon Road Bath, OH 44210	Date 1/19/2015 Telephone No. (Include Area Code) 330/659-4440

☐ Technical Director

☐ Registered Professional Engineer

☐ Chief Operator

☑ Technical Consultant

☐ Other (specify)

SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant
CBS Radio East Inc.

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

☑ Station License ☐ Direct Measurement of Power

1. Facilities authorized in construction permit

Call Sign	File No. of Construction Permit (if applicable)	Frequency (kHz)	Hours of Operation	Power in kilowatts	
				Night	Day
WWJ	N/A	950	U	50.0	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	Monroe	South Rockwood	9880 Haggerman Road

4. Main studio location

State	County	City or Town	Street address (or other identification)
MI	Oakland	Southfield	26495 American Drive

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

State	County	City or Town	Street address (or other identification)
MI	Oakland	Southfield	26495 American Drive

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. E-1

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
32.4	32.4

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	-j4.8	-j4.8

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	0.0	0.0	1.000	1.000		
2	-21.1	-22.0	0.573	1.084		
3	101.3	100.8	0.460	0.876		
4	118.7	122.2	0.749	0.776		
5	111.1	55.5	0.590	0.169		
6	-20.1		0.567			

Manufacturer and type of antenna monitor: Potomac Instruments 1901 (4188), S/N 338

ENGINEERING AFFIDAVIT

State of Ohio)
) ss:
County of Summit)

Roy P. Stype, III, being duly sworn, deposes and states that he is a graduate Electrical Engineer, a qualified and experienced Communications Consulting Engineer whose works are a matter of record with the Federal Communications Commission and that he is a member of the Firm of "Carl E. Smith Consulting Engineers" located at 2324 North Cleveland-Massillon Road in the Township of Bath, County of Summit, State of Ohio, and that the Firm has been retained by CBS Radio East Inc. to prepare the attached "Engineering Exhibit E-1."

The deponent states that the Exhibit was prepared by him or under his direction and is true of his own knowledge, except as to statements made on information and belief and as to such statements, he believes them to be true.

Roy P. Stype, III

Subscribed and sworn to before me on **January 19, 2015.**

Notary Public

/SEAL/

Nancy A. Adams, Notary Public
Residence - Cuyahoga County
State Wide Jurisdiction, Ohio
My Commission Expires Sept. 20, 2015

ENGINEERING AFFIDAVIT

State of Ohio)
) ss:
County of Summit)

Derek R. Gorman, being duly sworn, deposes and states that he is a qualified and experienced Communications Consulting Engineer whose works are a matter of record with the Federal Communications Commission and that he is a member of the Firm of "Carl E. Smith Consulting Engineers" located at 2324 North Cleveland-Massillon Road in the Township of Bath, County of Summit, State of Ohio, and that the Firm has been retained by CBS Radio East Inc. to prepare the attached "Engineering Exhibit E-1."

The deponent states that the Exhibit was prepared by him or under his direction and is true of his own knowledge, except as to statements made on information and belief and as to such statements, he believes them to be true.

Derek R. Gorman

Subscribed and sworn to before me on **January 19, 2015.**

Notary Public

Nancy A. Adams, Notary Public
Residence - Cuyahoga County
State Wide Jurisdiction, Ohio
My Commission Expires Sept. 20, 2015

/SEAL/

ENGINEERING STATEMENT

1.0 GENERAL

This engineering exhibit is prepared on behalf of CBS Radio East Inc., licensee of Radio Station WWJ(AM) - Detroit, Michigan, in support of an application for a modified station license. It details the results of a recent proof of performance conducted on the WWJ daytime and nighttime directional antenna system utilizing the computer modeling method of moments (MoM) technique outlined in Section 73.151(c) of the FCC rules. WWJ's daytime and nighttime directional antenna systems are eligible to use this proof methodology since they employ a standard ground system and all the elements of this antenna system are series fed.

WWJ operates unlimited time on 950 kHz at a power level of 50 kilowatts utilizing a six tower directional array. Five of these towers are used for the daytime directional pattern, while all six towers are utilized for WWJ's nighttime directional pattern. New base voltage sampling elements were installed prior to conducting this proof of performance.

The ground system for the WWJ directional antenna system consists of 120 equally spaced #10 AWG copper radials buried approximately 10 cm deep about the base of each tower. Sixty of these radials are each 157.8 meters in length and the remaining sixty are each 78.0 meters in length. These radials are truncated where they intersect a transverse copper strap running between adjacent towers. In addition, antennas for two Aural STL's and a Remote Pickup Station are installed on Tower #2 of the directional antenna system. The transmission lines for these antennas are isolated across the tower base by the use of isocouplers. The ground system and the STL and

RPU antennas are existing and remain unchanged from what is described in the present station license and this information is provided only for clarity purposes.

Pursuant to the FCC's October 29, 2009 Public Notice (DA 09-2340), no surveyor's certification is required to verify the locations of the WWJ towers since this application is only re-licensing an existing licensed antenna system without making any changes. The data contained in this exhibit shows that the WWJ daytime and nighttime directional patterns are in proper adjustment based on a Method of Moments analysis.

2.0 SAMPLE SYSTEM

The sample system for the WWJ directional antenna system is in full compliance with Section 73.151(c)(2)(i) of the FCC rules with regard to sample systems for directional antenna systems utilizing the computer modeling method of moments technique. The sample system consists of identical base voltage samplers used as the sample elements, equal length sample lines, and a Potomac Instruments antenna monitor.

The sample elements utilized in the WWJ nighttime sample system are Phasetek P600-206-2L base voltage sample elements mounted adjacent to the feed at each tower. Each sample element was field verified to be within the manufacturer's specifications of ±2% ratio and ±2 degree phase accuracy by placing them in parallel with a common reference signal and using the antenna monitor to compare the phase and ratio of the output sample from the sample element from Tower #1 with the output sample from each of the other sample elements. The results of this field verification are tabulated in Table 2.0 and confirms that the ratio and phase of the outputs of all of these sample elements are well within the manufacturer's specifications.

The sample lines utilized in the WWJ sample system consist of six equal length runs (1302 feet/396.8 meters each) of Cablewave FLC38-50J phase stabilized foam Flexwell coaxial cable with a 3 foot (0.91 meter) Belden RG-213 jumper at the antenna monitor end. The runs from the towers to the transmitter building, including the excess cable lengths for towers 2, 3, 5, and 6 are buried. The excess cable lengths for towers 1 and 4 are coiled in the transmitter building. Impedance measurements were conducted on this sample system as required by Section 73.153(c)(2)(i) of the FCC

Rules using an Agilent Technologies model 8753ES Vector Network Analyzer (VNA), S/N MY40002631, an Electronic Navigation Industries (ENI) model 310L linear amplifier, S/N 654, and a Tunwall Radio directional coupler, S/N DC11, as a calibrated measurement system. These measurements were conducted both with the sample lines open circuited and with them connected to the P600-206-2L sample elements.

The frequencies above and below the carrier frequency where resonance, defined as zero reactance corresponding with low resistance, were found and are listed in Table 2.1. These frequencies of resonance occur at odd multiples of 90 degrees electrical length, and the sample line length at the resonant frequency below the carrier frequency, which is the closest one to the carrier frequency, was found to be 450 electrical degrees. The electrical lengths of these sample lines at the carrier frequency are tabulated in Table 2.1 and were calculated utilizing the ratio between the frequencies.

To determine the characteristic impedance values of the sample lines, open circuit measurements were conducted on frequencies offset to result in electrical lengths $\pm$ 45 degrees from the electrical length at this resonant frequency. The characteristic impedance was calculated using the following formula, where $R_1 + jX_1$ and $R_2 + jX_2$ are the measured impedances at the +45 and -45 degree offset frequencies, respectively:

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

These measured offset frequencies, along with the calculated characteristic impedance of each sample line, are also tabulated in Table 2.1. These measured values comply with the requirement that the measured characteristic impedance of each sample line be within two ohms of the measured characteristic impedance of every other sample line in the antenna system.

The antenna monitor utilized with WWJ's directional antenna system is a type accepted Potomac Instruments 1901(4188), S/N 338. This antenna monitor was field verified to be within the manufacturers specifications of ±1% ratio accuracy and ±1 degree phase accuracy.

TABLE 2.0

WWJ
SAMPLE ELEMENT MEASUREMENTS
CBS Radio East Inc.
Detroit, MI

Tower	Sample Element * Model	Serial Number	Measured Ratio	Measured Phase (degrees)
1	P600-206-2L	101	1.000	0.1
2	P600-206-2L	102	1.003	-0.1
3	P600-206-2L	103	1.001	-0.1
4	P600-206-2L	104	0.997	-0.1
5	P600-206-2L	105	0.999	-0.1
6	P600-206-2L	106	1.002	0.3

* Sample Elements Manufactured By Phasetek, Inc.

TABLE 2.1

WWJ
SAMPLE LINE MEASUREMENTS
CBS Radio East Inc.
Detroit, MI

Tower	Resonant Frequency (kHz) Below 950 kHz	Resonant Frequency (kHz) Above 950 kHz	Calculated Electrical Length At 950 kHz (degrees)	Measured Impedance Connected To Sample Element At 950 kHz (ohms)
1	825.65	1158.80	517.8	32.4-j12.6
2	825.50	1158.95	517.9	32.5-j12.8
3	826.25	1159.70	517.4	32.4-j12.6
4	825.95	1159.70	517.6	32.6-j12.6
5	826.10	1159.85	517.5	32.4-j12.6
6	826.25	1159.85	517.4	32.4-j12.7

Tower	-45 Degree Offset Frequency (kHz)	-45 Degree Offset Impedance (ohms)	+45 Degree Offset Frequency (kHz)	+45 Degree Offset Impedance (ohms)	Calculated Characteristic Impedance (ohms)
1	743.45	11.3-j48.5	908.00	15.3+j47.4	49.8
2	742.85	12.3-j48.2	907.85	16.3+j47.1	49.8
3	743.45	11.3-j48.6	908.30	15.2+j47.3	49.8
4	743.75	11.3-j48.5	908.60	15.3+j47.5	49.7
5	743.75	11.3-j48.4	908.45	15.2+j47.3	49.7
6	743.75	11.3-j48.5	908.75	15.3+j47.5	49.8

3.0 ANTENNA SYSTEM MODELING

The WWJ antenna system was modeled using Expert MININEC Broadcast Professional Version 23. The tower heights of the towers in the WWJ antenna system are unequal. Two of the towers (Towers 1 and 4) are 168.0 electrical degrees in height, while the remaining four towers (Towers 2, 3, 5, and 6) are 138.0 electrical degrees in height. One wire was used to represent each tower and each wire was modeled using multiple wire segments to meet the requirement that wire segments be no longer than 10 electrical degrees in length. The top and bottom end points of each wire were specified in electrical degrees at 950 kHz.

All towers in the WWJ antenna system have a uniform triangular cross section with a face width of 42" (1.07 meters). Each tower's modeled height, relative to its physical height, falls within the required range of 75 to 125 percent of its physical height. Each tower's modeled radius, relative to the radius of a circle having a circumference equal to the sum of the widths of the physical tower sides, falls within the required range of 80 to 150 percent of its physical radius. Table 3.0 details the characteristics of each tower in the MoM model of the WWJ antenna system.

The individual characteristics of each tower were adjusted to provide a match of its modeled impedance with its measured impedance at the antenna tuning unit (ATU) output when presented to a circuit model that includes base region stray capacity, the tower feed, and the base voltage sampler. Each tower in the array was driven individually with all towers in the MoM model and all non-driven towers loaded with their open circuit impedance computed from the circuit model. Each tower has a specified base region stray capacity of 250 pF or less and a tower feed inductance of 10uH or less, as required by the rules.

The measured impedances were determined using a Delta Electronics OIB-3 impedance bridge, S/N 1411, driven by the station's Harris 3DX-50 transmitter, with all non-driven towers short circuited. Table 3.1 presents all of the individual tower MoM model data and measurements and Figure 3.1 details the tower base circuit diagram used in the MoM model. Tables 3.2 to 3.13 present in detail the MoM calculations and base circuit analysis for each tower driven individually. As shown in Table 3.1, the measured and modeled ATU output impedances agree within $\pm$ 2 ohms and $\pm$ 4 percent for resistance and reactance as required by the rules.

Once the MoM model was developed and verified with the measured impedances, it was synthesized with the theoretical parameters for the daytime directional array as specified on the station's license. The results of this synthesis with the MoM model driven as a directional array are presented in Tables 3.14 and 3.15. It should be noted that tower 6 is not used in the daytime directional array and its conjugate reactance, as computed in the MoM model by synthesizing it with a 0.000 ratio and 0.0 degree phase, is presented to the tower base in the daytime mode to detune it. Additionally, Table 3.15 presents the daytime directional array admittance and impedance matrixes resulting from the MoM model.

After the daytime directional array was synthesized, the resulting MoM base voltage and current for each tower was presented to the same circuit model used in verifying the individual tower impedance to calculate the voltage at the ATU output where the sample element to drive the antenna monitor is located. Once these voltages were calculated, they were normalized to the tower used as the reference tower for the daytime directional array. Tables 3.16 to 3.20 present in detail the base circuit analysis for each tower resulting from the array synthesis. Table 3.21 presents the calculated

sample element voltage for all towers and the resulting normalized antenna monitor parameters. These normalized antenna monitor parameters were established on the antenna monitor as the operating parameters for the daytime directional array.

Similarly, the MoM model was synthesized with the theoretical parameters for the nighttime directional array as specified on the station's license. The results of this synthesis with the MoM model driven as a directional array are presented in Tables 3.22 and 3.23. Additionally, Table 3.23 presents the nighttime directional array admittance and impedance matrixes resulting from the MoM model.

After the nighttime directional array was synthesized, the resulting MoM base voltage and current for each tower was presented to the same circuit model used in verifying the individual tower impedance to calculate the voltage at the ATU output where the sample element to drive the antenna monitor is located. Once these voltages were calculated, they were normalized to the tower used as the reference tower for the nighttime directional array. Tables 3.24 to 3.29 present in detail the base circuit analysis for each tower resulting from the array synthesis. Table 3.30 presents the calculated sample element voltage for all towers and the resulting normalized antenna monitor parameters. These normalized antenna monitor parameters were established on the antenna monitor as the operating parameters for the nighttime directional array.

TABLE 3.0

WWJ
INDIVIDUAL TOWER
MoM MODEL DETAILS
CBS Radio East Inc.
Detroit, MI

Tower	Physical Height (degrees)	Modeled Height (degrees)	Modeled Percent Of Height (%)	Modeled Radius (meters)	Percent Equivalent Radius (%)
1	168	196.8	107.6	0.484	95.1
2	138	149.5	108.3	0.509	100
3	138	148	107.2	0.458	90
4	168	179.7	107	0.509	100
5	138	148.4	107.5	0.458	90
6	138	147.8	107.1	0.458	90

Tower	Wire Number	Number Of Segments	Base Segment Number
1	1	22	1
2	2	18	23
3	3	18	41
4	4	22	59
5	5	18	81
6	6	18	99

TABLE 3.1

WWJ INDIVIDUAL
TOWER IMPEDANCE MEASUREMENTS
TO VERIFY MoM MODEL
CBS Radio East Inc.
Detroit, MI

Tower	Measured X_{SE} (ohms)	Specified X_F (ohms)	Specified L_F (uH)	Specified X_S (ohms)	Specified C_S (pF)	Modeled X_{OC} (ohms)
1	j100,000	j18.0	3.01	-j16,753	10	j18.0
2	j100,000	j25.0	4.12	-j4,188	40	j25.1
3	j100,000	j29.0	4.86	-j16,753	10	j29.0
4	j100,000	j23.0	3.85	-j16,753	10	j23.0
5	j100,000	j28.0	4.69	-j16,753	10	j28.0
6	j100,000	j18.0	3.01	-j16,753	10	j18.0

Tower	Measured Z_{ATU} (ohms)	Modeled Z_{ATU} (ohms)	Modeled Z_{ANT} (ohms)
1	339.0-j456.0	338.2-j456.2	354.7-j479.7
2	805.0+j140.6	801.6+j139.8	737.9+j243.9
3	707.0+j321.1	706.4+j320.5	686.0+j311.3
4	350.0-j446.5	349.2-j446.0	366.1-j473.9
5	727.0+j304.0	726.7+j303.0	706.7+j296.7
6	688.0+j306.2	686.6+j306.3	666.8+j306.8

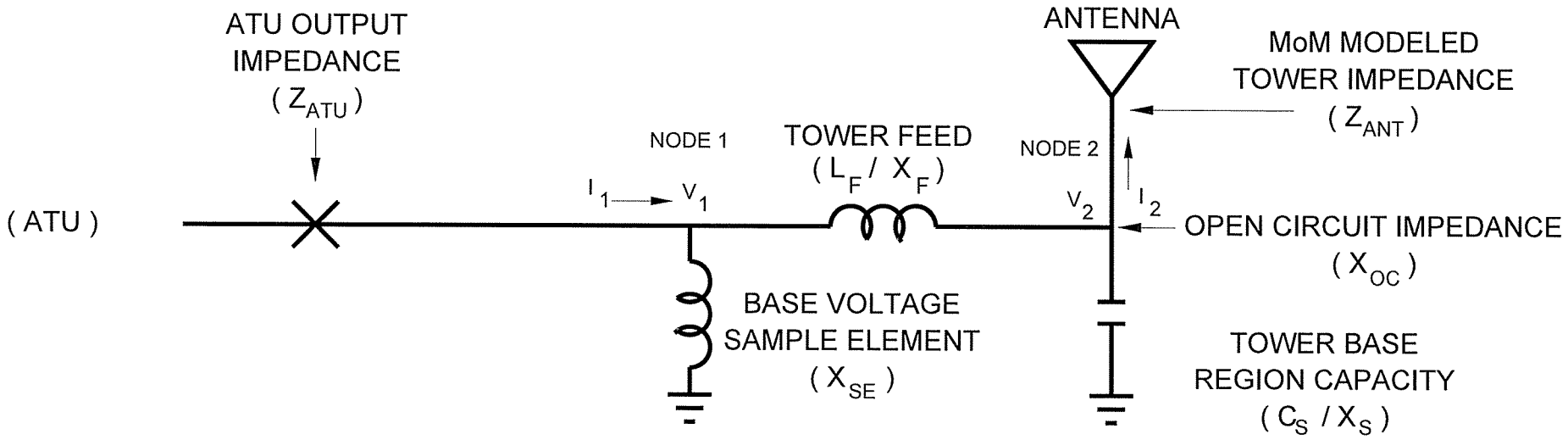


FIG. 3.1

WWJ
TOWER BASE CIRCUIT DIAGRAM
USED TO VERIFY IMPEDANCES

CBS RADIO EAST INC.
DETROIT, MI

CARL E. SMITH CONSULTING ENGINEERS
2324 N. CLEVE-MASS RD., BOX 807
BATH, OHIO 44210-0807
(330) 659-4440

TABLE 3.2

WWJ
TOWER 1 MoM SUMMARY
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.484	22
		0	0	180.8		
2	none	197.8	262.2	0	.509	18
		197.8	262.2	149.5		
3	none	208.4	245.	0	.458	18
		208.4	245.	148.		
4	none	84.2	175.8	0	.509	22
		84.2	175.8	179.7		
5	none	211.3	106.3	0	.458	18
		211.3	106.3	148.4		
6	none	193.2	89.	0	.458	18
		193.2	89.	147.8		

Number of wires = 6
current nodes = 116

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	8.16818	2	8.30556
radius	3	.458	2	.509

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.95	0	1	.0226894	.023071

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	23	0	25.1	0	0	0
2	41	0	29.	0	0	0
3	59	0	23.	0	0	0
4	81	0	28.	0	0	0
5	99	0	18.	0	0	0

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
.95	354.75	-479.71	596.63	306.5	20.16	-.86239	-7.4449

TABLE 3.2 (cont'd)

CURRENT rms
Frequency = .95 MHz
Input power = 4.983E-04 watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.19E-03	53.5	7.05E-04	9.53E-04
2	0	0	8.21818	7.49E-04	20.4	7.02E-04	2.61E-04
3	0	0	16.4364	7.23E-04	343.7	6.94E-04	-2.02E-04
4	0	0	24.6546	9.14E-04	318.1	6.8E-04	-6.11E-04
5	0	0	32.8727	1.18E-03	304.	6.61E-04	-9.79E-04
6	0	0	41.0909	1.46E-03	296.	6.37E-04	-1.31E-03
7	0	0	49.3091	1.71E-03	290.8	6.09E-04	-1.6E-03
8	0	0	57.5273	1.94E-03	287.3	5.77E-04	-1.85E-03
9	0	0	65.7455	2.13E-03	284.7	5.41E-04	-2.06E-03
10	0	0	73.9636	2.28E-03	282.8	5.02E-04	-2.22E-03
11	0	0	82.1818	2.38E-03	281.2	4.61E-04	-2.33E-03
12	0	0	90.4	2.43E-03	279.9	4.18E-04	-2.4E-03
13	0	0	98.6182	2.44E-03	278.8	3.74E-04	-2.41E-03
14	0	0	106.836	2.39E-03	277.9	3.3E-04	-2.37E-03
15	0	0	115.055	2.3E-03	277.1	2.85E-04	-2.28E-03
16	0	0	123.273	2.16E-03	276.4	2.42E-04	-2.15E-03
17	0	0	131.491	1.98E-03	275.8	2.E-04	-1.97E-03
18	0	0	139.709	1.75E-03	275.2	1.59E-04	-1.74E-03
19	0	0	147.927	1.48E-03	274.7	1.22E-04	-1.48E-03
20	0	0	156.146	1.18E-03	274.2	8.7E-05	-1.18E-03
21	0	0	164.364	8.44E-04	273.8	5.55E-05	-8.42E-04
22	0	0	172.582	4.7E-04	273.3	2.74E-05	-4.69E-04
END	0	0	180.8	0	0	0	0
GND	-26.8445	195.97	0	3.3E-04	275.4	3.13E-05	-3.28E-04
24	-26.8445	195.97	8.30556	3.2E-04	275.5	3.05E-05	-3.18E-04
25	-26.8445	195.97	16.6111	3.1E-04	275.6	3.E-05	-3.08E-04
26	-26.8445	195.97	24.9167	2.98E-04	275.7	2.96E-05	-2.96E-04
27	-26.8445	195.97	33.2222	2.83E-04	275.9	2.92E-05	-2.82E-04
28	-26.8445	195.97	41.5278	2.67E-04	276.2	2.89E-05	-2.65E-04
29	-26.8445	195.97	49.8333	2.49E-04	276.6	2.85E-05	-2.47E-04
30	-26.8445	195.97	58.1389	2.29E-04	277.	2.8E-05	-2.27E-04
31	-26.8445	195.97	66.4445	2.08E-04	277.6	2.74E-05	-2.06E-04
32	-26.8445	195.97	74.75	1.86E-04	278.2	2.66E-05	-1.84E-04
33	-26.8445	195.97	83.0556	1.63E-04	279.	2.56E-05	-1.61E-04
34	-26.8445	195.97	91.3611	1.41E-04	279.9	2.43E-05	-1.39E-04
35	-26.8445	195.97	99.6667	1.18E-04	281.	2.26E-05	-1.16E-04
36	-26.8445	195.97	107.972	9.62E-05	282.3	2.05E-05	-9.4E-05
37	-26.8445	195.97	116.278	7.51E-05	283.9	1.8E-05	-7.29E-05
38	-26.8445	195.97	124.583	5.5E-05	285.7	1.49E-05	-5.3E-05
39	-26.8445	195.97	132.889	3.62E-05	287.9	1.11E-05	-3.44E-05
40	-26.8445	195.97	141.195	1.85E-05	290.6	6.5E-06	-1.73E-05
END	-26.8445	195.97	149.5	0	0	0	0
GND	-88.0736	188.875	0	2.72E-04	269.5	-2.27E-06	-2.72E-04
42	-88.0736	188.875	8.22222	2.63E-04	269.6	-2.05E-06	-2.63E-04
43	-88.0736	188.875	16.4444	2.55E-04	269.6	-1.56E-06	-2.55E-04
44	-88.0736	188.875	24.6667	2.44E-04	269.8	-7.97E-07	-2.44E-04
45	-88.0736	188.875	32.8889	2.32E-04	270.1	2.08E-07	-2.32E-04
46	-88.0736	188.875	41.1111	2.19E-04	270.4	1.41E-06	-2.19E-04
47	-88.0736	188.875	49.3333	2.04E-04	270.8	2.75E-06	-2.04E-04
48	-88.0736	188.875	57.5556	1.87E-04	271.3	4.17E-06	-1.87E-04
49	-88.0736	188.875	65.7778	1.7E-04	271.9	5.6E-06	-1.7E-04
50	-88.0736	188.875	74.	1.52E-04	272.6	6.95E-06	-1.52E-04
51	-88.0736	188.875	82.2222	1.34E-04	273.5	8.14E-06	-1.33E-04
52	-88.0736	188.875	90.4444	1.15E-04	274.5	9.08E-06	-1.15E-04

TABLE 3.2 (cont'd)

53	-88.0736	188.875	98.6667	9.68E-05	275.7	9.68E-06	-9.63E-05
54	-88.0736	188.875	106.889	7.89E-05	277.2	9.85E-06	-7.83E-05
55	-88.0736	188.875	115.111	6.16E-05	278.9	9.51E-06	-6.09E-05
56	-88.0736	188.875	123.333	4.52E-05	280.9	8.54E-06	-4.44E-05
57	-88.0736	188.875	131.556	2.98E-05	283.3	6.84E-06	-2.9E-05
58	-88.0736	188.875	139.778	1.53E-05	286.2	4.25E-06	-1.47E-05
END	-88.0736	188.875	148.	0	0	0	0
GND	-83.9739	-6.16666	0	4.52E-04	342.5	4.31E-04	-1.36E-04
60	-83.9739	-6.16666	8.16818	4.39E-04	342.6	4.19E-04	-1.31E-04
61	-83.9739	-6.16666	16.3364	4.27E-04	343.1	4.08E-04	-1.24E-04
62	-83.9739	-6.16666	24.5046	4.11E-04	343.8	3.95E-04	-1.14E-04
63	-83.9739	-6.16666	32.6727	3.93E-04	344.9	3.79E-04	-1.02E-04
64	-83.9739	-6.16666	40.8409	3.72E-04	346.3	3.62E-04	-8.79E-05
65	-83.9739	-6.16666	49.0091	3.5E-04	348.1	3.42E-04	-7.23E-05
66	-83.9739	-6.16666	57.1773	3.25E-04	350.1	3.21E-04	-5.6E-05
67	-83.9739	-6.16666	65.3455	3.E-04	352.4	2.98E-04	-3.95E-05
68	-83.9739	-6.16666	73.5136	2.75E-04	355.1	2.74E-04	-2.36E-05
69	-83.9739	-6.16666	81.6818	2.49E-04	358.	2.49E-04	-8.69E-06
70	-83.9739	-6.16666	89.85	2.24E-04	1.2	2.24E-04	4.65E-06
71	-83.9739	-6.16666	98.0182	1.99E-04	4.6	1.98E-04	1.61E-05
72	-83.9739	-6.16666	106.186	1.75E-04	8.3	1.73E-04	2.52E-05
73	-83.9739	-6.16666	114.355	1.52E-04	12.1	1.49E-04	3.19E-05
74	-83.9739	-6.16666	122.523	1.3E-04	16.1	1.25E-04	3.61E-05
75	-83.9739	-6.16666	130.691	1.09E-04	20.3	1.02E-04	3.77E-05
76	-83.9739	-6.16666	138.859	8.89E-05	24.5	8.09E-05	3.69E-05
77	-83.9739	-6.16666	147.027	6.99E-05	28.8	6.13E-05	3.37E-05
78	-83.9739	-6.16666	155.195	5.19E-05	33.2	4.34E-05	2.85E-05
79	-83.9739	-6.16666	163.364	3.48E-05	37.8	2.75E-05	2.13E-05
80	-83.9739	-6.16666	171.532	1.82E-05	42.5	1.34E-05	1.23E-05
END	-83.9739	-6.16666	179.7	0	0	0	0
GND	-59.3049	-202.807	0	2.63E-04	267.4	-1.21E-05	-2.63E-04
82	-59.3049	-202.807	8.24444	2.55E-04	267.4	-1.15E-05	-2.55E-04
83	-59.3049	-202.807	16.4889	2.47E-04	267.5	-1.07E-05	-2.46E-04
84	-59.3049	-202.807	24.7333	2.37E-04	267.7	-9.57E-06	-2.37E-04
85	-59.3049	-202.807	32.9778	2.25E-04	267.9	-8.1E-06	-2.25E-04
86	-59.3049	-202.807	41.2222	2.12E-04	268.3	-6.37E-06	-2.12E-04
87	-59.3049	-202.807	49.4667	1.97E-04	268.7	-4.44E-06	-1.97E-04
88	-59.3049	-202.807	57.7111	1.82E-04	269.2	-2.38E-06	-1.82E-04
89	-59.3049	-202.807	65.9556	1.65E-04	269.9	-2.88E-07	-1.65E-04
90	-59.3049	-202.807	74.2	1.47E-04	270.7	1.75E-06	-1.47E-04
91	-59.3049	-202.807	82.4444	1.3E-04	271.6	3.64E-06	-1.3E-04
92	-59.3049	-202.807	90.6889	1.12E-04	272.7	5.28E-06	-1.12E-04
93	-59.3049	-202.807	98.9333	9.39E-05	274.	6.56E-06	-9.37E-05
94	-59.3049	-202.807	107.178	7.66E-05	275.5	7.38E-06	-7.62E-05
95	-59.3049	-202.807	115.422	5.98E-05	277.3	7.63E-06	-5.93E-05
96	-59.3049	-202.807	123.667	4.39E-05	279.5	7.22E-06	-4.33E-05
97	-59.3049	-202.807	131.911	2.89E-05	282.	6.02E-06	-2.83E-05
98	-59.3049	-202.807	140.156	1.48E-05	285.1	3.86E-06	-1.43E-05
END	-59.3049	-202.807	148.4	0	0	0	0
GND	3.3718	-193.171	0	3.43E-04	280.	5.95E-05	-3.38E-04
100	3.3718	-193.171	8.21111	3.36E-04	280.	5.84E-05	-3.31E-04
101	3.3718	-193.171	16.4222	3.27E-04	280.1	5.73E-05	-3.22E-04
102	3.3718	-193.171	24.6333	3.16E-04	280.2	5.61E-05	-3.11E-04
103	3.3718	-193.171	32.8444	3.02E-04	280.4	5.46E-05	-2.97E-04
104	3.3718	-193.171	41.0556	2.86E-04	280.7	5.29E-05	-2.81E-04
105	3.3718	-193.171	49.2667	2.68E-04	281.	5.1E-05	-2.63E-04
106	3.3718	-193.171	57.4778	2.48E-04	281.4	4.88E-05	-2.43E-04
107	3.3718	-193.171	65.6889	2.26E-04	281.8	4.64E-05	-2.21E-04
108	3.3718	-193.171	73.9	2.03E-04	282.4	4.36E-05	-1.98E-04
109	3.3718	-193.171	82.1111	1.8E-04	283.1	4.06E-05	-1.75E-04
110	3.3718	-193.171	90.3222	1.56E-04	283.8	3.72E-05	-1.51E-04

TABLE 3.2 (cont'd)

111	3.3718	-193.171	98.5333	1.32E-04	284.7	3.35E-05	-1.27E-04
112	3.3718	-193.171	106.744	1.08E-04	285.8	2.94E-05	-1.04E-04
113	3.3718	-193.171	114.956	8.47E-05	287.1	2.48E-05	-8.09E-05
114	3.3718	-193.171	123.167	6.25E-05	288.5	1.98E-05	-5.92E-05
115	3.3718	-193.171	131.378	4.13E-05	290.3	1.43E-05	-3.88E-05
116	3.3718	-193.171	139.589	2.13E-05	292.4	8.08E-06	-1.97E-05
END	3.3718	-193.171	147.8	0	0	0	0

TABLE 3.3

WWJ
TOWER 1 BASE CIRCUIT ANALYSIS
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 18.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 354.75, -479.71 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	335.13	-473.26
1	2	0.00	18.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	0.975	1.05
2	1.000	0.00

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	0.997E-03	0.140E-02	0.172E-02	54.50
OUTPUT CURRENT I2 (AMPS):	0.997E-03	0.135E-02	0.168E-02	53.52
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	338.20	-456.20	567.89	-53.45

TABLE 3.4

WWJ
TOWER 2 MoM SUMMARY
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.484	22
		0	0	180.8		
2	none	197.8	262.2	0	.509	18
		197.8	262.2	149.5		
3	none	208.4	245.	0	.458	18
		208.4	245.	148.		
4	none	84.2	175.8	0	.509	22
		84.2	175.8	179.7		
5	none	211.3	106.3	0	.458	18
		211.3	106.3	148.4		
6	none	193.2	89.	0	.458	18
		193.2	89.	147.8		

Number of wires = 6
current nodes = 116

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	8.16818	2	8.30556
radius	3	.458	2	.509

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.95	0	1	.0226894	.023071

Sources

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

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	18.	0	0	0
2	41	0	29.	0	0	0
3	59	0	23.	0	0	0
4	81	0	28.	0	0	0
5	99	0	18.	0	0	0

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB

source = 1; node 23, sector 1

TABLE 3.4 (cont'd)

```
.95      737.9    243.87   777.15   18.3     16.377  -1.0621  -6.6365
CURRENT rms
Frequency   = .95 MHz
Input power = 6.109E-04 watts
Efficiency  = 100. %
coordinates in degrees
```

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	3.41E-04	276.1	3.65E-05	-3.39E-04
2	0	0	8.21818	3.34E-04	276.2	3.6E-05	-3.32E-04
3	0	0	16.4364	3.26E-04	276.4	3.62E-05	-3.24E-04
4	0	0	24.6546	3.17E-04	276.7	3.68E-05	-3.15E-04
5	0	0	32.8727	3.06E-04	277.1	3.78E-05	-3.03E-04
6	0	0	41.0909	2.92E-04	277.7	3.9E-05	-2.9E-04
7	0	0	49.3091	2.78E-04	278.4	4.05E-05	-2.75E-04
8	0	0	57.5273	2.61E-04	279.3	4.21E-05	-2.58E-04
9	0	0	65.7455	2.44E-04	280.3	4.37E-05	-2.4E-04
10	0	0	73.9636	2.26E-04	281.6	4.52E-05	-2.21E-04
11	0	0	82.1818	2.07E-04	283.	4.65E-05	-2.02E-04
12	0	0	90.4	1.88E-04	284.6	4.75E-05	-1.82E-04
13	0	0	98.6182	1.69E-04	286.5	4.79E-05	-1.62E-04
14	0	0	106.836	1.49E-04	288.7	4.78E-05	-1.41E-04
15	0	0	115.055	1.31E-04	291.1	4.7E-05	-1.22E-04
16	0	0	123.273	1.12E-04	293.8	4.53E-05	-1.03E-04
17	0	0	131.491	9.46E-05	296.8	4.27E-05	-8.44E-05
18	0	0	139.709	7.78E-05	300.2	3.91E-05	-6.72E-05
19	0	0	147.927	6.17E-05	303.8	3.44E-05	-5.12E-05
20	0	0	156.146	4.63E-05	307.8	2.84E-05	-3.66E-05
21	0	0	164.364	3.15E-05	312.1	2.11E-05	-2.34E-05
22	0	0	172.582	1.69E-05	316.8	1.23E-05	-1.16E-05
END	0	0	180.8	0	0	0	0
GND	-26.8445	195.97	0	9.1E-04	341.7	8.64E-04	-2.86E-04
24	-26.8445	195.97	8.30556	1.31E-03	311.2	8.6E-04	-9.82E-04
25	-26.8445	195.97	16.6111	1.65E-03	300.9	8.48E-04	-1.42E-03
26	-26.8445	195.97	24.9167	1.95E-03	295.1	8.28E-04	-1.77E-03
27	-26.8445	195.97	33.2222	2.2E-03	291.4	8.01E-04	-2.05E-03
28	-26.8445	195.97	41.5278	2.4E-03	288.7	7.67E-04	-2.27E-03
29	-26.8445	195.97	49.8333	2.54E-03	286.6	7.27E-04	-2.43E-03
30	-26.8445	195.97	58.1389	2.62E-03	285.	6.8E-04	-2.53E-03
31	-26.8445	195.97	66.4445	2.65E-03	283.7	6.28E-04	-2.57E-03
32	-26.8445	195.97	74.75	2.61E-03	282.7	5.72E-04	-2.55E-03
33	-26.8445	195.97	83.0556	2.52E-03	281.7	5.13E-04	-2.47E-03
34	-26.8445	195.97	91.3611	2.38E-03	280.9	4.51E-04	-2.34E-03
35	-26.8445	195.97	99.6667	2.18E-03	280.2	3.87E-04	-2.15E-03
36	-26.8445	195.97	107.972	1.94E-03	279.6	3.22E-04	-1.91E-03
37	-26.8445	195.97	116.278	1.65E-03	279.	2.57E-04	-1.63E-03
38	-26.8445	195.97	124.583	1.31E-03	278.5	1.93E-04	-1.3E-03
39	-26.8445	195.97	132.889	9.39E-04	278.	1.3E-04	-9.3E-04
40	-26.8445	195.97	141.195	5.24E-04	277.5	6.83E-05	-5.2E-04
END	-26.8445	195.97	149.5	0	0	0	0
GND	-88.0736	188.875	0	6.31E-04	18.9	5.97E-04	2.04E-04
42	-88.0736	188.875	8.22222	6.12E-04	19.	5.78E-04	1.99E-04
43	-88.0736	188.875	16.4444	5.94E-04	19.4	5.6E-04	1.97E-04
44	-88.0736	188.875	24.6667	5.73E-04	20.	5.38E-04	1.96E-04
45	-88.0736	188.875	32.8889	5.49E-04	20.8	5.13E-04	1.95E-04
46	-88.0736	188.875	41.1111	5.22E-04	21.8	4.84E-04	1.94E-04
47	-88.0736	188.875	49.3333	4.92E-04	22.9	4.53E-04	1.92E-04
48	-88.0736	188.875	57.5556	4.59E-04	24.1	4.19E-04	1.88E-04
49	-88.0736	188.875	65.7778	4.23E-04	25.4	3.82E-04	1.81E-04
50	-88.0736	188.875	74.	3.85E-04	26.6	3.44E-04	1.73E-04
51	-88.0736	188.875	82.2222	3.45E-04	27.8	3.05E-04	1.61E-04

TABLE 3.4 (cont'd)

52	-88.0736	188.875	90.4444	3.03E-04	28.9	2.65E-04	1.47E-04
53	-88.0736	188.875	98.6667	2.6E-04	30.	2.25E-04	1.3E-04
54	-88.0736	188.875	106.889	2.16E-04	30.9	1.86E-04	1.11E-04
55	-88.0736	188.875	115.111	1.73E-04	31.7	1.47E-04	9.07E-05
56	-88.0736	188.875	123.333	1.29E-04	32.4	1.09E-04	6.91E-05
57	-88.0736	188.875	131.556	8.66E-05	32.9	7.28E-05	4.7E-05
58	-88.0736	188.875	139.778	4.51E-05	33.3	3.77E-05	2.47E-05
END	-88.0736	188.875	148.	0	0	0	0
GND	-83.9739	-6.16666	0	2.87E-04	268.8	-6.09E-06	-2.86E-04
60	-83.9739	-6.16666	8.16818	2.79E-04	268.8	-5.62E-06	-2.79E-04
61	-83.9739	-6.16666	16.3364	2.72E-04	269.	-4.54E-06	-2.72E-04
62	-83.9739	-6.16666	24.5046	2.63E-04	269.4	-2.86E-06	-2.63E-04
63	-83.9739	-6.16666	32.6727	2.53E-04	269.9	-6.2E-07	-2.53E-04
64	-83.9739	-6.16666	40.8409	2.41E-04	270.5	2.1E-06	-2.41E-04
65	-83.9739	-6.16666	49.0091	2.28E-04	271.3	5.21E-06	-2.28E-04
66	-83.9739	-6.16666	57.1773	2.15E-04	272.3	8.6E-06	-2.14E-04
67	-83.9739	-6.16666	65.3455	2.E-04	273.5	1.21E-05	-2.E-04
68	-83.9739	-6.16666	73.5136	1.85E-04	274.9	1.57E-05	-1.84E-04
69	-83.9739	-6.16666	81.6818	1.69E-04	276.5	1.92E-05	-1.68E-04
70	-83.9739	-6.16666	89.85	1.53E-04	278.4	2.23E-05	-1.51E-04
71	-83.9739	-6.16666	98.0182	1.37E-04	280.6	2.51E-05	-1.35E-04
72	-83.9739	-6.16666	106.186	1.21E-04	283.	2.73E-05	-1.18E-04
73	-83.9739	-6.16666	114.355	1.06E-04	285.8	2.89E-05	-1.02E-04
74	-83.9739	-6.16666	122.523	9.14E-05	288.9	2.96E-05	-8.65E-05
75	-83.9739	-6.16666	130.691	7.72E-05	292.3	2.93E-05	-7.14E-05
76	-83.9739	-6.16666	138.859	6.37E-05	296.1	2.8E-05	-5.72E-05
77	-83.9739	-6.16666	147.027	5.08E-05	300.2	2.56E-05	-4.39E-05
78	-83.9739	-6.16666	155.195	3.85E-05	304.6	2.18E-05	-3.17E-05
79	-83.9739	-6.16666	163.364	2.64E-05	309.3	1.67E-05	-2.05E-05
80	-83.9739	-6.16666	171.532	1.43E-05	314.2	9.99E-06	-1.03E-05
END	-83.9739	-6.16666	179.7	0	0	0	0
GND	-59.3049	-202.807	0	1.33E-04	96.3	-1.47E-05	1.32E-04
82	-59.3049	-202.807	8.24444	1.29E-04	96.4	-1.43E-05	1.28E-04
83	-59.3049	-202.807	16.4889	1.25E-04	96.6	-1.43E-05	1.24E-04
84	-59.3049	-202.807	24.7333	1.2E-04	96.9	-1.43E-05	1.19E-04
85	-59.3049	-202.807	32.9778	1.14E-04	97.3	-1.45E-05	1.13E-04
86	-59.3049	-202.807	41.2222	1.07E-04	97.9	-1.48E-05	1.06E-04
87	-59.3049	-202.807	49.4667	9.95E-05	98.7	-1.51E-05	9.83E-05
88	-59.3049	-202.807	57.7111	9.13E-05	99.7	-1.54E-05	9.E-05
89	-59.3049	-202.807	65.9556	8.28E-05	100.9	-1.56E-05	8.13E-05
90	-59.3049	-202.807	74.2	7.39E-05	102.3	-1.58E-05	7.22E-05
91	-59.3049	-202.807	82.4444	6.49E-05	104.	-1.57E-05	6.29E-05
92	-59.3049	-202.807	90.6889	5.58E-05	106.1	-1.55E-05	5.37E-05
93	-59.3049	-202.807	98.9333	4.7E-05	108.5	-1.49E-05	4.45E-05
94	-59.3049	-202.807	107.178	3.83E-05	111.4	-1.4E-05	3.57E-05
95	-59.3049	-202.807	115.422	3.01E-05	114.8	-1.26E-05	2.73E-05
96	-59.3049	-202.807	123.667	2.23E-05	118.7	-1.07E-05	1.95E-05
97	-59.3049	-202.807	131.911	1.49E-05	123.3	-8.17E-06	1.24E-05
98	-59.3049	-202.807	140.156	7.8E-06	128.8	-4.88E-06	6.08E-06
END	-59.3049	-202.807	148.4	0	0	0	0
GND	3.3718	-193.171	0	1.6E-04	104.6	-4.03E-05	1.55E-04
100	3.3718	-193.171	8.21111	1.56E-04	104.6	-3.95E-05	1.51E-04
101	3.3718	-193.171	16.4222	1.52E-04	104.8	-3.89E-05	1.47E-04
102	3.3718	-193.171	24.6333	1.47E-04	105.1	-3.82E-05	1.42E-04
103	3.3718	-193.171	32.8444	1.41E-04	105.4	-3.74E-05	1.35E-04
104	3.3718	-193.171	41.0556	1.33E-04	105.9	-3.65E-05	1.28E-04
105	3.3718	-193.171	49.2667	1.24E-04	106.6	-3.55E-05	1.19E-04
106	3.3718	-193.171	57.4778	1.15E-04	107.3	-3.43E-05	1.1E-04
107	3.3718	-193.171	65.6889	1.05E-04	108.3	-3.29E-05	9.95E-05
108	3.3718	-193.171	73.9	9.42E-05	109.4	-3.13E-05	8.88E-05
109	3.3718	-193.171	82.1111	8.32E-05	110.8	-2.95E-05	7.78E-05

TABLE 3.4 (cont'd)

110	3.3718	-193.171	90.3222	7.21E-05	112.3	-2.74E-05	6.67E-05
111	3.3718	-193.171	98.5333	6.09E-05	114.2	-2.5E-05	5.56E-05
112	3.3718	-193.171	106.744	5.E-05	116.4	-2.22E-05	4.48E-05
113	3.3718	-193.171	114.956	3.94E-05	118.9	-1.91E-05	3.45E-05
114	3.3718	-193.171	123.167	2.92E-05	121.9	-1.55E-05	2.48E-05
115	3.3718	-193.171	131.378	1.95E-05	125.4	-1.13E-05	1.59E-05
116	3.3718	-193.171	139.589	1.02E-05	129.6	-6.49E-06	7.85E-06
END	3.3718	-193.171	147.8	0	0	0	0

TABLE 3.5

WWJ
TOWER 2 BASE CIRCUIT ANALYSIS
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 25.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00, -4188.30 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 737.90, 243.87 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS) R	X
1		GROUND	0.00	100000.00
2		GROUND	803.83	108.57
1		2	0.00	25.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	1.005	1.74
2	1.000	0.00

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	0.122E-02	-0.175E-03	0.123E-02	351.85
OUTPUT CURRENT I2 (AMPS):	0.122E-02	-0.404E-03	0.129E-02	341.71
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	801.64	139.83	813.74	9.89

TABLE 3.6

WWJ
TOWER 3 MoM SUMMARY
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.484	22
		0	0	180.8		
2	none	197.8	262.2	0	.509	18
		197.8	262.2	149.5		
3	none	208.4	245.	0	.458	18
		208.4	245.	148.		
4	none	84.2	175.8	0	.509	22
		84.2	175.8	179.7		
5	none	211.3	106.3	0	.458	18
		211.3	106.3	148.4		
6	none	193.2	89.	0	.458	18
		193.2	89.	147.8		

Number of wires = 6
current nodes = 116

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	8.16818	2	8.30556
radius	3	.458	2	.509

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.95	0	1	.0226894	.023071

Sources

source	node	sector	magnitude	phase	type
1	41	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	18.	0	0	0
2	23	0	25.1	0	0	0
3	59	0	23.	0	0	0
4	81	0	28.	0	0	0
5	99	0	18.	0	0	0

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 41, sector 1							
.95	685.97	311.29	753.3	24.4	16.557	-1.0505	-6.6786

TABLE 3.6 (cont'd)

CURRENT rms
Frequency = .95 MHz
Input power = 6.044E-04 watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	2.83E-04	270.4	2.2E-06	-2.83E-04
2	0	0	8.21818	2.77E-04	270.5	2.47E-06	-2.77E-04
3	0	0	16.4364	2.71E-04	270.7	3.37E-06	-2.71E-04
4	0	0	24.6546	2.63E-04	271.1	4.85E-06	-2.63E-04
5	0	0	32.8727	2.54E-04	271.5	6.85E-06	-2.54E-04
6	0	0	41.0909	2.43E-04	272.2	9.3E-06	-2.43E-04
7	0	0	49.3091	2.31E-04	273.	1.21E-05	-2.31E-04
8	0	0	57.5273	2.18E-04	274.	1.52E-05	-2.17E-04
9	0	0	65.7455	2.04E-04	275.2	1.84E-05	-2.03E-04
10	0	0	73.9636	1.89E-04	276.5	2.16E-05	-1.88E-04
11	0	0	82.1818	1.74E-04	278.1	2.46E-05	-1.72E-04
12	0	0	90.4	1.58E-04	280.	2.74E-05	-1.56E-04
13	0	0	98.6182	1.42E-04	282.1	2.97E-05	-1.39E-04
14	0	0	106.836	1.27E-04	284.4	3.15E-05	-1.23E-04
15	0	0	115.055	1.11E-04	287.	3.25E-05	-1.06E-04
16	0	0	123.273	9.61E-05	289.9	3.28E-05	-9.04E-05
17	0	0	131.491	8.16E-05	293.1	3.2E-05	-7.5E-05
18	0	0	139.709	6.75E-05	296.6	3.03E-05	-6.04E-05
19	0	0	147.927	5.4E-05	300.4	2.73E-05	-4.66E-05
20	0	0	156.146	4.1E-05	304.4	2.32E-05	-3.38E-05
21	0	0	164.364	2.81E-05	308.7	1.76E-05	-2.2E-05
22	0	0	172.582	1.52E-05	313.2	1.04E-05	-1.11E-05
END	0	0	180.8	0	0	0	0
GND	-26.8445	195.97	0	6.35E-04	19.1	6.E-04	2.08E-04
24	-26.8445	195.97	8.30556	6.17E-04	19.2	5.82E-04	2.03E-04
25	-26.8445	195.97	16.6111	6.E-04	19.6	5.65E-04	2.01E-04
26	-26.8445	195.97	24.9167	5.8E-04	20.2	5.44E-04	2.E-04
27	-26.8445	195.97	33.2222	5.56E-04	21.	5.19E-04	2.E-04
28	-26.8445	195.97	41.5278	5.3E-04	22.	4.91E-04	1.98E-04
29	-26.8445	195.97	49.8333	5.E-04	23.1	4.6E-04	1.96E-04
30	-26.8445	195.97	58.1389	4.67E-04	24.2	4.26E-04	1.92E-04
31	-26.8445	195.97	66.4445	4.31E-04	25.4	3.9E-04	1.85E-04
32	-26.8445	195.97	74.75	3.93E-04	26.5	3.51E-04	1.75E-04
33	-26.8445	195.97	83.0556	3.52E-04	27.6	3.12E-04	1.63E-04
34	-26.8445	195.97	91.3611	3.1E-04	28.6	2.72E-04	1.48E-04
35	-26.8445	195.97	99.6667	2.66E-04	29.5	2.31E-04	1.31E-04
36	-26.8445	195.97	107.972	2.21E-04	30.3	1.91E-04	1.12E-04
37	-26.8445	195.97	116.278	1.76E-04	30.9	1.51E-04	9.06E-05
38	-26.8445	195.97	124.583	1.32E-04	31.4	1.13E-04	6.88E-05
39	-26.8445	195.97	132.889	8.87E-05	31.7	7.54E-05	4.66E-05
40	-26.8445	195.97	141.195	4.63E-05	31.9	3.93E-05	2.45E-05
END	-26.8445	195.97	149.5	0	0	0	0
GND	-88.0736	188.875	0	9.39E-04	335.6	8.55E-04	-3.88E-04
42	-88.0736	188.875	8.22222	1.35E-03	309.	8.51E-04	-1.05E-03
43	-88.0736	188.875	16.4444	1.69E-03	299.8	8.39E-04	-1.47E-03
44	-88.0736	188.875	24.6667	1.98E-03	294.5	8.2E-04	-1.8E-03
45	-88.0736	188.875	32.8889	2.22E-03	290.9	7.93E-04	-2.07E-03
46	-88.0736	188.875	41.1111	2.4E-03	288.4	7.6E-04	-2.28E-03
47	-88.0736	188.875	49.3333	2.54E-03	286.5	7.2E-04	-2.43E-03
48	-88.0736	188.875	57.5556	2.61E-03	285.	6.74E-04	-2.52E-03
49	-88.0736	188.875	65.7778	2.63E-03	283.7	6.23E-04	-2.55E-03
50	-88.0736	188.875	74.	2.59E-03	282.7	5.68E-04	-2.53E-03
51	-88.0736	188.875	82.2222	2.5E-03	281.8	5.09E-04	-2.44E-03
52	-88.0736	188.875	90.4444	2.35E-03	281.	4.48E-04	-2.31E-03

TABLE 3.6 (cont'd)

53	-88.0736	188.875	98.6667	2.15E-03	280.3	3.84E-04	-2.12E-03
54	-88.0736	188.875	106.889	1.91E-03	279.7	3.2E-04	-1.88E-03
55	-88.0736	188.875	115.111	1.62E-03	279.1	2.56E-04	-1.6E-03
56	-88.0736	188.875	123.333	1.29E-03	278.6	1.92E-04	-1.27E-03
57	-88.0736	188.875	131.556	9.21E-04	278.1	1.3E-04	-9.11E-04
58	-88.0736	188.875	139.778	5.12E-04	277.6	6.8E-05	-5.07E-04
END	-88.0736	188.875	148.	0	0	0	0
GND	-83.9739	-6.16666	0	3.54E-04	278.8	5.44E-05	-3.5E-04
60	-83.9739	-6.16666	8.16818	3.44E-04	278.9	5.33E-05	-3.4E-04
61	-83.9739	-6.16666	16.3364	3.35E-04	279.1	5.29E-05	-3.31E-04
62	-83.9739	-6.16666	24.5046	3.25E-04	279.4	5.28E-05	-3.2E-04
63	-83.9739	-6.16666	32.6727	3.12E-04	279.8	5.3E-05	-3.08E-04
64	-83.9739	-6.16666	40.8409	2.98E-04	280.3	5.34E-05	-2.93E-04
65	-83.9739	-6.16666	49.0091	2.82E-04	281.	5.39E-05	-2.77E-04
66	-83.9739	-6.16666	57.1773	2.65E-04	281.9	5.45E-05	-2.59E-04
67	-83.9739	-6.16666	65.3455	2.47E-04	282.9	5.51E-05	-2.4E-04
68	-83.9739	-6.16666	73.5136	2.28E-04	284.1	5.56E-05	-2.21E-04
69	-83.9739	-6.16666	81.6818	2.08E-04	285.6	5.58E-05	-2.E-04
70	-83.9739	-6.16666	89.85	1.88E-04	287.2	5.56E-05	-1.8E-04
71	-83.9739	-6.16666	98.0182	1.68E-04	289.1	5.5E-05	-1.59E-04
72	-83.9739	-6.16666	106.186	1.49E-04	291.2	5.39E-05	-1.39E-04
73	-83.9739	-6.16666	114.355	1.3E-04	293.7	5.2E-05	-1.19E-04
74	-83.9739	-6.16666	122.523	1.11E-04	296.4	4.95E-05	-9.95E-05
75	-83.9739	-6.16666	130.691	9.35E-05	299.5	4.6E-05	-8.13E-05
76	-83.9739	-6.16666	138.859	7.66E-05	302.9	4.16E-05	-6.43E-05
77	-83.9739	-6.16666	147.027	6.06E-05	306.7	3.62E-05	-4.86E-05
78	-83.9739	-6.16666	155.195	4.55E-05	310.8	2.97E-05	-3.44E-05
79	-83.9739	-6.16666	163.364	3.09E-05	315.2	2.19E-05	-2.17E-05
80	-83.9739	-6.16666	171.532	1.65E-05	320.1	1.27E-05	-1.06E-05
END	-83.9739	-6.16666	179.7	0	0	0	0
GND	-59.3049	-202.807	0	1.54E-04	102.4	-3.31E-05	1.5E-04
82	-59.3049	-202.807	8.24444	1.49E-04	102.5	-3.22E-05	1.46E-04
83	-59.3049	-202.807	16.4889	1.44E-04	102.6	-3.15E-05	1.41E-04
84	-59.3049	-202.807	24.7333	1.38E-04	102.9	-3.09E-05	1.35E-04
85	-59.3049	-202.807	32.9778	1.32E-04	103.3	-3.03E-05	1.28E-04
86	-59.3049	-202.807	41.2222	1.24E-04	103.9	-2.97E-05	1.2E-04
87	-59.3049	-202.807	49.4667	1.15E-04	104.6	-2.9E-05	1.11E-04
88	-59.3049	-202.807	57.7111	1.06E-04	105.5	-2.82E-05	1.02E-04
89	-59.3049	-202.807	65.9556	9.58E-05	106.6	-2.73E-05	9.18E-05
90	-59.3049	-202.807	74.2	8.55E-05	107.9	-2.63E-05	8.14E-05
91	-59.3049	-202.807	82.4444	7.51E-05	109.5	-2.5E-05	7.08E-05
92	-59.3049	-202.807	90.6889	6.46E-05	111.4	-2.35E-05	6.02E-05
93	-59.3049	-202.807	98.9333	5.43E-05	113.6	-2.17E-05	4.98E-05
94	-59.3049	-202.807	107.178	4.43E-05	116.2	-1.96E-05	3.97E-05
95	-59.3049	-202.807	115.422	3.47E-05	119.3	-1.7E-05	3.03E-05
96	-59.3049	-202.807	123.667	2.56E-05	123.	-1.39E-05	2.15E-05
97	-59.3049	-202.807	131.911	1.71E-05	127.3	-1.03E-05	1.36E-05
98	-59.3049	-202.807	140.156	8.9E-06	132.3	-6.E-06	6.58E-06
END	-59.3049	-202.807	148.4	0	0	0	0
GND	3.3718	-193.171	0	1.44E-04	104.3	-3.55E-05	1.39E-04
100	3.3718	-193.171	8.21111	1.41E-04	104.3	-3.48E-05	1.36E-04
101	3.3718	-193.171	16.4222	1.37E-04	104.5	-3.43E-05	1.33E-04
102	3.3718	-193.171	24.6333	1.32E-04	104.8	-3.38E-05	1.28E-04
103	3.3718	-193.171	32.8444	1.27E-04	105.2	-3.32E-05	1.22E-04
104	3.3718	-193.171	41.0556	1.2E-04	105.7	-3.25E-05	1.15E-04
105	3.3718	-193.171	49.2667	1.12E-04	106.4	-3.17E-05	1.08E-04
106	3.3718	-193.171	57.4778	1.04E-04	107.3	-3.07E-05	9.9E-05
107	3.3718	-193.171	65.6889	9.45E-05	108.3	-2.97E-05	8.98E-05
108	3.3718	-193.171	73.9	8.5E-05	109.5	-2.84E-05	8.01E-05
109	3.3718	-193.171	82.1111	7.52E-05	110.9	-2.69E-05	7.02E-05
110	3.3718	-193.171	90.3222	6.52E-05	112.6	-2.51E-05	6.01E-05

TABLE 3.6 (cont'd)

111	3.3718	-193.171	98.5333	5.52E-05	114.6	-2.3E-05	5.02E-05
112	3.3718	-193.171	106.744	4.54E-05	117.	-2.06E-05	4.04E-05
113	3.3718	-193.171	114.956	3.58E-05	119.7	-1.78E-05	3.11E-05
114	3.3718	-193.171	123.167	2.67E-05	122.9	-1.45E-05	2.24E-05
115	3.3718	-193.171	131.378	1.79E-05	126.6	-1.07E-05	1.44E-05
116	3.3718	-193.171	139.589	9.37E-06	130.9	-6.14E-06	7.08E-06
END	3.3718	-193.171	147.8	0	0	0	0

TABLE 3.7

WWJ
TOWER 3 BASE CIRCUIT ANALYSIS
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 29.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 685.97, 311.29 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS) R	X
1		GROUND	0.00	100000.00
2		GROUND	710.95	287.52
1		2	0.00	29.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	1.015	1.98
2	1.000	0.00

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	0.121E-02	-0.499E-03	0.131E-02	337.57
OUTPUT CURRENT I2 (AMPS):	0.121E-02	-0.549E-03	0.133E-02	335.59
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	706.44	320.53	775.75	24.41

TABLE 3.8

WWJ
TOWER 4 MoM SUMMARY
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.484	22
		0	0	180.8		
2	none	197.8	262.2	0	.509	18
		197.8	262.2	149.5		
3	none	208.4	245.	0	.458	18
		208.4	245.	148.		
4	none	84.2	175.8	0	.509	22
		84.2	175.8	179.7		
5	none	211.3	106.3	0	.458	18
		211.3	106.3	148.4		
6	none	193.2	89.	0	.458	18
		193.2	89.	147.8		

Number of wires = 6
current nodes = 116

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	8.16818	2	8.30556
radius	3	.458	2	.509

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.95	0	1	.0226894	.023071

Sources

source	node	sector	magnitude	phase	type
1	59	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	18.	0	0	0
2	23	0	25.1	0	0	0
3	41	0	29.	0	0	0
4	81	0	28.	0	0	0
5	99	0	18.	0	0	0

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 59, sector 1							

TABLE 3.8 (cont'd)

.95 366.08 -473.9 598.83 307.7 19.677 -.88361 -7.3495

CURRENT rms
Frequency = .95 MHz
Input power = 5.104E-04 watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	4.49E-04	342.8	4.29E-04	-1.33E-04
2	0	0	8.21818	4.39E-04	342.9	4.2E-04	-1.29E-04
3	0	0	16.4364	4.28E-04	343.4	4.1E-04	-1.22E-04
4	0	0	24.6546	4.14E-04	344.2	3.98E-04	-1.13E-04
5	0	0	32.8727	3.97E-04	345.3	3.84E-04	-1.01E-04
6	0	0	41.0909	3.77E-04	346.7	3.67E-04	-8.71E-05
7	0	0	49.3091	3.55E-04	348.3	3.48E-04	-7.18E-05
8	0	0	57.5273	3.32E-04	350.3	3.27E-04	-5.58E-05
9	0	0	65.7455	3.08E-04	352.6	3.05E-04	-3.96E-05
10	0	0	73.9636	2.83E-04	355.1	2.82E-04	-2.4E-05
11	0	0	82.1818	2.57E-04	357.9	2.57E-04	-9.38E-06
12	0	0	90.4	2.32E-04	.9	2.32E-04	3.69E-06
13	0	0	98.6182	2.07E-04	4.1	2.07E-04	1.49E-05
14	0	0	106.836	1.83E-04	7.5	1.81E-04	2.38E-05
15	0	0	115.055	1.59E-04	11.	1.56E-04	3.04E-05
16	0	0	123.273	1.36E-04	14.6	1.32E-04	3.44E-05
17	0	0	131.491	1.15E-04	18.3	1.09E-04	3.6E-05
18	0	0	139.709	9.36E-05	22.1	8.68E-05	3.52E-05
19	0	0	147.927	7.36E-05	25.9	6.63E-05	3.22E-05
20	0	0	156.146	5.46E-05	29.8	4.74E-05	2.71E-05
21	0	0	164.364	3.64E-05	33.7	3.03E-05	2.02E-05
22	0	0	172.582	1.9E-05	37.9	1.5E-05	1.17E-05
END	0	0	180.8	0	0	0	0
GND	-26.8445	195.97	0	2.75E-04	268.4	-7.53E-06	-2.75E-04
24	-26.8445	195.97	8.30556	2.67E-04	268.5	-7.15E-06	-2.67E-04
25	-26.8445	195.97	16.6111	2.59E-04	268.6	-6.46E-06	-2.59E-04
26	-26.8445	195.97	24.9167	2.49E-04	268.7	-5.43E-06	-2.49E-04
27	-26.8445	195.97	33.2222	2.37E-04	269.	-4.11E-06	-2.37E-04
28	-26.8445	195.97	41.5278	2.23E-04	269.4	-2.53E-06	-2.23E-04
29	-26.8445	195.97	49.8333	2.08E-04	269.8	-7.74E-07	-2.08E-04
30	-26.8445	195.97	58.1389	1.92E-04	270.3	1.09E-06	-1.92E-04
31	-26.8445	195.97	66.4445	1.74E-04	271.	2.98E-06	-1.74E-04
32	-26.8445	195.97	74.75	1.56E-04	271.8	4.8E-06	-1.56E-04
33	-26.8445	195.97	83.0556	1.37E-04	272.7	6.45E-06	-1.37E-04
34	-26.8445	195.97	91.3611	1.19E-04	273.8	7.82E-06	-1.18E-04
35	-26.8445	195.97	99.6667	9.99E-05	275.1	8.83E-06	-9.95E-05
36	-26.8445	195.97	107.972	8.16E-05	276.6	9.35E-06	-8.1E-05
37	-26.8445	195.97	116.278	6.39E-05	278.4	9.29E-06	-6.32E-05
38	-26.8445	195.97	124.583	4.7E-05	280.5	8.53E-06	-4.62E-05
39	-26.8445	195.97	132.889	3.11E-05	283.	6.96E-06	-3.03E-05
40	-26.8445	195.97	141.195	1.6E-05	286.	4.4E-06	-1.54E-05
END	-26.8445	195.97	149.5	0	0	0	0
GND	-88.0736	188.875	0	3.38E-04	278.3	4.84E-05	-3.34E-04
42	-88.0736	188.875	8.22222	3.27E-04	278.3	4.7E-05	-3.23E-04
43	-88.0736	188.875	16.4444	3.16E-04	278.4	4.59E-05	-3.13E-04
44	-88.0736	188.875	24.6667	3.03E-04	278.5	4.48E-05	-3.E-04
45	-88.0736	188.875	32.8889	2.88E-04	278.7	4.36E-05	-2.85E-04
46	-88.0736	188.875	41.1111	2.71E-04	279.	4.22E-05	-2.68E-04
47	-88.0736	188.875	49.3333	2.52E-04	279.3	4.08E-05	-2.49E-04
48	-88.0736	188.875	57.5556	2.32E-04	279.7	3.92E-05	-2.29E-04
49	-88.0736	188.875	65.7778	2.1E-04	280.2	3.74E-05	-2.07E-04
50	-88.0736	188.875	74.	1.88E-04	280.9	3.54E-05	-1.85E-04
51	-88.0736	188.875	82.2222	1.65E-04	281.6	3.32E-05	-1.62E-04

TABLE 3.8 (cont'd)

52	-88.0736	188.875	90.4444	1.42E-04	282.5	3.07E-05	-1.39E-04
53	-88.0736	188.875	98.6667	1.19E-04	283.5	2.79E-05	-1.16E-04
54	-88.0736	188.875	106.889	9.7E-05	284.7	2.47E-05	-9.38E-05
55	-88.0736	188.875	115.111	7.57E-05	286.2	2.11E-05	-7.27E-05
56	-88.0736	188.875	123.333	5.54E-05	287.9	1.7E-05	-5.27E-05
57	-88.0736	188.875	131.556	3.63E-05	290.	1.24E-05	-3.42E-05
58	-88.0736	188.875	139.778	1.85E-05	292.5	7.1E-06	-1.71E-05
END	-88.0736	188.875	148.	0	0	0	0
GND	-83.9739	-6.16666	0	1.18E-03	52.3	7.22E-04	9.34E-04
60	-83.9739	-6.16666	8.16818	7.55E-04	17.8	7.19E-04	2.31E-04
61	-83.9739	-6.16666	16.3364	7.49E-04	341.7	7.11E-04	-2.35E-04
62	-83.9739	-6.16666	24.5046	9.49E-04	317.2	6.97E-04	-6.45E-04
63	-83.9739	-6.16666	32.6727	1.22E-03	303.8	6.78E-04	-1.01E-03
64	-83.9739	-6.16666	40.8409	1.49E-03	296.	6.54E-04	-1.34E-03
65	-83.9739	-6.16666	49.0091	1.75E-03	291.	6.25E-04	-1.63E-03
66	-83.9739	-6.16666	57.1773	1.97E-03	287.5	5.92E-04	-1.88E-03
67	-83.9739	-6.16666	65.3455	2.16E-03	284.9	5.56E-04	-2.09E-03
68	-83.9739	-6.16666	73.5136	2.3E-03	283.	5.17E-04	-2.24E-03
69	-83.9739	-6.16666	81.6818	2.4E-03	281.4	4.75E-04	-2.35E-03
70	-83.9739	-6.16666	89.85	2.45E-03	280.1	4.31E-04	-2.42E-03
71	-83.9739	-6.16666	98.0182	2.46E-03	279.	3.86E-04	-2.43E-03
72	-83.9739	-6.16666	106.186	2.41E-03	278.1	3.4E-04	-2.39E-03
73	-83.9739	-6.16666	114.355	2.32E-03	277.3	2.95E-04	-2.3E-03
74	-83.9739	-6.16666	122.523	2.17E-03	276.6	2.5E-04	-2.16E-03
75	-83.9739	-6.16666	130.691	1.99E-03	276.	2.07E-04	-1.98E-03
76	-83.9739	-6.16666	138.859	1.76E-03	275.4	1.66E-04	-1.75E-03
77	-83.9739	-6.16666	147.027	1.49E-03	274.9	1.27E-04	-1.49E-03
78	-83.9739	-6.16666	155.195	1.19E-03	274.4	9.13E-05	-1.18E-03
79	-83.9739	-6.16666	163.364	8.49E-04	274.	5.85E-05	-8.47E-04
80	-83.9739	-6.16666	171.532	4.74E-04	273.5	2.9E-05	-4.73E-04
END	-83.9739	-6.16666	179.7	0	0	0	0
GND	-59.3049	-202.807	0	3.29E-04	275.8	3.35E-05	-3.27E-04
82	-59.3049	-202.807	8.24444	3.19E-04	275.9	3.26E-05	-3.17E-04
83	-59.3049	-202.807	16.4889	3.09E-04	276.	3.2E-05	-3.07E-04
84	-59.3049	-202.807	24.7333	2.96E-04	276.1	3.15E-05	-2.95E-04
85	-59.3049	-202.807	32.9778	2.82E-04	276.3	3.1E-05	-2.8E-04
86	-59.3049	-202.807	41.2222	2.65E-04	276.6	3.05E-05	-2.63E-04
87	-59.3049	-202.807	49.4667	2.47E-04	277.	2.99E-05	-2.45E-04
88	-59.3049	-202.807	57.7111	2.27E-04	277.4	2.92E-05	-2.25E-04
89	-59.3049	-202.807	65.9556	2.06E-04	277.9	2.85E-05	-2.04E-04
90	-59.3049	-202.807	74.2	1.84E-04	278.6	2.75E-05	-1.82E-04
91	-59.3049	-202.807	82.4444	1.62E-04	279.4	2.63E-05	-1.6E-04
92	-59.3049	-202.807	90.6889	1.39E-04	280.3	2.49E-05	-1.37E-04
93	-59.3049	-202.807	98.9333	1.17E-04	281.4	2.31E-05	-1.15E-04
94	-59.3049	-202.807	107.178	9.52E-05	282.7	2.09E-05	-9.29E-05
95	-59.3049	-202.807	115.422	7.42E-05	284.2	1.82E-05	-7.2E-05
96	-59.3049	-202.807	123.667	5.44E-05	286.	1.5E-05	-5.23E-05
97	-59.3049	-202.807	131.911	3.57E-05	288.1	1.11E-05	-3.39E-05
98	-59.3049	-202.807	140.156	1.82E-05	290.8	6.46E-06	-1.7E-05
END	-59.3049	-202.807	148.4	0	0	0	0
GND	3.3718	-193.171	0	2.87E-04	272.6	1.29E-05	-2.87E-04
100	3.3718	-193.171	8.21111	2.81E-04	272.6	1.27E-05	-2.81E-04
101	3.3718	-193.171	16.4222	2.74E-04	272.7	1.28E-05	-2.73E-04
102	3.3718	-193.171	24.6333	2.64E-04	272.8	1.31E-05	-2.64E-04
103	3.3718	-193.171	32.8444	2.53E-04	273.1	1.35E-05	-2.53E-04
104	3.3718	-193.171	41.0556	2.4E-04	273.4	1.4E-05	-2.39E-04
105	3.3718	-193.171	49.2667	2.25E-04	273.7	1.46E-05	-2.24E-04
106	3.3718	-193.171	57.4778	2.08E-04	274.2	1.52E-05	-2.07E-04
107	3.3718	-193.171	65.6889	1.9E-04	274.7	1.57E-05	-1.89E-04
108	3.3718	-193.171	73.9	1.71E-04	275.4	1.61E-05	-1.7E-04
109	3.3718	-193.171	82.1111	1.51E-04	276.2	1.62E-05	-1.51E-04

TABLE 3.8 (cont'd)

110	3.3718	-193.171	90.3222	1.31E-04	277.1	1.61E-05	-1.3E-04
111	3.3718	-193.171	98.5333	1.11E-04	278.1	1.57E-05	-1.1E-04
112	3.3718	-193.171	106.744	9.15E-05	279.3	1.48E-05	-9.02E-05
113	3.3718	-193.171	114.956	7.21E-05	280.8	1.34E-05	-7.08E-05
114	3.3718	-193.171	123.167	5.33E-05	282.4	1.15E-05	-5.21E-05
115	3.3718	-193.171	131.378	3.55E-05	284.4	8.8E-06	-3.43E-05
116	3.3718	-193.171	139.589	1.83E-05	286.7	5.27E-06	-1.76E-05
END	3.3718	-193.171	147.8	0	0	0	0

TABLE 3.9

WWJ
TOWER 4 BASE CIRCUIT ANALYSIS
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 23.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 366.08, -473.90 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS) R	X
1		GROUND	0.00	100000.00
2		GROUND	346.06	-468.22
1		2	0.00	23.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	0.969	1.39
2	1.000	0.00

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	0.102E-02	0.137E-02	0.171E-02	53.33
OUTPUT CURRENT I2 (AMPS):	0.102E-02	0.132E-02	0.167E-02	52.31
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	349.16	-445.99	566.41	-51.94

TABLE 3.10

WWJ
TOWER 5 MoM SUMMARY
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.484	22
		0	0	180.8		
2	none	197.8	262.2	0	.509	18
		197.8	262.2	149.5		
3	none	208.4	245.	0	.458	18
		208.4	245.	148.		
4	none	84.2	175.8	0	.509	22
		84.2	175.8	179.7		
5	none	211.3	106.3	0	.458	18
		211.3	106.3	148.4		
6	none	193.2	89.	0	.458	18
		193.2	89.	147.8		

Number of wires = 6
current nodes = 116

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	8.16818	2	8.30556
radius	3	.458	2	.509

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.95	0	1	.0226894	.023071

Sources

source	node	sector	magnitude	phase	type
1	81	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	18.	0	0	0
2	23	0	25.1	0	0	0
3	41	0	29.	0	0	0
4	59	0	23.	0	0	0
5	99	0	18.	0	0	0

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 81, sector 1							

TABLE 3.10 (cont'd)

.95 706.7 296.68 766.45 22.8 16.636 -1.0455 -6.6969

CURRENT rms
Frequency = .95 MHz
Input power = 6.015E-04 watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	2.73E-04	268.2	-8.49E-06	-2.73E-04
2	0	0	8.21818	2.68E-04	268.3	-8.E-06	-2.68E-04
3	0	0	16.4364	2.62E-04	268.5	-6.88E-06	-2.62E-04
4	0	0	24.6546	2.54E-04	268.8	-5.13E-06	-2.54E-04
5	0	0	32.8727	2.45E-04	269.3	-2.81E-06	-2.45E-04
6	0	0	41.0909	2.35E-04	270.	1.73E-08	-2.35E-04
7	0	0	49.3091	2.23E-04	270.8	3.25E-06	-2.23E-04
8	0	0	57.5273	2.1E-04	271.8	6.77E-06	-2.1E-04
9	0	0	65.7455	1.97E-04	273.	1.05E-05	-1.96E-04
10	0	0	73.9636	1.82E-04	274.5	1.42E-05	-1.82E-04
11	0	0	82.1818	1.67E-04	276.1	1.78E-05	-1.67E-04
12	0	0	90.4	1.52E-04	278.	2.11E-05	-1.51E-04
13	0	0	98.6182	1.37E-04	280.1	2.4E-05	-1.35E-04
14	0	0	106.836	1.22E-04	282.5	2.64E-05	-1.19E-04
15	0	0	115.055	1.07E-04	285.2	2.81E-05	-1.03E-04
16	0	0	123.273	9.27E-05	288.1	2.89E-05	-8.81E-05
17	0	0	131.491	7.87E-05	291.4	2.88E-05	-7.33E-05
18	0	0	139.709	6.52E-05	295.	2.76E-05	-5.91E-05
19	0	0	147.927	5.22E-05	298.8	2.52E-05	-4.57E-05
20	0	0	156.146	3.96E-05	302.9	2.16E-05	-3.33E-05
21	0	0	164.364	2.73E-05	307.3	1.65E-05	-2.17E-05
22	0	0	172.582	1.48E-05	311.8	9.85E-06	-1.1E-05
END	0	0	180.8	0	0	0	0
GND	-26.8445	195.97	0	1.34E-04	96.5	-1.51E-05	1.33E-04
24	-26.8445	195.97	8.30556	1.3E-04	96.6	-1.48E-05	1.29E-04
25	-26.8445	195.97	16.6111	1.26E-04	96.7	-1.47E-05	1.25E-04
26	-26.8445	195.97	24.9167	1.21E-04	97.1	-1.48E-05	1.2E-04
27	-26.8445	195.97	33.2222	1.15E-04	97.5	-1.51E-05	1.14E-04
28	-26.8445	195.97	41.5278	1.08E-04	98.2	-1.53E-05	1.07E-04
29	-26.8445	195.97	49.8333	1.01E-04	99.	-1.57E-05	9.94E-05
30	-26.8445	195.97	58.1389	9.25E-05	100.	-1.6E-05	9.11E-05
31	-26.8445	195.97	66.4445	8.39E-05	101.2	-1.63E-05	8.23E-05
32	-26.8445	195.97	74.75	7.5E-05	102.7	-1.64E-05	7.32E-05
33	-26.8445	195.97	83.0556	6.59E-05	104.4	-1.64E-05	6.38E-05
34	-26.8445	195.97	91.3611	5.68E-05	106.5	-1.61E-05	5.45E-05
35	-26.8445	195.97	99.6667	4.78E-05	109.	-1.55E-05	4.52E-05
36	-26.8445	195.97	107.972	3.91E-05	111.9	-1.46E-05	3.63E-05
37	-26.8445	195.97	116.278	3.07E-05	115.3	-1.31E-05	2.78E-05
38	-26.8445	195.97	124.583	2.28E-05	119.3	-1.12E-05	1.99E-05
39	-26.8445	195.97	132.889	1.53E-05	124.	-8.54E-06	1.27E-05
40	-26.8445	195.97	141.195	8.05E-06	129.5	-5.12E-06	6.21E-06
END	-26.8445	195.97	149.5	0	0	0	0
GND	-88.0736	188.875	0	1.54E-04	102.3	-3.28E-05	1.5E-04
42	-88.0736	188.875	8.22222	1.49E-04	102.4	-3.19E-05	1.45E-04
43	-88.0736	188.875	16.4444	1.44E-04	102.5	-3.12E-05	1.4E-04
44	-88.0736	188.875	24.6667	1.38E-04	102.8	-3.06E-05	1.34E-04
45	-88.0736	188.875	32.8889	1.31E-04	103.2	-2.99E-05	1.28E-04
46	-88.0736	188.875	41.1111	1.23E-04	103.7	-2.93E-05	1.2E-04
47	-88.0736	188.875	49.3333	1.14E-04	104.4	-2.85E-05	1.11E-04
48	-88.0736	188.875	57.5556	1.05E-04	105.3	-2.77E-05	1.01E-04
49	-88.0736	188.875	65.7778	9.52E-05	106.3	-2.68E-05	9.14E-05
50	-88.0736	188.875	74.	8.5E-05	107.6	-2.57E-05	8.1E-05

TABLE 3.10 (cont'd)

51	-88.0736	188.875	82.2222	7.46E-05	109.1	-2.44E-05	7.05E-05
52	-88.0736	188.875	90.4444	6.41E-05	110.9	-2.29E-05	5.99E-05
53	-88.0736	188.875	98.6667	5.39E-05	113.	-2.11E-05	4.96E-05
54	-88.0736	188.875	106.889	4.39E-05	115.6	-1.9E-05	3.96E-05
55	-88.0736	188.875	115.111	3.44E-05	118.6	-1.64E-05	3.02E-05
56	-88.0736	188.875	123.333	2.53E-05	122.2	-1.35E-05	2.14E-05
57	-88.0736	188.875	131.556	1.68E-05	126.4	-9.98E-06	1.36E-05
58	-88.0736	188.875	139.778	8.76E-06	131.4	-5.79E-06	6.57E-06
END	-88.0736	188.875	148.	0	0	0	0
GND	-83.9739	-6.16666	0	3.44E-04	276.4	3.81E-05	-3.42E-04
60	-83.9739	-6.16666	8.16818	3.35E-04	276.4	3.75E-05	-3.33E-04
61	-83.9739	-6.16666	16.3364	3.26E-04	276.6	3.75E-05	-3.24E-04
62	-83.9739	-6.16666	24.5046	3.16E-04	276.9	3.79E-05	-3.14E-04
63	-83.9739	-6.16666	32.6727	3.04E-04	277.3	3.86E-05	-3.01E-04
64	-83.9739	-6.16666	40.8409	2.9E-04	277.9	3.97E-05	-2.87E-04
65	-83.9739	-6.16666	49.0091	2.74E-04	278.6	4.1E-05	-2.71E-04
66	-83.9739	-6.16666	57.1773	2.58E-04	279.5	4.23E-05	-2.54E-04
67	-83.9739	-6.16666	65.3455	2.4E-04	280.5	4.37E-05	-2.36E-04
68	-83.9739	-6.16666	73.5136	2.21E-04	281.7	4.5E-05	-2.17E-04
69	-83.9739	-6.16666	81.6818	2.02E-04	283.2	4.61E-05	-1.97E-04
70	-83.9739	-6.16666	89.85	1.83E-04	284.9	4.69E-05	-1.77E-04
71	-83.9739	-6.16666	98.0182	1.64E-04	286.8	4.73E-05	-1.57E-04
72	-83.9739	-6.16666	106.186	1.45E-04	289.	4.7E-05	-1.37E-04
73	-83.9739	-6.16666	114.355	1.26E-04	291.5	4.61E-05	-1.17E-04
74	-83.9739	-6.16666	122.523	1.08E-04	294.3	4.44E-05	-9.84E-05
75	-83.9739	-6.16666	130.691	9.08E-05	297.4	4.18E-05	-8.06E-05
76	-83.9739	-6.16666	138.859	7.44E-05	300.9	3.83E-05	-6.38E-05
77	-83.9739	-6.16666	147.027	5.89E-05	304.8	3.36E-05	-4.84E-05
78	-83.9739	-6.16666	155.195	4.42E-05	309.	2.78E-05	-3.44E-05
79	-83.9739	-6.16666	163.364	3.01E-05	313.5	2.07E-05	-2.18E-05
80	-83.9739	-6.16666	171.532	1.61E-05	318.4	1.21E-05	-1.07E-05
END	-83.9739	-6.16666	179.7	0	0	0	0
GND	-59.3049	-202.807	0	9.23E-04	337.2	8.51E-04	-3.57E-04
82	-59.3049	-202.807	8.24444	1.33E-03	309.7	8.47E-04	-1.02E-03
83	-59.3049	-202.807	16.4889	1.66E-03	300.1	8.35E-04	-1.44E-03
84	-59.3049	-202.807	24.7333	1.95E-03	294.7	8.16E-04	-1.78E-03
85	-59.3049	-202.807	32.9778	2.19E-03	291.1	7.89E-04	-2.05E-03
86	-59.3049	-202.807	41.2222	2.38E-03	288.5	7.56E-04	-2.26E-03
87	-59.3049	-202.807	49.4667	2.51E-03	286.5	7.16E-04	-2.41E-03
88	-59.3049	-202.807	57.7111	2.59E-03	285.	6.7E-04	-2.5E-03
89	-59.3049	-202.807	65.9556	2.61E-03	283.7	6.19E-04	-2.54E-03
90	-59.3049	-202.807	74.2	2.58E-03	282.6	5.64E-04	-2.51E-03
91	-59.3049	-202.807	82.4444	2.48E-03	281.7	5.06E-04	-2.43E-03
92	-59.3049	-202.807	90.6889	2.34E-03	280.9	4.44E-04	-2.3E-03
93	-59.3049	-202.807	98.9333	2.14E-03	280.2	3.81E-04	-2.11E-03
94	-59.3049	-202.807	107.178	1.9E-03	279.6	3.18E-04	-1.87E-03
95	-59.3049	-202.807	115.422	1.61E-03	279.1	2.54E-04	-1.59E-03
96	-59.3049	-202.807	123.667	1.28E-03	278.5	1.9E-04	-1.27E-03
97	-59.3049	-202.807	131.911	9.18E-04	278.	1.28E-04	-9.09E-04
98	-59.3049	-202.807	140.156	5.1E-04	277.6	6.73E-05	-5.06E-04
END	-59.3049	-202.807	148.4	0	0	0	0
GND	3.3718	-193.171	0	6.26E-04	17.7	5.96E-04	1.9E-04
100	3.3718	-193.171	8.21111	6.13E-04	17.8	5.84E-04	1.87E-04
101	3.3718	-193.171	16.4222	5.99E-04	18.1	5.69E-04	1.86E-04
102	3.3718	-193.171	24.6333	5.82E-04	18.7	5.51E-04	1.86E-04
103	3.3718	-193.171	32.8444	5.6E-04	19.4	5.28E-04	1.86E-04
104	3.3718	-193.171	41.0556	5.35E-04	20.3	5.02E-04	1.85E-04
105	3.3718	-193.171	49.2667	5.07E-04	21.2	4.72E-04	1.83E-04
106	3.3718	-193.171	57.4778	4.75E-04	22.3	4.39E-04	1.8E-04
107	3.3718	-193.171	65.6889	4.39E-04	23.3	4.03E-04	1.74E-04
108	3.3718	-193.171	73.9	4.01E-04	24.4	3.66E-04	1.65E-04

TABLE 3.10 (cont'd)

109	3.3718	-193.171	82.1111	3.61E-04	25.4	3.26E-04	1.54E-04
110	3.3718	-193.171	90.3222	3.18E-04	26.3	2.85E-04	1.41E-04
111	3.3718	-193.171	98.5333	2.74E-04	27.1	2.44E-04	1.25E-04
112	3.3718	-193.171	106.744	2.29E-04	27.9	2.02E-04	1.07E-04
113	3.3718	-193.171	114.956	1.83E-04	28.5	1.61E-04	8.74E-05
114	3.3718	-193.171	123.167	1.38E-04	29.	1.2E-04	6.67E-05
115	3.3718	-193.171	131.378	9.29E-05	29.3	8.1E-05	4.55E-05
116	3.3718	-193.171	139.589	4.87E-05	29.6	4.24E-05	2.4E-05
END	3.3718	-193.171	147.8	0	0	0	0

TABLE 3.11

WWJ
TOWER 5 BASE CIRCUIT ANALYSIS
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 28.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 706.70, 296.68 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	731.06	270.63
1	2	0.00	28.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	1.013	1.91
2	1.000	0.00

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	0.120E-02	-0.455E-03	0.129E-02	339.27
OUTPUT CURRENT I2 (AMPS):	0.120E-02	-0.505E-03	0.130E-02	337.23
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	726.68	303.04	787.33	22.64

TABLE 3.12

WWJ
TOWER 6 MoM SUMMARY
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.484	22
		0	0	180.8		
2	none	197.8	262.2	0	.509	18
		197.8	262.2	149.5		
3	none	208.4	245.	0	.458	18
		208.4	245.	148.		
4	none	84.2	175.8	0	.509	22
		84.2	175.8	179.7		
5	none	211.3	106.3	0	.458	18
		211.3	106.3	148.4		
6	none	193.2	89.	0	.458	18
		193.2	89.	147.8		

Number of wires = 6
current nodes = 116

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	8.16818	2	8.30556
radius	3	.458	2	.509

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.95	0	1	.0226894	.023071

Sources

source	node	sector	magnitude	phase	type
1	99	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	18.	0	0	0
2	23	0	25.1	0	0	0
3	41	0	29.	0	0	0
4	59	0	23.	0	0	0
5	81	0	28.	0	0	0

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 99, sector 1							
.95	666.85	306.82	734.05	24.7	16.173	-1.0755	-6.5885

TABLE 3.12 (cont'd)

CURRENT rms
Frequency = .95 MHz
Input power = 6.188E-04 watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	3.55E-04	280.2	6.29E-05	-3.5E-04
2	0	0	8.21818	3.48E-04	280.3	6.2E-05	-3.42E-04
3	0	0	16.4364	3.4E-04	280.4	6.16E-05	-3.34E-04
4	0	0	24.6546	3.3E-04	280.7	6.15E-05	-3.24E-04
5	0	0	32.8727	3.19E-04	281.2	6.16E-05	-3.12E-04
6	0	0	41.0909	3.05E-04	281.7	6.19E-05	-2.99E-04
7	0	0	49.3091	2.9E-04	282.4	6.23E-05	-2.83E-04
8	0	0	57.5273	2.73E-04	283.3	6.27E-05	-2.66E-04
9	0	0	65.7455	2.55E-04	284.3	6.3E-05	-2.47E-04
10	0	0	73.9636	2.36E-04	285.5	6.31E-05	-2.28E-04
11	0	0	82.1818	2.17E-04	286.9	6.3E-05	-2.07E-04
12	0	0	90.4	1.97E-04	288.5	6.24E-05	-1.87E-04
13	0	0	98.6182	1.77E-04	290.3	6.14E-05	-1.66E-04
14	0	0	106.836	1.57E-04	292.4	5.97E-05	-1.45E-04
15	0	0	115.055	1.37E-04	294.7	5.74E-05	-1.25E-04
16	0	0	123.273	1.18E-04	297.3	5.42E-05	-1.05E-04
17	0	0	131.491	9.97E-05	300.2	5.02E-05	-8.61E-05
18	0	0	139.709	8.2E-05	303.4	4.52E-05	-6.84E-05
19	0	0	147.927	6.51E-05	306.9	3.91E-05	-5.2E-05
20	0	0	156.146	4.89E-05	310.7	3.19E-05	-3.7E-05
21	0	0	164.364	3.32E-05	314.9	2.34E-05	-2.36E-05
22	0	0	172.582	1.78E-05	319.3	1.35E-05	-1.16E-05
END	0	0	180.8	0	0	0	0
GND	-26.8445	195.97	0	1.6E-04	104.1	-3.9E-05	1.55E-04
24	-26.8445	195.97	8.30556	1.55E-04	104.2	-3.8E-05	1.5E-04
25	-26.8445	195.97	16.6111	1.5E-04	104.4	-3.72E-05	1.45E-04
26	-26.8445	195.97	24.9167	1.44E-04	104.6	-3.65E-05	1.4E-04
27	-26.8445	195.97	33.2222	1.37E-04	105.1	-3.57E-05	1.33E-04
28	-26.8445	195.97	41.5278	1.29E-04	105.7	-3.49E-05	1.24E-04
29	-26.8445	195.97	49.8333	1.2E-04	106.4	-3.39E-05	1.15E-04
30	-26.8445	195.97	58.1389	1.11E-04	107.3	-3.29E-05	1.06E-04
31	-26.8445	195.97	66.4445	1.E-04	108.4	-3.17E-05	9.52E-05
32	-26.8445	195.97	74.75	8.97E-05	109.8	-3.03E-05	8.44E-05
33	-26.8445	195.97	83.0556	7.88E-05	111.4	-2.87E-05	7.34E-05
34	-26.8445	195.97	91.3611	6.79E-05	113.3	-2.68E-05	6.24E-05
35	-26.8445	195.97	99.6667	5.71E-05	115.5	-2.46E-05	5.15E-05
36	-26.8445	195.97	107.972	4.66E-05	118.2	-2.21E-05	4.11E-05
37	-26.8445	195.97	116.278	3.66E-05	121.4	-1.91E-05	3.13E-05
38	-26.8445	195.97	124.583	2.71E-05	125.1	-1.56E-05	2.22E-05
39	-26.8445	195.97	132.889	1.81E-05	129.4	-1.15E-05	1.4E-05
40	-26.8445	195.97	141.195	9.48E-06	134.6	-6.65E-06	6.75E-06
END	-26.8445	195.97	149.5	0	0	0	0
GND	-88.0736	188.875	0	1.43E-04	103.6	-3.35E-05	1.39E-04
42	-88.0736	188.875	8.22222	1.38E-04	103.6	-3.26E-05	1.34E-04
43	-88.0736	188.875	16.4444	1.34E-04	103.8	-3.19E-05	1.3E-04
44	-88.0736	188.875	24.6667	1.28E-04	104.1	-3.13E-05	1.24E-04
45	-88.0736	188.875	32.8889	1.22E-04	104.5	-3.06E-05	1.18E-04
46	-88.0736	188.875	41.1111	1.15E-04	105.1	-2.99E-05	1.11E-04
47	-88.0736	188.875	49.3333	1.07E-04	105.9	-2.91E-05	1.03E-04
48	-88.0736	188.875	57.5556	9.8E-05	106.8	-2.83E-05	9.38E-05
49	-88.0736	188.875	65.7778	8.88E-05	107.9	-2.73E-05	8.45E-05
50	-88.0736	188.875	74.	7.93E-05	109.3	-2.62E-05	7.49E-05
51	-88.0736	188.875	82.2222	6.97E-05	110.9	-2.49E-05	6.51E-05
52	-88.0736	188.875	90.4444	6.E-05	112.8	-2.33E-05	5.53E-05

TABLE 3.12 (cont'd)

53	-88.0736	188.875	98.6667	5.05E-05	115.1	-2.14E-05	4.57E-05
54	-88.0736	188.875	106.889	4.12E-05	117.9	-1.93E-05	3.64E-05
55	-88.0736	188.875	115.111	3.24E-05	121.1	-1.67E-05	2.77E-05
56	-88.0736	188.875	123.333	2.39E-05	124.8	-1.37E-05	1.97E-05
57	-88.0736	188.875	131.556	1.6E-05	129.2	-1.01E-05	1.24E-05
58	-88.0736	188.875	139.778	8.37E-06	134.4	-5.86E-06	5.98E-06
END	-88.0736	188.875	148.	0	0	0	0
GND	-83.9739	-6.16666	0	2.99E-04	272.4	1.27E-05	-2.99E-04
60	-83.9739	-6.16666	8.16818	2.91E-04	272.5	1.27E-05	-2.91E-04
61	-83.9739	-6.16666	16.3364	2.84E-04	272.7	1.33E-05	-2.83E-04
62	-83.9739	-6.16666	24.5046	2.75E-04	273.	1.45E-05	-2.74E-04
63	-83.9739	-6.16666	32.6727	2.64E-04	273.5	1.61E-05	-2.64E-04
64	-83.9739	-6.16666	40.8409	2.52E-04	274.1	1.81E-05	-2.51E-04
65	-83.9739	-6.16666	49.0091	2.39E-04	274.9	2.05E-05	-2.38E-04
66	-83.9739	-6.16666	57.1773	2.25E-04	275.9	2.3E-05	-2.23E-04
67	-83.9739	-6.16666	65.3455	2.09E-04	277.	2.57E-05	-2.08E-04
68	-83.9739	-6.16666	73.5136	1.93E-04	278.4	2.83E-05	-1.91E-04
69	-83.9739	-6.16666	81.6818	1.77E-04	280.	3.08E-05	-1.74E-04
70	-83.9739	-6.16666	89.85	1.61E-04	281.8	3.29E-05	-1.57E-04
71	-83.9739	-6.16666	98.0182	1.44E-04	283.9	3.47E-05	-1.4E-04
72	-83.9739	-6.16666	106.186	1.28E-04	286.3	3.59E-05	-1.23E-04
73	-83.9739	-6.16666	114.355	1.12E-04	289.	3.64E-05	-1.06E-04
74	-83.9739	-6.16666	122.523	9.64E-05	291.9	3.6E-05	-8.94E-05
75	-83.9739	-6.16666	130.691	8.16E-05	295.2	3.48E-05	-7.38E-05
76	-83.9739	-6.16666	138.859	6.73E-05	298.9	3.25E-05	-5.9E-05
77	-83.9739	-6.16666	147.027	5.37E-05	302.8	2.91E-05	-4.52E-05
78	-83.9739	-6.16666	155.195	4.06E-05	307.	2.45E-05	-3.25E-05
79	-83.9739	-6.16666	163.364	2.79E-05	311.5	1.85E-05	-2.09E-05
80	-83.9739	-6.16666	171.532	1.51E-05	316.2	1.09E-05	-1.04E-05
END	-83.9739	-6.16666	179.7	0	0	0	0
GND	-59.3049	-202.807	0	6.23E-04	17.	5.96E-04	1.83E-04
82	-59.3049	-202.807	8.24444	6.05E-04	17.1	5.78E-04	1.78E-04
83	-59.3049	-202.807	16.4889	5.87E-04	17.5	5.6E-04	1.76E-04
84	-59.3049	-202.807	24.7333	5.66E-04	18.1	5.38E-04	1.76E-04
85	-59.3049	-202.807	32.9778	5.43E-04	18.8	5.14E-04	1.75E-04
86	-59.3049	-202.807	41.2222	5.16E-04	19.7	4.85E-04	1.74E-04
87	-59.3049	-202.807	49.4667	4.85E-04	20.7	4.54E-04	1.72E-04
88	-59.3049	-202.807	57.7111	4.53E-04	21.8	4.2E-04	1.68E-04
89	-59.3049	-202.807	65.9556	4.17E-04	22.9	3.84E-04	1.63E-04
90	-59.3049	-202.807	74.2	3.79E-04	24.1	3.46E-04	1.55E-04
91	-59.3049	-202.807	82.4444	3.39E-04	25.1	3.07E-04	1.44E-04
92	-59.3049	-202.807	90.6889	2.98E-04	26.2	2.67E-04	1.31E-04
93	-59.3049	-202.807	98.9333	2.55E-04	27.1	2.27E-04	1.16E-04
94	-59.3049	-202.807	107.178	2.12E-04	27.9	1.87E-04	9.91E-05
95	-59.3049	-202.807	115.422	1.69E-04	28.5	1.48E-04	8.07E-05
96	-59.3049	-202.807	123.667	1.26E-04	29.1	1.1E-04	6.14E-05
97	-59.3049	-202.807	131.911	8.47E-05	29.5	7.38E-05	4.17E-05
98	-59.3049	-202.807	140.156	4.41E-05	29.7	3.83E-05	2.19E-05
END	-59.3049	-202.807	148.4	0	0	0	0
GND	3.3718	-193.171	0	9.63E-04	335.3	8.75E-04	-4.03E-04
100	3.3718	-193.171	8.21111	1.38E-03	309.3	8.71E-04	-1.06E-03
101	3.3718	-193.171	16.4222	1.71E-03	300.1	8.59E-04	-1.48E-03
102	3.3718	-193.171	24.6333	2.E-03	294.8	8.39E-04	-1.81E-03
103	3.3718	-193.171	32.8444	2.24E-03	291.3	8.12E-04	-2.08E-03
104	3.3718	-193.171	41.0556	2.42E-03	288.7	7.78E-04	-2.29E-03
105	3.3718	-193.171	49.2667	2.55E-03	286.8	7.37E-04	-2.44E-03
106	3.3718	-193.171	57.4778	2.62E-03	285.3	6.9E-04	-2.53E-03
107	3.3718	-193.171	65.6889	2.64E-03	284.	6.38E-04	-2.56E-03
108	3.3718	-193.171	73.9	2.6E-03	282.9	5.82E-04	-2.53E-03
109	3.3718	-193.171	82.1111	2.5E-03	282.	5.22E-04	-2.45E-03
110	3.3718	-193.171	90.3222	2.36E-03	281.2	4.59E-04	-2.31E-03

TABLE 3.12 (cont'd)

111	3.3718	-193.171	98.5333	2.16E-03	280.5	3.94E-04	-2.12E-03
112	3.3718	-193.171	106.744	1.91E-03	279.9	3.28E-04	-1.88E-03
113	3.3718	-193.171	114.956	1.62E-03	279.3	2.62E-04	-1.6E-03
114	3.3718	-193.171	123.167	1.29E-03	278.8	1.97E-04	-1.28E-03
115	3.3718	-193.171	131.378	9.22E-04	278.3	1.33E-04	-9.13E-04
116	3.3718	-193.171	139.589	5.13E-04	277.8	6.98E-05	-5.08E-04
END	3.3718	-193.171	147.8	0	0	0	0

TABLE 3.13

WWJ
TOWER 6 BASE CIRCUIT ANALYSIS
DRIVEN INDIVIDUALLY
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 18.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 666.85, 306.82 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS) R	X
1		GROUND	0.00	100000.00
2		GROUND	690.83	284.53
1		2	0.00	18.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	1.009	1.26
2	1.000	0.00

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	0.124E-02	-0.520E-03	0.134E-02	337.22
OUTPUT CURRENT I2 (AMPS):	0.124E-02	-0.569E-03	0.136E-02	335.29
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	686.63	306.35	751.88	24.04

TABLE 3.14

WWJ DAYTIME
DIRECTIONAL ARRAY MoM SUMMARY
CBS Radio East Inc.
Detroit, MI

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.484	22
		0	0	180.8		
2	none	197.8	262.2	0	.509	18
		197.8	262.2	149.5		
3	none	208.4	245.	0	.458	18
		208.4	245.	148.		
4	none	84.2	175.8	0	.509	22
		84.2	175.8	179.7		
5	none	211.3	106.3	0	.458	18
		211.3	106.3	148.4		
6	none	193.2	89.	0	.458	18
		193.2	89.	147.9		

Number of wires = 6
current nodes = 116

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	8.16818	2	8.30556
radius	3	.458	2	.509

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.95	0	1	.0226894	.023071

Sources

source	node	sector	magnitude	phase	type
1	1	1	6,098.57	73.8	voltage
2	23	1	6,461.66	51.5	voltage
3	41	1	4,926.07	174.6	voltage
4	59	1	4,696.08	197.2	voltage
5	81	1	964.162	128.2	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	99	0	262.13	0	0	0

TABLE 3.14 (cont'd)

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
.95	356.07	-451.11	574.71	308.3	18.639	-.93293	-7.1375
source = 2; node 23, sector 1							
.95	972.83	110.64	979.11	6.5	19.709	-.88217	-7.3559
source = 3; node 41, sector 1							
.95	162.54	439.71	468.79	69.7	27.312	-.63633	-8.6553
source = 4; node 59, sector 1							
.95	-161.79	-1,408.2	1,417.5	263.4	****	****	****
source = 5; node 81, sector 1							
.95	305.5	344.52	460.47	48.4	13.973	-1.2454	-6.0326

CURRENT rms
Frequency = .95 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	7.50349	125.5	-4.36006	6.10674
2	0	0	8.21818	4.92032	93.7	-.314309	4.91027
3	0	0	16.4364	4.71178	59.5	2.39193	4.0595
4	0	0	24.6546	5.77692	34.4	4.76691	3.26334
5	0	0	32.8727	7.33451	19.9	6.89535	2.49983
6	0	0	41.0909	8.97158	11.4	8.79584	1.76707
7	0	0	49.3091	10.5177	5.8	10.4631	1.07071
8	0	0	57.5273	11.8909	2.	11.8835	.419272
9	0	0	65.7455	13.043	359.2	13.0418	-.177915
10	0	0	73.9636	13.9419	357.1	13.9237	-.711695
11	0	0	82.1818	14.5651	355.4	14.5177	-1.17372
12	0	0	90.4	14.8976	354.	14.816	-1.55689
13	0	0	98.6182	14.931	352.9	14.8152	-1.85557
14	0	0	106.836	14.6628	351.9	14.5165	-2.06585
15	0	0	115.055	14.0962	351.1	13.9258	-2.18556
16	0	0	123.273	13.2399	350.4	13.0534	-2.21432
17	0	0	131.491	12.1069	349.8	11.9139	-2.15343
18	0	0	139.709	10.7144	349.2	10.525	-2.00571
19	0	0	147.927	9.08153	348.7	8.90636	-1.77513
20	0	0	156.146	7.22698	348.3	7.07672	-1.46606
21	0	0	164.364	5.16211	347.9	5.04751	-1.08167
22	0	0	172.582	2.87347	347.5	2.80582	-.619846
END	0	0	180.8	0	0	0	0
GND	-26.8445	195.97	0	4.66658	45.	3.29952	3.30002
24	-26.8445	195.97	8.30556	6.82877	3.9	6.81266	.468888
25	-26.8445	195.97	16.6111	9.07293	351.4	8.9712	-1.35489
26	-26.8445	195.97	24.9167	11.0747	344.8	10.6896	-2.89496
27	-26.8445	195.97	33.2222	12.7648	340.7	12.0503	-4.21063
28	-26.8445	195.97	41.5278	14.1193	337.9	13.0803	-5.3159
29	-26.8445	195.97	49.8333	15.1217	335.8	13.7881	-6.209
30	-26.8445	195.97	58.1389	15.7601	334.1	14.1771	-6.88393
31	-26.8445	195.97	66.4445	16.0278	332.8	14.251	-7.33488
32	-26.8445	195.97	74.75	15.9239	331.7	14.0157	-7.5584
33	-26.8445	195.97	83.0556	15.4531	330.7	13.4808	-7.55416

TABLE 3.14 (cont'd)

34	-26.8445	195.97	91.3611	14.6263	329.9	12.6596	-7.32555
35	-26.8445	195.97	99.6667	13.4598	329.3	11.5687	-6.87979
36	-26.8445	195.97	107.972	11.9745	328.7	10.2279	-6.2273
37	-26.8445	195.97	116.278	10.1943	328.1	8.65844	-5.38097
38	-26.8445	195.97	124.583	8.14273	327.7	6.88076	-4.35421
39	-26.8445	195.97	132.889	5.83537	327.3	4.90799	-3.15644
40	-26.8445	195.97	141.195	3.25977	326.9	2.72968	-1.78184
END	-26.8445	195.97	149.5	0	0	0	0
GND	-88.0736	188.875	0	7.43035	104.9	-1.91346	7.17974
42	-88.0736	188.875	8.22222	10.5333	98.8	-1.60643	10.4101
43	-88.0736	188.875	16.4444	12.4774	96.5	-1.40788	12.3978
44	-88.0736	188.875	24.6667	14.0065	95.1	-1.23978	13.9515
45	-88.0736	188.875	32.8889	15.1852	94.1	-1.09214	15.1459
46	-88.0736	188.875	41.1111	16.0324	93.4	-.95955	16.0037
47	-88.0736	188.875	49.3333	16.5519	92.9	-.838409	16.5307
48	-88.0736	188.875	57.5556	16.7446	92.5	-.726099	16.7289
49	-88.0736	188.875	65.7778	16.6129	92.1	-.62079	16.6013
50	-88.0736	188.875	74.	16.1625	91.8	-.521369	16.1541
51	-88.0736	188.875	82.2222	15.4035	91.6	-.4274	15.3976
52	-88.0736	188.875	90.4444	14.3502	91.4	-.339084	14.3462
53	-88.0736	188.875	98.6667	13.0211	91.1	-.25721	13.0185
54	-88.0736	188.875	106.889	11.4381	90.9	-.183087	11.4367
55	-88.0736	188.875	115.111	9.62501	90.7	-.118457	9.62428
56	-88.0736	188.875	123.333	7.60471	90.5	-.0653746	7.60443
57	-88.0736	188.875	131.556	5.39209	90.3	-.0260722	5.39202
58	-88.0736	188.875	139.778	2.97629	90.1	-2.87E-03	2.97629
END	-88.0736	188.875	148.	0	0	0	0
GND	-83.9739	-6.16666	0	2.34259	293.8	.945054	-2.1435
60	-83.9739	-6.16666	8.16818	1.00759	92.2	-.038978	1.00683
61	-83.9739	-6.16666	16.3364	3.1677	102.8	-.70405	3.08847
62	-83.9739	-6.16666	24.5046	5.07697	104.8	-1.29921	4.90792
63	-83.9739	-6.16666	32.6727	6.7864	105.8	-1.84311	6.53132
64	-83.9739	-6.16666	40.8409	8.30954	106.3	-2.33808	7.97382
65	-83.9739	-6.16666	49.0091	9.6412	106.8	-2.78026	9.23162
66	-83.9739	-6.16666	57.1773	10.7697	107.1	-3.1637	10.2946
67	-83.9739	-6.16666	65.3455	11.6818	107.3	-3.482	11.1508
68	-83.9739	-6.16666	73.5136	12.365	107.6	-3.72923	11.7892
69	-83.9739	-6.16666	81.6818	12.8093	107.7	-3.90038	12.2011
70	-83.9739	-6.16666	89.85	13.0077	107.9	-3.99178	12.38
71	-83.9739	-6.16666	98.0182	12.9568	108.	-4.00126	12.3235
72	-83.9739	-6.16666	106.186	12.6572	108.1	-3.92823	12.0322
73	-83.9739	-6.16666	114.355	12.1133	108.2	-3.77378	11.5105
74	-83.9739	-6.16666	122.523	11.3337	108.2	-3.54056	10.7665
75	-83.9739	-6.16666	130.691	10.3299	108.2	-3.23268	9.81103
76	-83.9739	-6.16666	138.859	9.11653	108.3	-2.85544	8.65781
77	-83.9739	-6.16666	147.027	7.70962	108.3	-2.41487	7.32166
78	-83.9739	-6.16666	155.195	6.12453	108.2	-1.91698	5.81679
79	-83.9739	-6.16666	163.364	4.36982	108.2	-1.3658	4.1509
80	-83.9739	-6.16666	171.532	2.43325	108.2	-.758923	2.31187
END	-83.9739	-6.16666	179.7	0	0	0	0
GND	-59.3049	-202.807	0	1.4806	79.7	.263939	1.45688
82	-59.3049	-202.807	8.24444	1.99966	67.4	.767125	1.84666
83	-59.3049	-202.807	16.4889	2.34469	62.5	1.0843	2.07891
84	-59.3049	-202.807	24.7333	2.62089	59.2	1.34053	2.25212
85	-59.3049	-202.807	32.9778	2.83531	56.9	1.54743	2.3758
86	-59.3049	-202.807	41.2222	2.98954	55.1	1.7085	2.45323
87	-59.3049	-202.807	49.4667	3.08352	53.7	1.82457	2.48577
88	-59.3049	-202.807	57.7111	3.1171	52.5	1.89575	2.47436
89	-59.3049	-202.807	65.9556	3.09061	51.5	1.9222	2.42012
90	-59.3049	-202.807	74.2	3.00511	50.7	1.90443	2.32461
91	-59.3049	-202.807	82.4444	2.86247	49.9	1.84343	2.18986

TABLE 3.14 (cont'd)

92	-59.3049	-202.807	90.6889	2.66544	49.2	1.74081	2.01846
93	-59.3049	-202.807	98.9333	2.41749	48.6	1.59867	1.81343
94	-59.3049	-202.807	107.178	2.12271	48.	1.41957	1.5782
95	-59.3049	-202.807	115.422	1.78554	47.5	1.20639	1.31634
96	-59.3049	-202.807	123.667	1.41021	47.	.961891	1.03124
97	-59.3049	-202.807	131.911	.999503	46.5	.687859	.725159
98	-59.3049	-202.807	140.156	.551428	46.	.382763	.396945
END	-59.3049	-202.807	148.4	0	0	0	0
GND	3.3718	-193.171	0	.985852	59.7	.497125	.851335
100	3.3718	-193.171	8.21667	.737267	59.	.380142	.631707
101	3.3718	-193.171	16.4333	.565433	58.3	.297112	.481081
102	3.3718	-193.171	24.65	.410681	57.5	.220411	.346523
103	3.3718	-193.171	32.8667	.268402	56.5	.148207	.223774
104	3.3718	-193.171	41.0833	.138214	54.3	.0806815	.112221
105	3.3718	-193.171	49.3	.0225454	33.8	.0187393	.0125352
106	3.3718	-193.171	57.5167	.0827153	243.8	-.0365031	-.0742249
107	3.3718	-193.171	65.7333	.169245	240.3	-.0839342	-.146966
108	3.3718	-193.171	73.95	.238615	239.1	-.122563	-.204733
109	3.3718	-193.171	82.1667	.289639	238.4	-.151585	-.246806
110	3.3718	-193.171	90.3833	.321608	238.	-.170419	-.272744
111	3.3718	-193.171	98.6	.334206	237.7	-.178723	-.282404
112	3.3718	-193.171	106.817	.327488	237.4	-.176388	-.275928
113	3.3718	-193.171	115.033	.301819	237.2	-.163507	-.253693
114	3.3718	-193.171	123.25	.257734	237.	-.140301	-.2162
115	3.3718	-193.171	131.467	.195614	236.9	-.106927	-.163803
116	3.3718	-193.171	139.683	.114838	236.7	-.063005	-.0960109
END	3.3718	-193.171	147.9	0	0	0	0

TABLE 3.15

WWJ DAYTIME
DIRECTIONAL ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = .95 MHz

tower	field ratio magnitude	phase (deg)
1	1.	0
2	.995	-24.5
3	1.08	93.
4	.9	107.4
5	.201	53.6
6	0	0

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	4,312.34	73.8	7.5035	125.5
23	4,569.08	51.5	4.66657	45.
41	3,483.26	174.6	7.43036	104.9
59	3,320.63	197.2	2.3426	293.8
81	681.766	128.2	1.4806	79.7
99	11.2635	59.7	.985854	59.7

Sum of square of source currents = 283.883
Total power = 50,000. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.0009959	.00138935
Y(1, 2)	7.8839E-05	-.000484289
Y(1, 3)	3.1009E-05	-.000403357
Y(1, 4)	.000596076	-.000147112
Y(1, 5)	-8.4869E-05	-.000395975
Y(1, 6)	-2.0125E-05	-.000409179
Y(2, 1)	7.8838E-05	-.000484288
Y(2, 2)	.00120505	-.000384954
Y(2, 3)	.000846676	.000321934
Y(2, 4)	1.9019E-05	-.000403073
Y(2, 5)	6.2131E-06	.000191847
Y(2, 6)	-8.7396E-06	.000182989
Y(3, 1)	3.1009E-05	-.000403358
Y(3, 2)	.00084668	.000321938
Y(3, 3)	.00119605	-.000534721
Y(3, 4)	9.973E-05	-.000488804
Y(3, 5)	-2.3399E-05	.000216165
Y(3, 6)	-7.9259E-06	.000163078
Y(4, 1)	.000596078	-.000147105
Y(4, 2)	1.9021E-05	-.000403075
Y(4, 3)	9.9732E-05	-.000488804
Y(4, 4)	.00103165	.0013442
Y(4, 5)	-6.0588E-06	-.000474224
Y(4, 6)	-5.728E-05	-.000333301
Y(5, 1)	-8.487E-05	-.000395975

TABLE 3.15 (cont'd)

Y(5, 2)	6.2128E-06	.000191847
Y(5, 3)	-2.3399E-05	.000216165
Y(5, 4)	-6.0611E-06	-.000474223
Y(5, 5)	.00125952	-.00066745
Y(5, 6)	.000750038	3.3884E-05
Y(6, 1)	-2.0126E-05	-.000409179
Y(6, 2)	-8.74E-06	.000182989
Y(6, 3)	-7.9258E-06	.000163078
Y(6, 4)	-5.7281E-05	-.0003333
Y(6, 5)	.00075004	3.3887E-05
Y(6, 6)	.000866682	-.000727592

TOWER IMPEDANCE MATRIX

impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	241.015	-397.456
Z(1, 2)	30.3166	112.138
Z(1, 3)	48.5583	32.2152
Z(1, 4)	85.7498	218.1
Z(1, 5)	61.9617	39.3007
Z(1, 6)	4.87391	105.495
Z(2, 1)	30.3168	112.138
Z(2, 2)	479.537	546.539
Z(2, 3)	-41.5014	-499.061
Z(2, 4)	65.6035	43.9717
Z(2, 5)	-29.2117	-43.8265
Z(2, 6)	-4.85379	-12.4436
Z(3, 1)	48.558	32.2153
Z(3, 2)	-41.5024	-499.058
Z(3, 3)	416.541	563.233
Z(3, 4)	8.39014	104.426
Z(3, 5)	-4.66346	-10.5004
Z(3, 6)	-14.0049	-38.1833
Z(4, 1)	85.7515	218.099
Z(4, 2)	65.6032	43.9713
Z(4, 3)	8.39072	104.426
Z(4, 4)	248.97	-390.692
Z(4, 5)	25.4666	112.131
Z(4, 6)	43.9247	40.2822
Z(5, 1)	61.9619	39.3011
Z(5, 2)	-29.2114	-43.8267
Z(5, 3)	-4.66391	-10.5002
Z(5, 4)	25.4662	112.131
Z(5, 5)	446.859	559.127
Z(5, 6)	-34.7966	-476.683
Z(6, 1)	4.87365	105.496
Z(6, 2)	-4.85335	-12.4437
Z(6, 3)	-14.0051	-38.1833
Z(6, 4)	43.9243	40.2821
Z(6, 5)	-34.7984	-476.682
Z(6, 6)	423.8	797.166

TABLE 3.16

WWJ DAYTIME
TOWER 1 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 18.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 356.07, -451.11 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	337.64	-446.21
1	2	0.00	18.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	4202.553	74.94
2	4312.340	73.80

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	-4.564	6.169	7.674	126.49
OUTPUT CURRENT I2 (AMPS):	-4.357	6.108	7.503	125.50
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	340.55	-428.90	547.66	-51.55

TABLE 3.17

WWJ DAYTIME
TOWER 2 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 25.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00, -4188.30 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 972.83, 110.64 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	971.06	-117.82
1	2	0.00	25.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	4556.490	52.96
2	4569.080	51.50

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	2.483	3.952	4.667	57.86
OUTPUT CURRENT I2 (AMPS):	3.300	3.300	4.667	45.00
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	972.77	-83.45	976.34	-4.90

TABLE 3.18

WWJ DAYTIME
TOWER 3 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 29.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 162.54, 439.71 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	171.52	449.83
1	2	0.00	29.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	3680.077	175.76
2	3483.260	174.60

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	-1.927	7.010	7.270	105.37
OUTPUT CURRENT I2 (AMPS):	-1.910	7.180	7.430	104.90
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	169.88	476.84	506.20	70.39

TABLE 3.19

WWJ DAYTIME
TOWER 4 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 23.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X):-161.79, -1408.20 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	-138.61	-1299.97
1	2	0.00	23.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	3262.545	197.09
2	3320.630	197.20

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	0.995	-2.302	2.508	293.37
OUTPUT CURRENT I2 (AMPS):	0.946	-2.144	2.343	293.80
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	-142.22	-1293.28	1301.08	-96.28

TABLE 3.20

WWJ DAYTIME
TOWER 5 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 28.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 305.50, 344.52 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	317.88	346.11
1	2	0.00	28.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	712.214	130.41
2	681.766	128.20

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	0.238	1.437	1.456	80.58
OUTPUT CURRENT I2 (AMPS):	0.265	1.457	1.481	79.70
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	315.51	373.72	489.09	49.83

TABLE 3.21

WWJ DAYTIME
ANTENNA MONITOR PARAMETERS
RESULTING FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

	Base Voltage Sample Element		Antenna Monitor	
Tower	Magnitude (volts)	Phase (degrees)	Ratio	Phase (degrees)
1	4202.55	74.94	1	0
2	4556.49	52.96	1.084	-22
3	3680.08	175.76	0.876	100.8
4	3262.54	197.09	0.776	122.2
5	712.21	130.41	0.169	55.5

TABLE 3.22

WWJ NIGHTTIME
DIRECTIONAL ARRAY MoM SUMMARY
CBS Radio East Inc.
Detroit, MI

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.484	22
		0	0	180.8		
2	none	197.8	262.2	0	.509	18
		197.8	262.2	149.5		
3	none	208.4	245.	0	.458	18
		208.4	245.	148.		
4	none	84.2	175.8	0	.509	22
		84.2	175.8	179.7		
5	none	211.3	106.3	0	.458	18
		211.3	106.3	148.4		
6	none	193.2	89.	0	.458	18
		193.2	89.	147.9		

Number of wires = 6
current nodes = 116

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	8.16818	2	8.30556
radius	3	.458	2	.509

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.95	0	1	.0226894	.023071

Sources

source	node	sector	magnitude	phase	type
1	1	1	6,883.12	72.5	voltage
2	23	1	3,843.33	50.9	voltage
3	41	1	2,910.27	174.1	voltage
4	59	1	5,095.83	192.5	voltage
5	81	1	3,786.68	184.	voltage
6	99	1	3,786.2	52.5	voltage

TABLE 3.22 (cont'd)

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
.95	353.01	-423.98	551.7	309.8	17.328	-1.0036	-6.8543
source = 2; node 23, sector 1							
.95	799.01	156.66	814.22	11.1	16.597	-1.048	-6.6878
source = 3; node 41, sector 1							
.95	118.97	437.93	453.8	74.8	35.012	-.4963	-9.6662
source = 4; node 59, sector 1							
.95	-106.24	-1,835.6	1,838.7	266.7	****	****	****
source = 5; node 81, sector 1							
.95	182.9	554.13	583.54	71.7	37.482	-.46358	-9.9463
source = 6; node 99, sector 1							
.95	858.71	241.39	892.	15.7	18.536	-.93812	-7.1159

CURRENT rms
Frequency = .95 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	8.82196	122.7	-4.76776	7.42263
2	0	0	8.21818	5.97076	92.3	-.234463	5.96616
3	0	0	16.4364	5.66833	60.5	2.79497	4.93134
4	0	0	24.6546	6.73955	36.	5.45078	3.96364
5	0	0	32.8727	8.39635	21.2	7.82816	3.03622
6	0	0	41.0909	10.1773	12.2	9.94835	2.14654
7	0	0	49.3091	11.8771	6.3	11.8056	1.30134
8	0	0	57.5273	13.3951	2.2	13.3853	.510767
9	0	0	65.7455	14.6722	359.2	14.6706	-.213963
10	0	0	73.9636	15.6699	356.8	15.6461	-.861856
11	0	0	82.1818	16.3611	355.	16.2992	-1.42287
12	0	0	90.4	16.7285	353.5	16.6215	-1.8884
13	0	0	98.6182	16.7616	352.3	16.6096	-2.25168
14	0	0	106.836	16.4575	351.2	16.2653	-2.50788
15	0	0	115.055	15.8195	350.3	15.5952	-2.65433
16	0	0	123.273	14.857	349.6	14.6114	-2.69045
17	0	0	131.491	13.5846	348.9	13.33	-2.61771
18	0	0	139.709	12.0214	348.3	11.7713	-2.4394
19	0	0	147.927	10.1888	347.8	9.95719	-2.16014
20	0	0	156.146	8.10786	347.3	7.90891	-1.78506
21	0	0	164.364	5.79106	346.8	5.63912	-1.31785
22	0	0	172.582	3.22345	346.4	3.13362	-.755684
END	0	0	180.8	0	0	0	0
GND	-26.8445	195.97	0	3.33772	39.8	2.56347	2.13753
24	-26.8445	195.97	8.30556	4.65325	5.3	4.63316	.43185
25	-26.8445	195.97	16.6111	5.93535	353.5	5.89763	-.66813
26	-26.8445	195.97	24.9167	7.07938	347.	6.89661	-1.59826
27	-26.8445	195.97	33.2222	8.04357	342.7	7.67896	-2.39429
28	-26.8445	195.97	41.5278	8.81118	339.6	8.26105	-3.06464
29	-26.8445	195.97	49.8333	9.37087	337.4	8.64833	-3.60826
30	-26.8445	195.97	58.1389	9.7148	335.5	8.84335	-4.02149

TABLE 3.22 (cont'd)

31	-26.8445	195.97	66.4445	9.83874	334.1	8.84894	-4.30083
32	-26.8445	195.97	74.75	9.74191	332.9	8.66919	-4.44408
33	-26.8445	195.97	83.0556	9.4274	331.8	8.31048	-4.45104
34	-26.8445	195.97	91.3611	8.90182	330.9	7.78128	-4.32367
35	-26.8445	195.97	99.6667	8.17509	330.2	7.09213	-4.06617
36	-26.8445	195.97	107.972	7.2599	329.5	6.25531	-3.68474
37	-26.8445	195.97	116.278	6.17075	328.9	5.28403	-3.18705
38	-26.8445	195.97	124.583	4.92187	328.4	4.19081	-2.58106
39	-26.8445	195.97	132.889	3.52255	327.9	2.98371	-1.8724
40	-26.8445	195.97	141.195	1.96536	327.4	1.6565	-1.05767
END	-26.8445	195.97	149.5	0	0	0	0
GND	-88.0736	188.875	0	4.53473	99.3	-.732583	4.47517
42	-88.0736	188.875	8.22222	6.40324	94.8	-.534992	6.38085
43	-88.0736	188.875	16.4444	7.56233	93.1	-.411704	7.55112
44	-88.0736	188.875	24.6667	8.46903	92.1	-.312053	8.46328
45	-88.0736	188.875	32.8889	9.16435	91.4	-.229572	9.16148
46	-88.0736	188.875	41.1111	9.66055	91.	-.160743	9.65921
47	-88.0736	188.875	49.3333	9.96048	90.6	-.103165	9.95994
48	-88.0736	188.875	57.5556	10.0651	90.3	-.0549998	10.065
49	-88.0736	188.875	65.7778	9.97629	90.1	-.014839	9.97628
50	-88.0736	188.875	74.	9.69762	89.9	.0183425	9.69761
51	-88.0736	188.875	82.2222	9.23541	89.7	.0452051	9.2353
52	-88.0736	188.875	90.4444	8.59824	89.6	.0660597	8.59799
53	-88.0736	188.875	98.6667	7.79732	89.4	.080888	7.79691
54	-88.0736	188.875	106.889	6.84582	89.3	.0893655	6.84523
55	-88.0736	188.875	115.111	5.75798	89.1	.0908942	5.75726
56	-88.0736	188.875	123.333	4.54744	88.9	.0846272	4.54665
57	-88.0736	188.875	131.556	3.22311	88.8	.0694604	3.22236
58	-88.0736	188.875	139.778	1.77843	88.6	.0438291	1.77789
END	-88.0736	188.875	148.	0	0	0	0
GND	-83.9739	-6.16666	0	1.95971	285.8	.533002	-1.88583
60	-83.9739	-6.16666	8.16818	1.62598	98.7	-.246615	1.60717
61	-83.9739	-6.16666	16.3364	3.98736	101.2	-.777095	3.9109
62	-83.9739	-6.16666	24.5046	6.05169	102.	-1.25493	5.92015
63	-83.9739	-6.16666	32.6727	7.89236	102.4	-1.69421	7.70838
64	-83.9739	-6.16666	40.8409	9.52601	102.7	-2.09592	9.29258
65	-83.9739	-6.16666	49.0091	10.9478	103.	-2.45611	10.6688
66	-83.9739	-6.16666	57.1773	12.1457	103.2	-2.76907	11.8259
67	-83.9739	-6.16666	65.3455	13.1058	103.4	-3.02883	12.751
68	-83.9739	-6.16666	73.5136	13.8152	103.5	-3.2298	13.4324
69	-83.9739	-6.16666	81.6818	14.2637	103.7	-3.36731	13.8605
70	-83.9739	-6.16666	89.85	14.4439	103.8	-3.43786	14.0288
71	-83.9739	-6.16666	98.0182	14.3532	103.9	-3.43931	13.935
72	-83.9739	-6.16666	106.186	13.9923	103.9	-3.37098	13.5802
73	-83.9739	-6.16666	114.355	13.3669	104.	-3.2337	12.9699
74	-83.9739	-6.16666	122.523	12.4865	104.	-3.0297	12.1134
75	-83.9739	-6.16666	130.691	11.3643	104.1	-2.76255	11.0234
76	-83.9739	-6.16666	138.859	10.0163	104.1	-2.4369	9.71536
77	-83.9739	-6.16666	147.027	8.46053	104.1	-2.05809	8.20639
78	-83.9739	-6.16666	155.195	6.71361	104.1	-1.63143	6.51237
79	-83.9739	-6.16666	163.364	4.78519	104.	-1.16063	4.6423
80	-83.9739	-6.16666	171.532	2.66191	104.	-.643901	2.58285
END	-83.9739	-6.16666	179.7	0	0	0	0
GND	-59.3049	-202.807	0	4.58852	112.3	-1.73751	4.24684
82	-59.3049	-202.807	8.24444	7.00839	105.8	-1.90864	6.74349
83	-59.3049	-202.807	16.4889	8.53109	103.6	-2.00779	8.29145
84	-59.3049	-202.807	24.7333	9.738	102.3	-2.07744	9.51383
85	-59.3049	-202.807	32.9778	10.6811	101.4	-2.12027	10.4685
86	-59.3049	-202.807	41.2222	11.3752	100.8	-2.13608	11.1728
87	-59.3049	-202.807	49.4667	11.8239	100.3	-2.12384	11.6315
88	-59.3049	-202.807	57.7111	12.0276	100.	-2.08264	11.8459

TABLE 3.22 (cont'd)

89	-59.3049	-202.807	65.9556	11.9877	99.7	-2.01204	11.8177
90	-59.3049	-202.807	74.2	11.7084	99.4	-1.91226	11.5511
91	-59.3049	-202.807	82.4444	11.1963	99.2	-1.78426	11.0532
92	-59.3049	-202.807	90.6889	10.4619	99.	-1.62973	10.3341
93	-59.3049	-202.807	98.9333	9.51831	98.8	-1.45107	9.40706
94	-59.3049	-202.807	107.178	8.38142	98.6	-1.25124	8.2875
95	-59.3049	-202.807	115.422	7.06864	98.4	-1.03357	6.99267
96	-59.3049	-202.807	123.667	5.59652	98.2	-.801441	5.53884
97	-59.3049	-202.807	131.911	3.97596	98.1	-.557453	3.93669
98	-59.3049	-202.807	140.156	2.19866	97.9	-.301617	2.17787
END	-59.3049	-202.807	148.4	0	0	0	0
GND	3.3718	-193.171	0	3.0014	36.8	2.40435	1.79653
100	3.3718	-193.171	8.21667	4.39282	3.3	4.38556	.252411
101	3.3718	-193.171	16.4333	5.6663	352.3	5.61538	-.757933
102	3.3718	-193.171	24.65	6.7842	346.2	6.58966	-1.61302
103	3.3718	-193.171	32.8667	7.72022	342.3	7.35539	-2.34522
104	3.3718	-193.171	41.0833	8.46285	339.5	7.92772	-2.9616
105	3.3718	-193.171	49.3	9.00322	337.4	8.31154	-3.46068
106	3.3718	-193.171	57.5167	9.33478	335.7	8.50896	-3.83872
107	3.3718	-193.171	65.7333	9.45399	334.4	8.52247	-4.09212
108	3.3718	-193.171	73.95	9.36042	333.2	8.35587	-4.21862
109	3.3718	-193.171	82.1667	9.05722	332.2	8.01519	-4.21782
110	3.3718	-193.171	90.3833	8.55078	331.4	7.50841	-4.09142
111	3.3718	-193.171	98.6	7.8508	330.7	6.84576	-3.84326
112	3.3718	-193.171	106.817	6.9696	330.1	6.03916	-3.47907
113	3.3718	-193.171	115.033	5.92119	329.5	5.10142	-3.00599
114	3.3718	-193.171	123.25	4.7194	329.	4.0448	-2.43154
115	3.3718	-193.171	131.467	3.37347	328.5	2.87732	-1.76106
116	3.3718	-193.171	139.683	1.87639	328.1	1.59312	-.991356
END	3.3718	-193.171	147.9	0	0	0	0

TABLE 3.23

WWJ NIGHTTIME
DIRECTIONAL ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = .95 MHz

tower	field ratio magnitude	phase (deg)
1	1.	0
2	.548	-22.9
3	.578	90.7
4	.899	103.5
5	.688	100.4
6	.521	-22.9

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	4,867.1	72.5	8.82194	122.7
23	2,717.65	50.9	3.33773	39.8
41	2,057.87	174.1	4.53474	99.3
59	3,603.29	192.5	1.95971	285.8
81	2,677.59	184.	4.58852	112.3
99	2,677.25	52.5	3.00142	36.8

Sum of square of source currents = 286.869
Total power = 50,000. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.00100503	.00133781
Y(1, 2)	7.2545E-05	-.000461746
Y(1, 3)	2.5383E-05	-.000383272
Y(1, 4)	.000598423	-.000190254
Y(1, 5)	7.5845E-06	-.000370419
Y(1, 6)	.000108517	-.000475148
Y(2, 1)	7.2544E-05	-.000461745
Y(2, 2)	.00120883	-.000394715
Y(2, 3)	.000850049	.000313237
Y(2, 4)	1.6109E-05	-.000383973
Y(2, 5)	-3.3831E-05	.000176474
Y(2, 6)	-6.8849E-05	.000206787
Y(3, 1)	2.5383E-05	-.000383272
Y(3, 2)	.000850053	.000313241
Y(3, 3)	.00119906	-.000542469
Y(3, 4)	9.7122E-05	-.000471784
Y(3, 5)	-5.9077E-05	.000202434
Y(3, 6)	-6.1515E-05	.000184242
Y(4, 1)	.000598425	-.000190247
Y(4, 2)	1.6111E-05	-.000383975
Y(4, 3)	9.7124E-05	-.000471784
Y(4, 4)	.00102927	.00130861
Y(4, 5)	7.2251E-05	-.000462498
Y(4, 6)	4.1562E-05	-.000400184
Y(5, 1)	7.5837E-06	-.000370419

TABLE 3.23 (cont'd)

Y(5, 2)	-3.3832E-05	.000176474
Y(5, 3)	-5.9076E-05	.000202434
Y(5, 4)	7.2249E-05	-.000462497
Y(5, 5)	.00119694	-.000503175
Y(5, 6)	.000848205	.000279981
Y(6, 1)	.000108517	-.000475148
Y(6, 2)	-6.885E-05	.000206787
Y(6, 3)	-6.1515E-05	.000184242
Y(6, 4)	4.1561E-05	-.000400184
Y(6, 5)	.000848206	.000279985
Y(6, 6)	.00122666	-.000554722

TOWER IMPEDANCE MATRIX

impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	241.015	-397.457
Z(1, 2)	30.3168	112.138
Z(1, 3)	48.558	32.2155
Z(1, 4)	85.7501	218.101
Z(1, 5)	61.9616	39.3012
Z(1, 6)	4.87338	105.495
Z(2, 1)	30.3171	112.138
Z(2, 2)	479.537	546.538
Z(2, 3)	-41.502	-499.061
Z(2, 4)	65.6037	43.9716
Z(2, 5)	-29.2116	-43.8263
Z(2, 6)	-4.85377	-12.4434
Z(3, 1)	48.5576	32.2158
Z(3, 2)	-41.5031	-499.058
Z(3, 3)	416.542	563.234
Z(3, 4)	8.3898	104.426
Z(3, 5)	-4.66357	-10.5005
Z(3, 6)	-14.005	-38.1834
Z(4, 1)	85.7519	218.1
Z(4, 2)	65.6034	43.9711
Z(4, 3)	8.39051	104.426
Z(4, 4)	248.97	-390.693
Z(4, 5)	25.4668	112.131
Z(4, 6)	43.9243	40.2826
Z(5, 1)	61.9618	39.3015
Z(5, 2)	-29.2114	-43.8266
Z(5, 3)	-4.66393	-10.5004
Z(5, 4)	25.4663	112.132
Z(5, 5)	446.858	559.125
Z(5, 6)	-34.7947	-476.68
Z(6, 1)	4.87345	105.495
Z(6, 2)	-4.8534	-12.4435
Z(6, 3)	-14.0051	-38.1832
Z(6, 4)	43.9239	40.2822
Z(6, 5)	-34.7964	-476.679
Z(6, 6)	423.796	535.032

TABLE 3.24

WWJ NIGHTTIME
TOWER 1 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 18.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 353.01, -423.98 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	335.79	-420.31
1	2	0.00	18.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	4740.960	73.73
2	4867.100	72.50

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	-4.998	7.498	9.011	123.68
OUTPUT CURRENT I2 (AMPS):	-4.766	7.424	8.822	122.70
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	338.51	-402.79	526.14	-49.96

TABLE 3.25

WWJ NIGHTTIME
TOWER 2 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 25.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00, -4188.30 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 799.01, 156.66 OHMS

NODE	TO	NODE	IMPEDANCE (OHMS) R	X
1		GROUND	0.00	100000.00
2		GROUND	829.67	-1.58
1		2	0.00	25.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	2718.728	52.63
2	2717.650	50.90

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	2.083	2.529	3.276	50.53
OUTPUT CURRENT I2 (AMPS):	2.565	2.137	3.338	39.80
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	829.23	30.30	829.78	2.09

TABLE 3.26

WWJ NIGHTTIME
TOWER 3 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 29.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 118.97, 437.93 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	125.44	448.74
1	2	0.00	29.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	2181.495	175.01
2	2057.870	174.10

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	-0.744	4.375	4.438	99.65
OUTPUT CURRENT I2 (AMPS):	-0.733	4.475	4.535	99.30
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	124.25	475.62	491.58	75.36

TABLE 3.27

WWJ NIGHTTIME
TOWER 4 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 23.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X):-106.24, -1835.60 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	-85.96	-1654.64
1	2	0.00	23.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	3553.339	192.46
2	3603.290	192.50

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	0.573	-2.061	2.139	285.52
OUTPUT CURRENT I2 (AMPS):	0.534	-1.886	1.960	285.80
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	-88.83	-1658.62	1661.00	-93.07

TABLE 3.28

WWJ NIGHTTIME
TOWER 5 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 28.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 182.90, 554.13 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	195.93	570.70
1	2	0.00	28.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	2795.400	184.83
2	2677.590	184.00

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	-1.733	4.114	4.464	112.84
OUTPUT CURRENT I2 (AMPS):	-1.741	4.246	4.589	112.30
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	193.60	595.51	626.19	71.99

TABLE 3.29

WWJ NIGHTTIME
TOWER 6 BASE CIRCUIT ANALYSIS
DRIVEN FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

FREQUENCY: 950 kHz

BASE VOLTAGE SAMPLE ELEMENT IMPEDANCE (R,X): 0.00,100000.00 OHMS
TOWER FEED IMPEDANCE (R,X): 0.00, 18.00 OHMS
TOWER BASE REGION IMPEDANCE (R,X): 0.00,-16753.00 OHMS
MoM MODELED TOWER IMPEDANCE (R,X): 858.71, 241.39 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	100000.00
2	GROUND	881.75	199.07
1	2	0.00	18.00

NODE	VOLTAGE (VOLTS) MAGNITUDE	PHASE
1	2689.493	53.61
2	2677.250	52.50

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT CURRENT I1 (AMPS):	2.298	1.879	2.968	39.27
OUTPUT CURRENT I2 (AMPS):	2.403	1.798	3.001	36.80
MODELED ATU OUTPUT IMPEDANCE V1/I1 (OHMS):	877.86	224.33	906.07	14.33

TABLE 3.30

WWJ NIGHTTIME
ANTENNA MONITOR PARAMETERS
RESULTING FROM ARRAY SYNTHESIS
CBS Radio East Inc.
Detroit, MI

	Base Voltage Sample Element		Antenna Monitor	
Tower	Magnitude (volts)	Phase (degrees)	Ratio	Phase (degrees)
1	4,740.96	73.73	1.000	0.0
2	2,718.73	52.63	0.573	-21.1
3	2,181.49	175.01	0.460	101.3
4	3,553.34	192.46	0.749	118.7
5	2,795.40	184.83	0.590	111.1
6	2,689.49	53.61	0.567	-20.1

4.0 REFERENCE FIELD STRENGTH MEASUREMENTS

Reference field strength measurements, measured on the pattern minima radial bearings and center of pattern maxima bearing, were made on the WWJ daytime and nighttime directional patterns. Three measurements were attempted on each of these radial bearings as required by the rules, but because of the proximity of the WWJ transmitter site to Lake Erie, only two points were obtainable on two of the minima radial bearings (104.5° day and 103.5° night). The measurement values, along with GPS coordinates and point descriptions, are listed in Table 4.0 for the daytime directional pattern and Table 4.1 for the nighttime directional pattern. All field strength measurements were made by Derek Gorman using a Potomac Instruments FIM-41, S/N 2086. This meter was last calibrated by Potomac Instruments on August 29, 2013.

TABLE 4.0

WWJ DAYTIME REFERENCE
FIELD STRENGTH MEASUREMENTS
CBS Radio East Inc.
Detroit, MI

Azimuth (Degrees)	Point	Distance (km)	Field Strength (mV/m)	Date	Time (EDT)	GPS Coordinates (NAD 27)	Description
50	1	4.27	25.0	10/2/14	1439	N42-02-38.7 W83-12-00.7	Center of Pointe Moullee road 0.4 km S of Campau Road
50	2	5.03	27.0	10/2/14	1452	N42-02-54.8 W83-11-35.5	Center of the road in front of 35715 Milleville Road
50	3	5.61	5.0	10/2/14	1506	N42-03-06.3 W83-11-15.9	Center of the road in front of 13669 Troyon Drive
104.5	1	0.70	480	10/2/14	1524	N42-01-03.2 W83-13-53.2	Center of US Turnpike Road 0.16 km NE of the driveway to 9501 US Turnpike Road
104.5	2	1.30	165	10/2/14	1538	N42-00-58.6 W83-13-28.4	Center of Roberts Road 0.96 km from US Turnpike Road and 30 m S of a gate to Rockwood Landfill
154.5	1	0.67	120	10/2/14	1554	N42-00-49.8 W83-14-09.8	Center of US Turnpike Road 0.08 km SW of the intersection of US Turnpike Road and Reaume Road
154.5	2	1.02	110	10/2/14	1606	N42-00-39.2 W83-14-03.7	West side of Reaume Road 0.4 km S of the intersection of Reaume Road and US Turnpike Road
154.5	3	1.24	50.0	10/2/14	1615	N42-00-32.7 W83-13-58.8	Center of Reaume Road 46 m E of the entrance to Newport Quarry

TABLE 4.0 (cont'd)

Azimuth (Degrees)	Point	Distance (km)	Field Strength (mV/m)	Date	Time (EDT)	GPS Coordinates (NAD 27)	Description
183	1	0.90	155	10/2/14	1633	N42-00-39.8 W83-14-24.4	Center of US Turnpike Road 0.32 km NE of the intersection of US Turnpike Road and Port Sunlight Road
183	2	3.56	29.0	10/2/14	1644	N41-59-13.6 W83-14-30.2	Center of the road in front of 7093 Lakeview Boulevard
183	3	3.84	28.0	10/2/14	1650	N41-59-04.4 W83-14-30.4	Center of Center Street 23 m E of the intersection of Center Street and Canal Street
211.5	1	3.25	70.0	10/2/14	1707	N41-59-39.0 W83-15-35.8	Center of the road in front of 6075 Masserant Road
211.5	2	3.64	50.0	10/2/14	1715	N41-59-28.2 W83-15-45.0	West side of Strong Road opposite the driveway to 7838 Strong Road
211.5	3	4.78	31.5	10/2/14	1724	N41-58-57.2 W83-16-11.6	South side of Trombley Road opposite a fire hydrant between 5701 and 5717 Trombley Road
273.5	1	3.57	120	10/2/14	1738	N42-01-16.2 W83-16-58.0	Center of the road in front of 9896 Armstrong Road
273.5	2	4.46	67.0	10/2/14	1746	N42-01-17.6 W83-17-35.9	North side of Brandon Road 0.16 km S of the intersection of Brandon Road and Labo Road
273.5	3	5.98	46.0	10/2/14	1756	N42-01-21.4 W83-18-42.3	East side of road in front of 10025 Swan Creek Road
354	1	3.70	1550	10/2/14	1814	N42-03-08.9 W83-14-39.5	North side of Ready Road opposite 7120 Ready Road

TABLE 4.0 (cont'd)

Azimuth (Degrees)	Point	Distance (km)	Field Strength (mV/m)	Date	Time (EDT)	GPS Coordinates (NAD 27)	Description
354	2	4.54	1200	10/2/14	1823	N42-03-35.4 W83-14-43.8	North side of South Huron River Drive opposite the driveway to 7000 South Huron River Drive
354	3	5.35	1050	10/2/14	1834	N42-04-01.6 W83-14-48.2	Center of Road in front of the entrance to Irving Brewer Apartments, 22065 Huron River Drive

TABLE 4.1

WWJ NIGHTTIME REFERENCE
FIELD STRENGTH MEASUREMENTS
CBS Radio East Inc.
Detroit, MI

Azimuth (Degrees)	Point	Distance (km)	Field Strength (mV/m)	Date	Time (EDT)	GPS Coordinates (NAD 27)	Description
103.5	1	0.72	325	10/8/14	1538	N42-01-03.7 W83-13-52.6	Center of US Turnpike Road 0.24 km NE of the driveway to 9501 US Turnpike Road
103.5	2	1.28	175	10/8/14	1550	N42-00-59.3 W83-13-28.5	Center of Roberts Road 0.88 km from US Turnpike Road at a gate to Rockwood Landfill
185	1	0.93	270	10/8/14	1601	N42-00-38.8 W83-14-25.9	Center of US Turnpike Road 0.24 km NE of the intersection of US Turnpike Road and Port Sunlight Road
185	2	2.78	72.0	10/8/14	1612	N41-59-39.8 W83-14-35.3	Port Sunlight Road opposite Masserant Road in the parking area for the Detroit River International Wildlife Refuge by sign
185	3	3.10	57.0	10/8/14	1622	N41-59-29.1 W83-14-35.2	West edge of Port Sunlight Road at the north end of a guardrail 2.0 km south of the intersection of Port Sunlight Road and US Turnpike Road
229	1	3.27	74.0	10/8/14	1635	N41-59-59.1 W83-16-09.4	NW edge of Dixie Highway at the driveway to 18461 Dixie Highway
229	2	4.68	60.0	10/8/14	1643	N41-59-28.9 W83-16-55.2	East side of Trombley Road by a manhole cover in front of 5283 Trombley Road
229	3	5.48	52.0	10/8/14	1650	N41-59-11.9 W83-17-21.2	West edge of Dixie Highway at the driveway to 7500 Dixie Highway

TABLE 4.1 (cont'd)

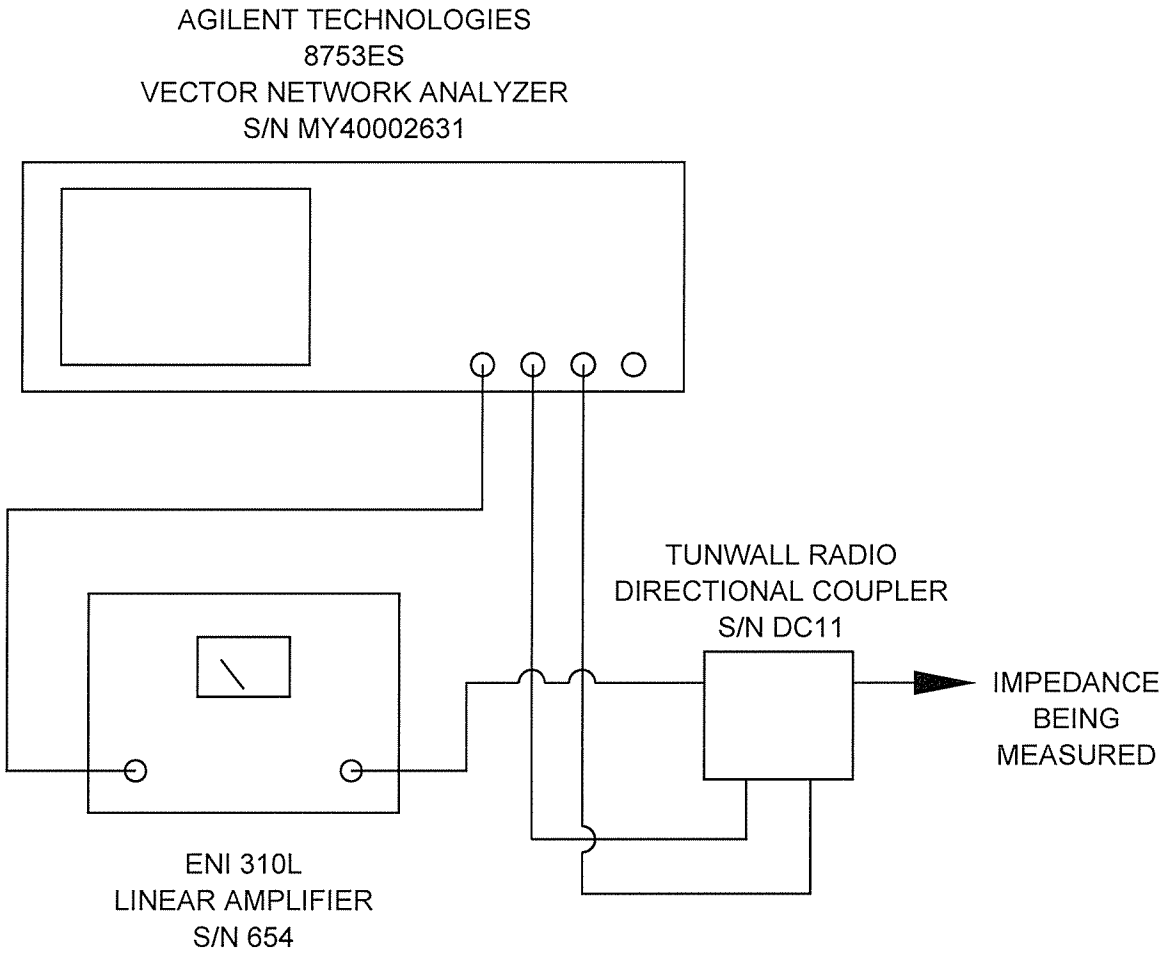
Azimuth (Degrees)	Point	Distance (km)	Field Strength (mV/m)	Date	Time (EDT)	GPS Coordinates (NAD 27)	Description
259.5	1	3.61	66.0	10/8/14	1705	N42-00-47.1 W83-16-57.0	East edge of Armstrong Road opposite the driveway to 9365 Armstrong Road
259.5	2	5.28	42.0	10/8/14	1750	N42-00-39.2 W83-18-08.3	NW edge of Brandon Road at the driveway to 9199 Brandon Road
259.5	3	7.09	24.0	10/8/14	1738	N42-00-26.7 W83-19-25.4	Center of Joann Drive by a manhole cover at the intersection of Joann Drive and Newport Road
354	1	3.70	1800	10/8/14	1804	N42-03-08.9 W83-14-39.5	North side of Ready Road opposite 7120 Ready Road
354	2	4.54	1400	10/8/14	1808	N42-03-35.4 W83-14-43.8	North side of South Huron River Drive opposite the driveway to 7000 South Huron River Drive
354	3	5.35	1250	10/8/14	1814	N42-04-01.6 W83-14-48.2	Center of Road in front of the entrance to Irving Brewer Apartments, 22065 Huron River Drive

5.0 ANTENNA SYSTEM IMPEDANCE MEASUREMENTS

All impedance measurements were conducted on October 22, 2014 by Derek Gorman using the equipment shown in Figure 5.0. This equipment consists of an Agilent Technologies model 8753ES Vector Network Analyzer (VNA), an Electronic Navigation Industries (ENI) model 310L linear amplifier, and a Tunwall Radio directional coupler, as a calibrated measurement system. The system was calibrated with precision standards prior to conducting these measurements.

The WWJ daytime directional common point impedance measurements are tabulated in Table 5.1 and plotted in Figure 5.1. The WWJ nighttime directional common point impedance measurements are tabulated in Table 5.2 and plotted in Figure 5.2. Figure 5.3 is a diagram of the feeder system for the WWJ directional antenna system showing the point at which these impedance measurements were made.

BDCBSRWWJ 1/05/15



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BATH, OHIO 44210-0807
(330) 659-4440

FIG. 5.0

BLOCK DIAGRAM OF
IMPEDANCE MEASURING EQUIPMENT

CBS RADIO EAST INC.
DETROIT, MI

TABLE 5.1

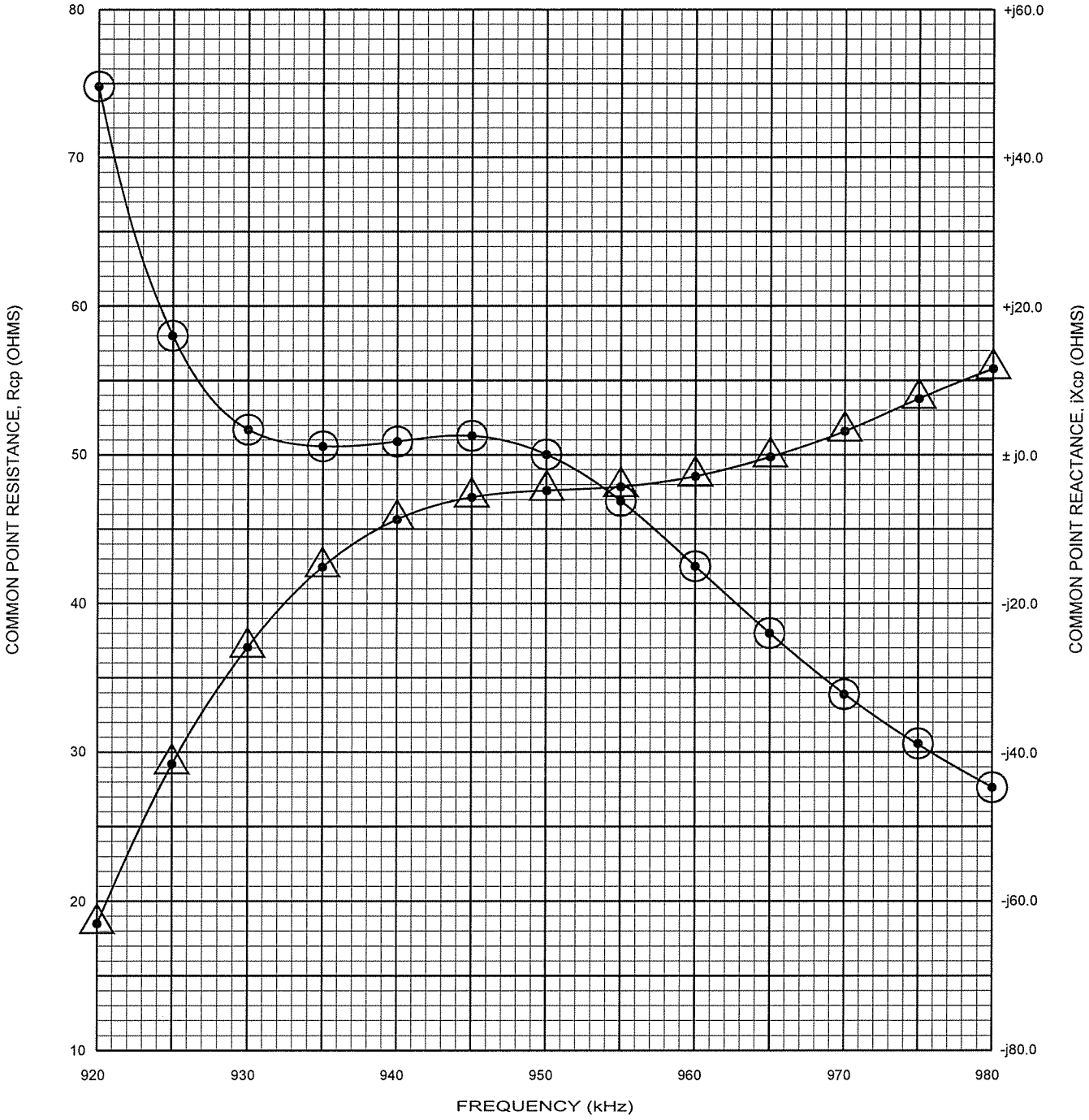
WWJ DAYTIME DIRECTIONAL COMMON
POINT IMPEDANCE MEASUREMENTS
CBS Radio East Inc.
Detroit, MI

Frequency (kHz)	Resistance (ohms)	Reactance (ohms)
920	74.8	-j63.1
925	58.0	-j41.6
930	51.8	-j25.9
935	50.5	-j15.1
940	50.9	-j8.7
945	51.2	-j5.7
*950	50.0	-j4.8
955	46.9	-j4.3
960	42.5	-j2.9
965	38.0	-j0.3
970	33.9	+j3.0
975	30.5	+j6.9
980	27.6	+j10.7

*Operating Frequency

CES-116

CBSIM1 1/7/2015



- Rcp

- jXcp

Zcp = 50.0 - j 4.8 OHMS

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(330) 659-4440

FIG. 5.1

WWJ DAYTIME DIRECTIONAL COMMON POINT IMPEDANCE MEASUREMENTS

CBS RADIO EAST INC.
DETROIT, MI

TABLE 5.2

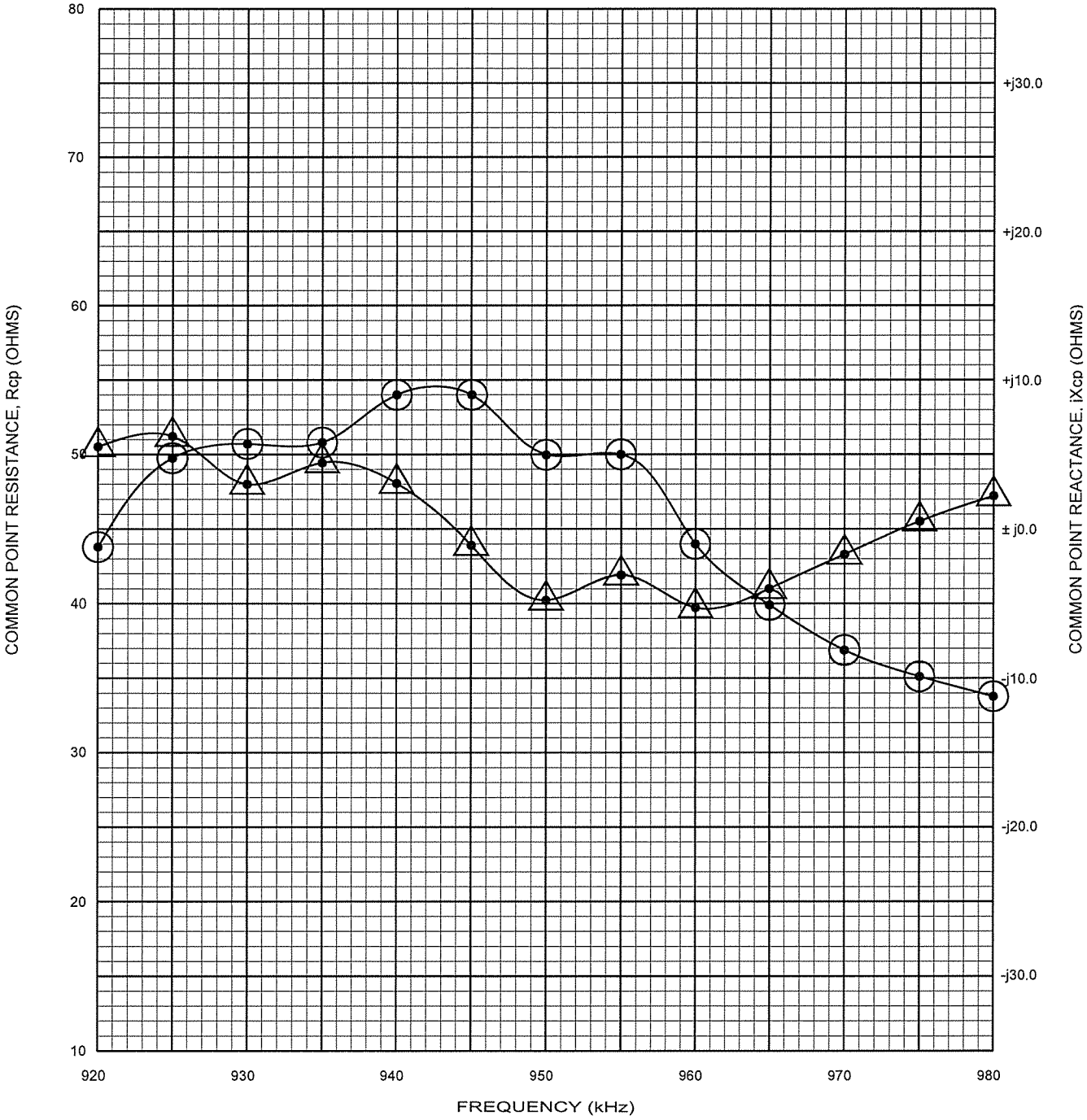
WWJ NIGHTTIME DIRECTIONAL COMMON
POINT IMPEDANCE MEASUREMENTS
CBS Radio East Inc.
Detroit, MI

Frequency (kHz)	Resistance (ohms)	Reactance (ohms)
920	43.8	+j5.5
925	49.4	+j6.2
930	50.7	+j3.0
935	50.8	+j4.5
940	54.0	+j3.1
945	54.0	-j1.2
*950	50.0	-j4.8
955	50.0	-j3.1
960	44.0	-j5.3
965	39.9	-j4.0
970	36.9	-j1.7
975	35.1	+j0.5
980	33.8	+j2.2

*Operating Frequency

CES-116

CBSIM2 1/7/2015



- Rcp

- jXcp

Zcp = 50.0 - j 4.8 OHMS

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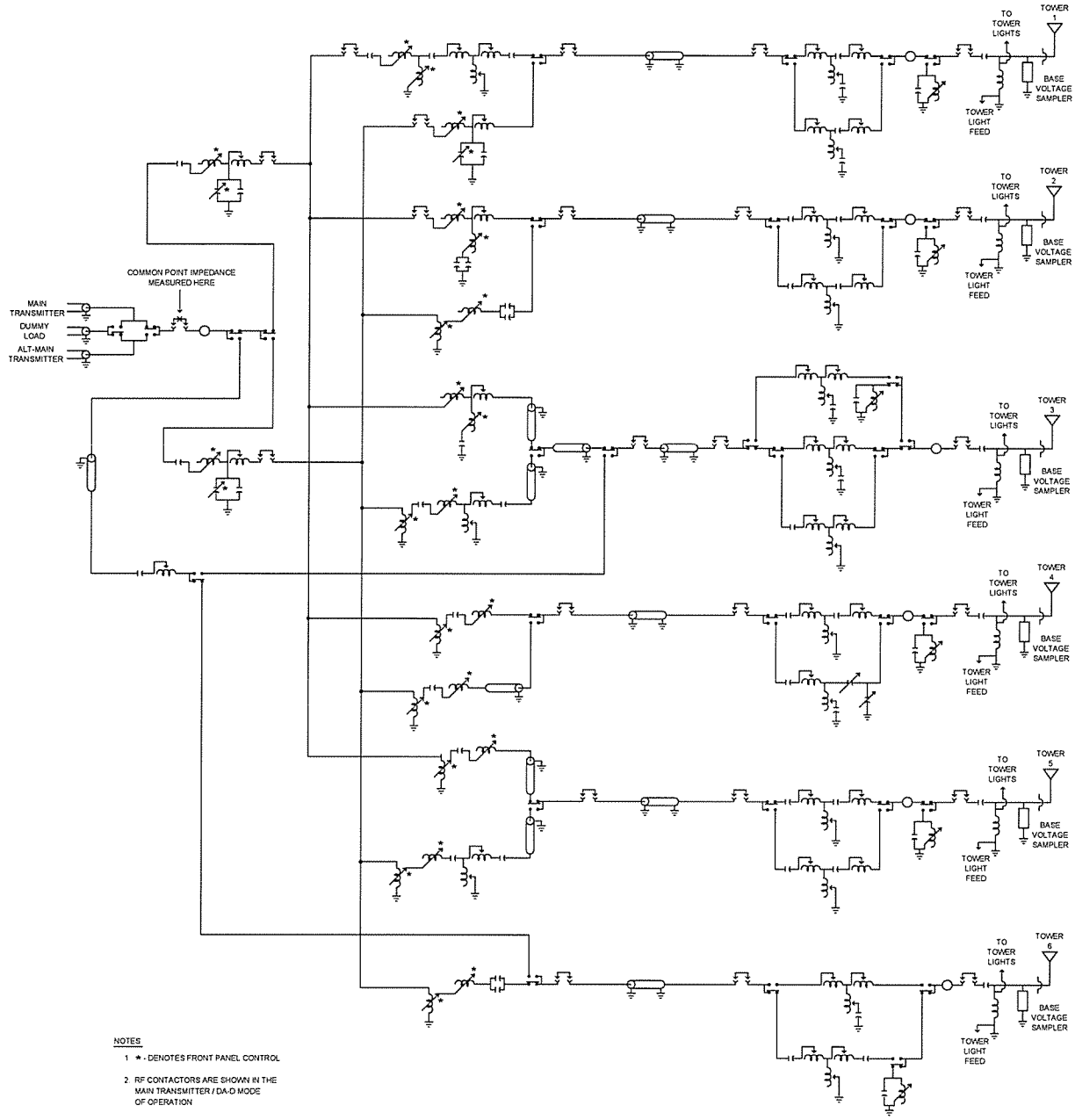
FIG. 5.2

WWJ NIGHTTIME DIRECTIONAL COMMON POINT IMPEDANCE MEASUREMENTS

CBS RADIO EAST INC.
DETROIT, MI



NOTES

1. ★ - DENOTES FRONT PANEL CONTROL
2. RF CONTACTORS ARE SHOWN IN THE MAIN TRANSMITTER / DA-D MODE OF OPERATION

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BATH, OHIO 44210-0807
(330) 659-4440

FIG 5-3
WWJ FEEDER SYSTEM
CBS RADIO EAST INC
DETROIT, MI