#78626 20100302 ACK

CBS RADIO
BROADCAST HD STREAMING ON-DEMAND
ESTABLISHED 1928

Jo Ann Haller
Senior Vice President & General Counsel

July 14, 2010

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, D.C. 20554

Re: WIP 302 License Application
File # BMML 20100302ACK

Dear Ms. Dortch:

CBS Radio Inc. of Philadelphia, a subsidiary of CBS Corporation, (CBS) hereby submits an amendment to the above referenced application file number BMML-2010302ACK.

This amendment corrects the deficiencies noted in the staff review letter. The amendment also changes the status of the application to a cover a Construction Permit license application. CBS requests that processing of the license application be deferred until the construction permit is granted.

The construction permit was filed to correct an error in the stations center of array coordinates. It appears from examining the stations license granted in 1940, that the error in the coordinates appears to be a typo that occurred prior to the grant of the 1940 license.

If there are any engineering questions regarding the amendment, please contact Raymond Benedict, CBS engineering, 202 457-4518.

Respectfully submitted,

Jo Ann Haller
Assistant Secretary.

Cc: Ann Gallagher
Media Bureau

40 West 57th Street 14th Floor New York, NY 10019 212-649-9655 JoAnn.Haller@cbs.com www.cbsradio.com

F.C.C. Form No. 352

File No. B2-L-1210
B2-Z-461
Official No. 356
Call letters W I P

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION

RADIO BROADCASTING STATION LICENSE

Modified as of September 16, 1940

Subject to the provisions of the Communications Act of 1934, subsequent acts, and treaties, and all regulations heretofore or hereafter made by this Commission, and further subject to conditions set forth in this license, the LICENSEE PENNSYLVANIA BROADCASTING COMPANY is hereby authorized to use and operate the radio transmitting apparatus hereinafter described for the purpose of broadcasting for the term beginning September 16, 1940, and ending March 29 (3 a. m., Eastern Standard Time), 1941.

The licensee shall use and operate said apparatus only in accordance with the following terms:

1. On a frequency of 610 kc.
2. With power of 5 kilo watts, * with an additional xxx watts from local sunrise to local sunset only.
   Antenna current 8.25 amperes for 5 kilo watts; xxx amperes for xxx watts.
   Antenna resistance 74.0 ohms. of common input for 5 kilowatts for directional antenna.
3. During the following period or periods of time: Unlimited time.

*Employing directional antenna day and night.
Antenna specifications attached.

4. Under the call letters W I P
5. With the main studio of the station located at:

35 South Ninth Street, Philadelphia, Pennsylvania.

The apparatus hereinabove authorized to be used and operated is located at:

Creek Road, Bellmawr, New Jersey. Lat. 39 51' 56" North, Long. 75 06 43 West.

and is described as follows: WESTERN ELECTRIC, Type 405-B-1, Broadcasting Transmitter. Direct Crystal Control. Last radio stage: two 2.5 kilowatt vacuum tubes for low level modulation (W.E. 343-AA). Maximum rated carrier power output 5 kilowatts. The field intensity of WIP measured at the monitoring points described on the attached sheet shall not exceed the following values: Point #1, 129 mv/m; Point #2, 76 mv/m; Point #3, 91 mv/m; Point #4, 76 mv/m.
Towers painted and lighted in accordance with the attached specifications.

The Commission reserves the right during said license period of terminating this license or making effective any changes or modification of this license which may be necessary to comply with any decision of the Commission rendered as a result of any hearing held under the rules of the Commission prior to the commencement of this license period or any decision rendered as a result of any such hearing which has been designated but not held, prior to the commencement of this license period.

This license is issued on the licensee's representation that the statements contained in licensee's application are true and that the undertakings therein contained so far as they are consistent herewith, will be carried out in good faith. The licensee shall, during the term of this license, render such broadcasting service as will serve public interest, convenience, or necessity to the full extent of the privileges herein conferred.

This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequency designated in the license beyond the term hereof, nor in any other manner than authorized herein. Neither the license nor the right granted hereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934. This license is subject to the right of use or control by the Government of the United States conferred by section 606 of the Communications Act of 1934.

Dated this 16th day of September, 1940

[SEAL]

By direction of the FEDERAL COMMUNICATIONS COMMISSION

T. J. Slowie
Secretary.

U. S. GOVERNMENT PRINTING OFFICE 16—2545

mfh

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.

SECTION I - APPLICANT FEE INFORMATION

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

FILED/ACCEPTED
JUN 15 2010
Federal Communications Commission
Office of the Secretary

MAILING ADDRESS (Line 1) (Maximum 35 characters)
Suite 350

MAILING ADDRESS (Line 2) (Maximum 35 characters)
2175 K St NW

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Washington	DC	21046

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
202 457-4518	WIP	FAC ID 28626

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
	0001	$	

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
	0001	$	

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

TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
$	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT CBS Radio inc of Philadelphia		
MAILING ADDRESS 2175 K ST NW		
CITY Washington	STATE DC	ZIP CODE 20037

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
WIP	Philadelphia			

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	7/12/2010	202 457-4518

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

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

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

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

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

SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant

CBS RADIO INC. OF PHILADELPHIA

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
WIP	BMP-20100715AAG	610	UNLIMITED	5.0	5.0

2. Station location

State	City or Town
PENNSYLVANIA	PHILADELPHIA

3. Transmitter location

State	County	City or Town	Street address (or other identification)
NJ	CAMDEN	BELLMAWR	775 CREEK ROAD

4. Main studio location

State	County	City or Town	Street address (or other identification)
PA	MONTGOMERY	BALA CYNWYD	333 CITY AVENUE

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

State	County	City or Town	Street address (or other identification)
PA	MONTGOMERY	BALA CYNWYD	333 CITY AVENUE

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

7. Does the sampling system meet the requirements of 47 C.F.R. Section 73.68? ☑ Yes ☐ No ☐ Not Applicable

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

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system	RF common point or antenna current (in amperes) without modulation for day system
10.4	10.4
Measured antenna or common point resistance (in ohms) at operating frequency	**Measured antenna or common point reactance (in ohms) at operating frequency**
Night: 50 Day: 50	Night: -3.8 Day: -3.8

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 (SW)	0.0	0.0	1.000	1.000		
2 (NE)	-7.4	-7.4	.669	.669		

Manufacturer and type of antenna monitor: POTOMAC INSTRUMENTS AM 19 (204)

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

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded.	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit.
SELF SUPPORTING TOWER	83.8	TWR 1: 85.8 TWR 2: 84.8	TWR 1: 86.6 TWR 2: 85.6	Exhibit No. ENG

Excitation ☑ Series ☐ Shunt

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

North Latitude	39 °	51 '	55 "	West Longitude	75 °	06 '	34 "

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

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

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

N/A

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

EQUIPMENT CHANGES

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)
KURT GORMAN	
Address (include ZIP Code) 550 CALIFORNIA ROAD, UNIT 11 QUAKERTOWN, PA 18951	Date JUNE 4, 2010
	Telephone No. (Include Area Code) 215-536-6648

☐ Technical Director

☐ Registered Professional Engineer

☐ Chief Operator

☑ Technical Consultant

☐ Other (specify)

ENGINEERING STATEMENT CONCERNING

APPLICATION FOR LICENSE INFORMATION EMPLOYING MOMENT METHOD MODELING

WIP, 610 KHZ, DA-1

PHILADELPHIA, PENNSLVANIA

FEBRUARY, 2010

REVISED JUNE 4, 2010

PHASETEK INC.
550 CALIFORNIA ROAD, UNIT 11
QUAKERTOWN, PA 18951
PHONE: 215-536-6648
FAX: 215-536-7180

ENGINEERING STATEMENT CONCERNING APPLICATION FOR LICENSE INFORMATION EMPLOYING MOMENT METHOD MODELING WIP, 610 KHZ, DA-1 PHILADELPHIA, PA

JUNE 4, 2010

In response to the Commission's letter dated May 11, 2010, the Engineering Statement concerning Radio Station WIP, 610 kHz, Philadelphia, Pennsylvania, has been revised. The following items have been addressed:

1. The Tower model segments have been revised such that the wire segment length/radius values exceed 2.57; a convergence test was performed on the model the validate accuracy.
2. Figure 5A was generated to show modeled wire radius versus actual Tower face width for all wire sections.
3. The Sampling System data includes TCT measurement and that the Sampling Line impedance measurement connected to TCT was performed at 610 kHz.
4. A revised Form 302 is attached with corrected operating parameters and correct coordinates for the center of the Array. In addition, a 301 application is being submitted to correct the coordinates.

Kurt Gorman
President
Phasetek Inc.

PHASETEK INC.

ENGINEERING STATEMENT CONCERNING
APPLICATION FOR LICENSE INFORMATION
EMPLOYING MOMENT METHOD MODELING
WIP, 610 KHZ, DA-1
PHILADELPHIA, PA
FEBRUARY, 2010
REVISED JUNE 4, 2010

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PHASETEK INC.

ENGINEERING STATEMENT CONCERNING APPLICATION FOR LICENSE INFORMATION EMPLOYING MOMENT METHOD MODELING WIP, 610 KHZ, DA-1 PHILADELPHIA, PA FEBRUARY, 2010 REVISED JUNE 4, 2010

SUMMARY

Adjustment of the Antenna System and a Proof of Performance employing Moment Method Modeling was performed on Radio Station WIP, 610 kHz, Philadelphia, Pennsylvania, after replacement of Antenna Phasing equipment, Transmission and Sampling Lines, and new Tower Feed Assemblies. This report was prepared on behalf of CBS Radio Inc., of Philadelphia, licensee of Radio Station WIP.

SITE MODIFICATIONS

The WIP Transmitter site remains that as previously licensed. Due to the age of the equipment, new Transmission Lines, Sampling Lines, and Antenna Phasing and Branching equipment have been installed. The Towers have not been changed except for maintenance of Tower lighting conduits, Tower repainting, and new feed connection at base. In conjunction with these upgrades and determination that the licensed coordinates were incorrect (a Form 301 is being submitted to amend this), a License Application employing Moment Method Modeling as set forth in Section 73.151(C) has been done to cover the 301 CP application and license under the new rules.

REFERENCE POINTS

Reference Points were measured at pattern minima and maxima for the Directional mode of operation. These Points and their measured field intensity are shown in Figure 13.

MEASURING EQUIPMENT AND PERSONNEL

All Resistance and Reactance measurements were made with a Delta Electronics OIB-3 Operating Impedance Bridge. Before use, tests of known impedances were made to verify operation. All Field Intensity Measurements were made with a Potomac Instruments Field Intensity Meter; FIM-41, Serial Number 2181, calibrated on June 27, 2006. The meter was calibrated by Potomac Instruments, Silver Spring, Maryland. All measurements were taken by Phasetek Inc. personnel supervised by Kurt Gorman of Phasetek Inc.

PHASETEK INC.

ENGINEERING STATEMENT CONCERNING
APPLICATION FOR LICENSE INFORMATION
EMPLOYING MOMENT METHOD MODELING
WIP, 610 KHZ, DA-1
PHILADELPHIA, PA
FEBRUARY, 2010
REVISED JUNE 4, 2010

CONCLUSION

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

Kurt Gorman, President
Phasetek Inc.
Quakertown, Pennsylvania

FIGURE 1

ANTENNA SYSTEM AS ADJUSTED

APPLICATION FOR LICENSE INFORMATION
EMPLOYING MOMENT METHOD MODELING
WIP, 610 KHZ, DA-1
PHILADELPHIA, PA
REVISED JUNE 4, 2010

ANTENNA SYSTEM DESCRIPTION

1. The Antenna System consists of two (2), self-supporting, tapered, vertical steel transmitting Towers. Both Towers stand 83.8M (61.4°) above their Base Insulators. Both Towers are top loaded with a 9.15M Top Hat. Both Towers have aviation obstruction lighting. The Towers are arranged with Tower 1 as a reference; Tower 2 is spaced 181.0° on a bearing of 50.0°T. Lighting for both Towers is isolated at each base by a Ring Isolation Transformer. Additionally, a "Star" Feed Assembly, attached to all (4) legs, is connected at the base and provides the connection to each Antenna Tuning Unit.

2. The Ground System for each Tower consists of (120) buried copper Radials, 122M in length, except where they intersect with copper transverse straps between Towers or property boundaries. Additionally, a 12.2M x 12.2M copper ground screen is installed at the base of each Tower. Copper strap connects all Towers to the main Transmitter grounding point.

3. The Sampling System consists of two (2), Delta Electronics TCT-1, 0.5 V/A Toroidal Current Transformers. Both TCT's are at the Output of each Antenna Tuning Unit. These TCT's are connected to a Potomac Instruments AM19 (204) Phase Monitor via two (2) equal lengths of Andrew, LDF-2, 3/8" phase stabilized foam coaxial cable.

TOWER PARAMETERS (DIRECTIONAL)

	Theoretical		Modeled TCT		Operating *	
Tower	Field	Phase	Amplitude	Phase	Amplitude	Phase
1 (SW)	1.540	0.0°	1.000	0.0°	1.000	0.0°
2 (NE)	1.000	0.0°	.669	-0.6°	.669	-7.4°

*** As indicated on Potomac Instruments AM19 (204) Antenna Monitor with additional jumper for Tower #2. See Figures 2 and 3.**

FIGURE 1
ANTENNA SYSTEM AS ADJUSTED

APPLICATION FOR LICENSE INFORMATION
EMPLOYING MOMENT METHOD MODELING
WIP, 610 KHZ, DA-1
PHILADELPHIA, PA
CONTINUED
REVISED JUNE 4, 2010

ANTENNA SYSTEM DESCRIPTION – Continued

DIRECTIONAL OPERATION

COMMON POINT

Impedance = 50.0 – j 3.8 ohms
Current = 10.4 Amperes
Power = 5,400 Watts

Directional Antenna Monitor indications are within ±5% and ±3° of the modeled TCT values.

TOWER REGISTRATION NUMBERS

Tower #1 (SW): 1040104
Tower #2 (NE): 1040105

FIGURE 2
WIP SAMPLING SYSTEM DESCRIPTION/MEASUREMENTS
REVISED JUNE 4, 2010

SAMPLING SYSTEM DESCRIPTION

The Sampling System consists of Delta Electronics TCT-1 Toroidal Sampling Transformers (0.5 volt/amp) mounted at the base of each Tower. The sampling devices are connected to the Phase Monitor with equal lengths of Andrew LDF-2. Each Sample Line was ordered and tested by the manufacturer to be phase stabilized and of equal lengths. The Phase Monitor is a Potomac Instruments Model AM-19 (204), Serial Number 546.

Toroidal sample devices were tested for accuracy by the manufacturer prior to shipment as being within 1 percent ratio and 1 degree phase accuracy. Measurement of both TCT's connected at Tower #1 in series yields the following as indicated on the Potomac Instruments AM19 (204) Monitor:

TCT 1: 1.000, 0.0°
TCT 2: 1.000, -0.5°

SAMPLE SYSTEM MEASUREMENTS

Impedance measurements were made of the Antenna Sampling System using an Array Solutions Model AIM4170C Vector Network Analyzer (VNA) and verified with a Delta Electronics OIB-3 Operating Impedance Bridge and Potomac Instruments SD-31/RX-31 RF Generator/Detector. Measurements were done with the lines open circuited and then connected to the TCT's.

The table below shows the frequencies above and below the carrier frequency where resonance, defined as zero reactance corresponding with low resistance, was found. Frequencies of resonance occur at odd multiples of 90 degrees electrical length, the Sample Line length at the resonant frequency below the carrier frequency, which is the closest one to the carrier frequency, was found to be 270 electrical degrees. The electrical length at carrier frequency appearing in the table below was calculated by ratioing the frequencies.

	WIP Tower Sample Line Measurements			
	Resonant Frequency (kHz) below 610 kHz	Resonant Frequency (kHz) above 610 kHz	Calculated Electrical Length (deg) at 610 kHz	Measured Impedance Connected to TCT @ 610kHz
Tower 1	566.3	929.0	290.8	50.0 +j0.7
Tower 2	566.6	928.9	290.7	50.5 +j0.6

FIGURE 2
WIP SAMPLING SYSTEM DESCRIPTION/MEASUREMENTS
CONTINUED
REVISED JUNE 4, 2010

SAMPLE SYSTEM MEASUREMENTS (CONTINUED)

To determine the characteristic impedance values of the Sample Lines, open-circuited measurements were made with frequencies offset to produce ± 45 degrees of electrical length from resonance. The characteristic impedance was calculated using the following formula, where R1 + jX1 and R2 +j X2 are the measured impedances at the +45 and -45 degree offset frequencies, respectively:

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

WIP TOWER SAMPLE LINE MEASUREMENTS

	+ 45 Degree Offset Frequency (kHz)	+45 Degree Measured Impedance (Ohms)	- 45 Degree Offset Frequency (kHz)	-45 Degree Measured Impedance (Ohms)	Calculated Characteristic Impedance (Ohms)
Tower 1	660.7	9.8 +j51.93	471.9	6.51 -j48.97	51.09
Tower 2	661.0	9.6 +j51.10	472.2	6.49 –j48.70	50.54
				Impedance Delta	0.55

Due to the nature of the WIP Array, the required phase indication on the Antenna Monitor is close to 0°. This situation provides difficulty in accurate measurement with the Potomac Instruments AM19 (204) Antenna Monitor. A short jumper constructed of RG-58/U, 50 ohm, coaxial cable is installed at the Antenna Monitor in series with the Tower #2 (non-reference) Sample Line. Measurement of this jumper yields an open circuit resonant frequency of 8.1044 MHz. This corresponds to a lagging phase of 6.8° at 610 kHz. The jumper is mounted in the equipment rack and at constant environmental conditions. Attached as Figure 3 are the recommendations as found in the Potomac Instruments Instruction Manual.

FIGURE 3
WIP POTOMAC INSTRUMENTS RECOMMENDATIONS
(PAGE 3-3 FROM TYPE 19 ANTENNA MONITOR INSTRUCTION MANUAL)

When installing the Sampling Lines, it is recommended that the cable lengths be as nearly equal as possible; both to preserve the absolute accuracy of the. phase measurements, and also to "cancel" variations in line characteristics due to temperature changes and other causes.

An important exception to this rule is sometimes made for those arrays which produce measured phase angles near 0 degrees. In this case, the sense (leading or lagging) indication of a phase angle must be interpreted carefully, and also the monitor is most susceptible to interference at these angles. If desired, these effects may be eliminated by inserting an extra length of coaxial cable in series with the sampling lines from the towers in question. The length of the extra cables should be sufficient to affect a phase delay of about 5 degrees as determined from the following formula:

$$\text{LENGTH OF CABLE (FEET)} = \frac{2733 \cdot V \cdot \text{PHASE DELAY (DEGREES)}}{\text{OPERATING FREQUENCY (KILOCYCLCES)}}$$

V (Cable Velocity Factor)

= 0.85 for air-spaced dielectric
= 0.67 for solid polyethylene dielectric
(ei. RG-8/U, RG-58/U, RG-59/U)
= 0 .695 for solid teflon dielectric

EXAMPLE: Use 9.15 feet of .RG-8/U for 5 degrees delay at 1000 kHz

The 'extra' cable should be installed in a protected location where temperature extremes are minimized.

3 -4.2 Non-Directional Voltage Limit

In a DA-D or DA-N system, it is important to determine the sampling line voltage from both the powered and unpowered towers during Non-Directional operation. To avoid damage in cases where the specified voltage limit is exceeded, a coaxial relay can be utilized to transfer the sampling lines from each overloaded input receptacle to a dissipating resistance during Non-Directional operation. The relay coils can be energized by a Phasor contactor utilizing either the 24 volt supply in the monitor (pins 23 and 24 of J1) or an external power source.

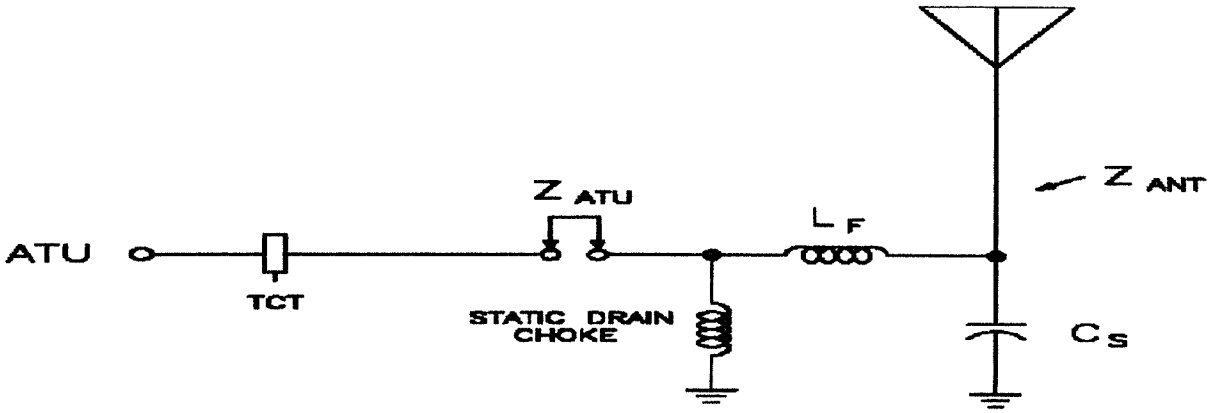
3.4.3 Input Module Connections

The coaxial cables from the antenna sampling loops are connected to UHF receptacles on the rear of the AM-19. Each coaxial receptacle is mounted on an input module which contains the switching relays and critical RF circuits repeated for each tower. The input modules are assembled across the rear of the monitor with one module provided for each antenna tower up to a maximum of 12.

Two types of input modules are utilized in the AM-l.9. These are designated either as reference tower input modules or as non-reference tower input modules.

In a monitor equipped for a single pattern system, that is for a DA-1

FIGURE 4
WIP TOWER IMPEDANCE MEASUREMENTS COMPARED TO METHOD OF MOMENTS MODEL
REVISED JUNE 4, 2010



TOWER	Specified Cs (pf)	Measured L_F (µH)	Measured X_F (Ω)	Modeled Z_{ANT} (Ω)	Modeled Z_{ATU} (Ω)	Measured Z_{ATU} (Ω)
1	40	5.22	+20.0	15.8 –j68.8	15.6 –j48.2	15.0 –j45.1
2	40	6.65	+25.5	15.6 –j70.0	15.4 –j43.8	14.5 –j41.5

Above "measured" impedance values were measured with Delta Electronics OIB-3 Operating Impedance Bridge with other Tower open circuited.

FIGURE 5
WIP MOMENT MODEL PARAMETERS
REVISED JUNE 4, 2010

Tower #	Wire #	# of Segments	Base Node	Radius (m)	Tower Model Length (°)	Tower Physical Length (°)
1	1	3	1	2.4061	68.2	61.4
1	2	3	-	2.0051	-	-
1	3	3	-	1.6041	-	-
1	4	3	-	1.203	-	-
1	5	3	-	.8521	-	-
1	6	3		.6391	-	-
1	7	2	-	.08	-	-
1	8	2	-	.08	-	-
1	9	2	-	.08	-	-
2	10	3	25	2.4061	67.8	61.4
2	11	3	-	2.0051	-	-
2	12	3	-	1.6041	-	-
2	13	3	-	1.203	-	-
2	14	3	-	.8521	-	-
2	15	3	-	.6391	-	-
2	16	2	-	.08	-	-
2	17	2	-	.08	-	-
2	18	2	-	.08	-	-

Note: Wires 7 – 9 and 16 – 18 represent Top Hat Top Loading and lengths are equal to physical Radius.

Both Towers are four (4) sided, tapered, self-supporting, with a 15.5 ft. base and 31.0 inch top face widths. Each Tower has four (4) Base Insulators at an approximate capacitance of 10pf each. The Output of each Antenna Tuning Unit has a Phasetek Inc. P600-161-2 Static Drain Choke which measures +j32,000 ohms (8,349.1uH) @ 610kHz.

See Figure 5A for wire diameter as compared to Tower Face Width for all wires.

FIGURE 5A
WIRE RADIUS VS. TOWER FACE WIDTH

WIRE	WIRE RADIUS METERS	RATIO OF EFFECTIVE HEIGHT	ACTUAL TOWER FACE WIDTH (INCHES)	EQUIVALENT RADIUS (METERS)	PERCENTAGE OF EQUIVALENT RADIUS
1 Bottom	2.4061	0.0000	186.0	3.0076	80.0
1 Top	2.4061	.1994	155.1	2.5080	95.9
2 Bottom	2.0051	.1994	155.1	2.5080	80.0
2 Top	2.0051	.4003	124.0	2.0051	100.0
3 Bottom	1.6041	.4003	124.0	2.0051	80.0
3 Top	1.6041	.5997	93.0	1.5038	106.7
4 Bottom	1.2030	.5997	93.0	1.5038	80.0
4 Top	1.2030	.7991	62.1	1.0042	119.8
5 Bottom	.8521	.7991	62.1	1.0042	84.9
5 Top	.8521	.9047	45.8	.7406	115.1
6 Bottom	.6391	.9047	45.8	.7406	86.3
6 Top	.6391	1.000	31.0	.5013	127.5
10 Bottom	2.4061	0.0000	186.0	3.0076	80.0
10 Top	2.4061	.2006	154.9	2.5048	96.1
11 Bottom	2.0051	.2006	154.9	2.5048	80.1
11 Top	2.0051	.4027	123.6	1.9986	100.3
12 Bottom	1.6041	.4027	123.6	1.9986	80.3
12 Top	1.6041	.6032	92.5	1.4957	107.3
13 Bottom	1.2030	.6032	92.5	1.4957	80.4
13 Top	1.2030	.8038	61.4	.9928	121.2
14 Bottom	.8521	.8038	61.4	.9928	85.8
14 Top	.8521	.9041	45.9	.7422	114.8
15 Bottom	.6391	.9041	45.9	.7422	86.1
15 Top	.6391	1.000	31.0	.5013	127.5

FIGURE 6A

WIP MOMENT MODEL SUMMARY FOR INDIVIDUAL TOWERS
TOWER 1

WIP REVISED TOWER 1 INDIVIDUAL

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

wire	caps	Radius	Angle	Z	radius	segs
1	none	0	0	0	2.4061	3
		0	0	13.6		
2	none	0	0	13.6	2.0051	3
		0	0	27.3		
3	none	0	0	27.3	1.6041	3
		0	0	40.9		
4	none	0	0	40.9	1.203	3
		0	0	54.5		
5	none	0	0	54.5	.8521	3
		0	0	61.7		
6	none	0	0	61.7	.6391	3
		0	0	68.2		
7	none	0	0	68.2	.08	2
		3.35	0	68.2		
8	none	0	0	68.2	.08	2
		3.35	120.	68.2		
9	none	0	0	68.2	.08	2
		3.35	240.	68.2		
10	none	181.	50.	0	2.4061	3
		181.	50.	13.6		
11	none	181.	50.	13.6	2.0051	3
		181.	50.	27.3		
12	none	181.	50.	27.3	1.6041	3
		181.	50.	40.9		
13	none	181.	50.	40.9	1.203	3
		181.	50.	54.5		
14	none	181.	50.	54.5	.8521	3
		181.	50.	61.3		
15	none	181.	50.	61.3	.6391	3
		181.	50.	67.8		
16	none	181.	50.	67.8	.08	2
		183.17	49.2	67.8		
17	none	181.	50.	67.8	.08	2
		177.7	49.8	67.8		
18	none	181.	50.	67.8	.08	2
		182.17	51.	67.8		

Number of wires = 18
current nodes = 48

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	2	4.56667	16	1.67125
radius	7	.08	1	2.4061

ELECTRICAL DESCRIPTION
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	.61	0	1	4.64E-03	.0126852

Sources

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

FIGURE 6A
WIP MOMENT MODEL SUMMARY FOR INDIVIDUAL TOWERS
TOWER 1
CONTINUED

WIP REVISED TOWER 1 INDIVIDUAL Cont'd

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	25	0	-6,522.7	0	0	0

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR dB	S11 dB	S12 dB
source = 1; node 1, sector 1							
.61	15.834	-68.836	70.633	-77.05	9.3525	-1.8646	-14.28

CURRENT rms
Frequency = .61 MHz
Input power = .00158687 watts
Efficiency = 100. %

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	.0100109	77.05	2.24E-03	9.76E-03
2	0	0	4.53333	9.06E-03	75.73	2.23E-03	8.78E-03
3	0	0	9.06667	8.54E-03	75.08	2.2E-03	8.25E-03
END	0	0	13.6	8.01E-03	74.51	2.14E-03	7.71E-03
2J1	0	0	13.6	8.01E-03	74.51	2.14E-03	7.71E-03
5	0	0	18.1667	7.53E-03	74.06	2.07E-03	7.24E-03
6	0	0	22.7333	7.E-03	73.64	1.97E-03	6.72E-03
END	0	0	27.3	6.41E-03	73.22	1.85E-03	6.14E-03
2J2	0	0	27.3	6.41E-03	73.22	1.85E-03	6.14E-03
8	0	0	31.8333	5.88E-03	72.89	1.73E-03	5.62E-03
9	0	0	36.3667	5.28E-03	72.55	1.58E-03	5.04E-03
END	0	0	40.9	4.62E-03	72.21	1.41E-03	4.4E-03
2J3	0	0	40.9	4.62E-03	72.21	1.41E-03	4.4E-03
11	0	0	45.4333	4.04E-03	71.93	1.25E-03	3.84E-03
12	0	0	49.9667	3.39E-03	71.65	1.07E-03	3.21E-03
END	0	0	54.5	2.66E-03	71.36	8.51E-04	2.52E-03
2J4	0	0	54.5	2.66E-03	71.36	8.51E-04	2.52E-03
14	0	0	56.9	2.35E-03	71.24	7.55E-04	2.22E-03
15	0	0	59.3	2.E-03	71.11	6.48E-04	1.89E-03
END	0	0	61.7	1.63E-03	70.98	5.3E-04	1.54E-03
2J5	0	0	61.7	1.63E-03	70.98	5.3E-04	1.54E-03
17	0	0	63.8667	1.34E-03	70.88	4.38E-04	1.26E-03
18	0	0	66.0333	1.03E-03	70.8	3.38E-04	9.7E-04
END	0	0	68.2	7.42E-04	70.75	2.45E-04	7.01E-04
2J6	0	0	68.2	2.47E-04	70.75	8.16E-05	2.34E-04
20	1.675	0	68.2	1.6E-04	70.78	5.25E-05	1.51E-04
END	3.35	0	68.2	0	0	0	0
2J6	0	0	68.2	2.47E-04	70.75	8.16E-05	2.34E-04
22	-.8375	1.45059	68.2	1.6E-04	70.78	5.25E-05	1.51E-04
END	-1.675	2.90119	68.2	0	0	0	0
2J6	0	0	68.2	2.47E-04	70.75	8.16E-05	2.34E-04
24	-.8375	-1.45059	68.2	1.6E-04	70.78	5.25E-05	1.51E-04
END	-1.675	-2.90119	68.2	0	0	0	0
GND	116.345	138.654	0	1.03E-05	-132.08	-6.91E-06	-7.65E-06
26	116.345	138.654	4.53333	1.22E-04	-132.1	-8.15E-05	-9.02E-05
27	116.345	138.654	9.06667	1.51E-04	-132.14	-1.01E-04	-1.12E-04
END	116.345	138.654	13.6	1.77E-04	-132.19	-1.19E-04	-1.31E-04
2J10	116.345	138.654	13.6	1.77E-04	-132.19	-1.19E-04	-1.31E-04
29	116.345	138.654	18.1667	1.92E-04	-132.25	-1.29E-04	-1.42E-04
30	116.345	138.654	22.7333	2.E-04	-132.32	-1.35E-04	-1.48E-04
END	116.345	138.654	27.3	2.04E-04	-132.4	-1.37E-04	-1.5E-04
2J11	116.345	138.654	27.3	2.04E-04	-132.4	-1.37E-04	-1.5E-04

FIGURE 6A
WIP MOMENT MODEL SUMMARY FOR INDIVIDUAL TOWERS
TOWER 1
CONTINUED

WIP REVISED TOWER 1 INDIVIDUAL Cont'd

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
32	116.345	138.654	31.8333	2.01E-04	-132.48	-1.36E-04	-1.48E-04
33	116.345	138.654	36.3667	1.94E-04	-132.57	-1.31E-04	-1.43E-04
END	116.345	138.654	40.9	1.81E-04	-132.67	-1.23E-04	-1.33E-04
2J12	116.345	138.654	40.9	1.81E-04	-132.67	-1.23E-04	-1.33E-04
35	116.345	138.654	45.4333	1.66E-04	-132.77	-1.13E-04	-1.22E-04
36	116.345	138.654	49.9667	1.46E-04	-132.88	-9.93E-05	-1.07E-04
END	116.345	138.654	54.5	1.2E-04	-133.	-8.16E-05	-8.75E-05
2J13	116.345	138.654	54.5	1.2E-04	-133.	-8.16E-05	-8.75E-05
38	116.345	138.654	56.7667	1.08E-04	-133.06	-7.38E-05	-7.89E-05
39	116.345	138.654	59.0333	9.46E-05	-133.12	-6.46E-05	-6.9E-05
END	116.345	138.654	61.3	7.91E-05	-133.18	-5.41E-05	-5.77E-05
2J14	116.345	138.654	61.3	7.91E-05	-133.18	-5.41E-05	-5.77E-05
41	116.345	138.654	63.4667	6.61E-05	-133.23	-4.52E-05	-4.81E-05
42	116.345	138.654	65.6333	5.15E-05	-133.28	-3.53E-05	-3.75E-05
END	116.345	138.654	67.8	3.75E-05	-133.3	-2.57E-05	-2.73E-05
2J15	116.345	138.654	67.8	1.22E-05	-132.64	-8.29E-06	-9.E-06
44	118.016	138.656	67.8	7.84E-06	-132.49	-5.3E-06	-5.78E-06
END	119.687	138.659	67.8	0	0	0	0
2J15	116.345	138.654	67.8	1.27E-05	-134.27	-8.9E-06	-9.13E-06
46	115.521	137.19	67.8	8.22E-06	-134.45	-5.75E-06	-5.87E-06
END	114.698	135.727	67.8	0	0	0	0
2J15	116.345	138.654	67.8	1.25E-05	-132.95	-8.51E-06	-9.14E-06
48	115.494	140.113	67.8	8.E-06	-132.87	-5.44E-06	-5.86E-06
END	114.643	141.573	67.8	0	0	0	0

FIGURE 6B
WIP MOMENT MODEL SUMMARY FOR INDIVIDUAL TOWERS
TOWER 2

WIP REVISED - TOWER 2 INDIVIDUAL

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

wire	caps	Radius	Angle	Z	radius	segs
1	none	0	0	0	2.4061	3
		0	0	13.6		
2	none	0	0	13.6	2.0051	3
		0	0	27.3		
3	none	0	0	27.3	1.6041	3
		0	0	40.9		
4	none	0	0	40.9	1.203	3
		0	0	54.5		
5	none	0	0	54.5	.8521	3
		0	0	61.7		
6	none	0	0	61.7	.6391	3
		0	0	68.2		
7	none	0	0	68.2	.08	2
		3.35	0	68.2		
8	none	0	0	68.2	.08	2
		3.35	120.	68.2		
9	none	0	0	68.2	.08	2
		3.35	240.	68.2		
10	none	181.	50.	0	2.4061	3
		181.	50.	13.6		
11	none	181.	50.	13.6	2.0051	3
		181.	50.	27.3		
12	none	181.	50.	27.3	1.6041	3
		181.	50.	40.9		
13	none	181.	50.	40.9	1.203	3
		181.	50.	54.5		
14	none	181.	50.	54.5	.8521	3
		181.	50.	61.3		
15	none	181.	50.	61.3	.6391	3
		181.	50.	67.8		
16	none	181.	50.	67.8	.08	2
		183.17	49.2	67.8		
17	none	181.	50.	67.8	.08	2
		177.7	49.8	67.8		
18	none	181.	50.	67.8	.08	2
		182.17	51.	67.8		

Number of wires = 18
current nodes = 48

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	2	4.56667	16	1.67125
radius	7	.08	1	2.4061

ELECTRICAL DESCRIPTION
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	.61	0	1	4.64E-03	.0126852

Sources

source	node	sector	magnitude	phase	type
1	25	1	1.	0	voltage

FIGURE 6B
WIP MOMENT MODEL SUMMARY FOR INDIVIDUAL TOWERS
TOWER 2
CONTINUED

WIP REVISED - TOWER 2 INDIVIDUAL Con'td

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-6,522.7	0	0	0

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR dB	S11 dB	S12 dB
source = 1; node 25, sector 1							
.61	15.574	-69.983	71.695	-77.45	9.7087	-1.7957	-14.574

CURRENT rms
Frequency = .61 MHz
Input power = .00151489 watts
Efficiency = 100. %

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.02E-05	-131.68	-6.75E-06	-7.59E-06
2	0	0	4.53333	1.2E-04	-131.7	-7.97E-05	-8.95E-05
3	0	0	9.06667	1.49E-04	-131.73	-9.92E-05	-1.11E-04
END	0	0	13.6	1.75E-04	-131.79	-1.16E-04	-1.3E-04
2J1	0	0	13.6	1.75E-04	-131.79	-1.16E-04	-1.3E-04
5	0	0	18.1667	1.89E-04	-131.85	-1.26E-04	-1.41E-04
6	0	0	22.7333	1.98E-04	-131.91	-1.32E-04	-1.47E-04
END	0	0	27.3	2.01E-04	-132.	-1.35E-04	-1.49E-04
2J2	0	0	27.3	2.01E-04	-132.	-1.35E-04	-1.49E-04
8	0	0	31.8333	1.99E-04	-132.08	-1.33E-04	-1.48E-04
9	0	0	36.3667	1.92E-04	-132.17	-1.29E-04	-1.42E-04
END	0	0	40.9	1.8E-04	-132.27	-1.21E-04	-1.33E-04
2J3	0	0	40.9	1.8E-04	-132.27	-1.21E-04	-1.33E-04
11	0	0	45.4333	1.65E-04	-132.37	-1.11E-04	-1.22E-04
12	0	0	49.9667	1.46E-04	-132.48	-9.83E-05	-1.07E-04
END	0	0	54.5	1.2E-04	-132.6	-8.13E-05	-8.84E-05
2J4	0	0	54.5	1.2E-04	-132.6	-8.13E-05	-8.84E-05
14	0	0	56.9	1.08E-04	-132.66	-7.32E-05	-7.94E-05
15	0	0	59.3	9.4E-05	-132.72	-6.38E-05	-6.9E-05
END	0	0	61.7	7.79E-05	-132.79	-5.29E-05	-5.71E-05
2J5	0	0	61.7	7.79E-05	-132.79	-5.29E-05	-5.71E-05
17	0	0	63.8667	6.5E-05	-132.84	-4.42E-05	-4.76E-05
18	0	0	66.0333	5.06E-05	-132.89	-3.44E-05	-3.71E-05
END	0	0	68.2	3.68E-05	-132.91	-2.5E-05	-2.69E-05
2J6	0	0	68.2	1.24E-05	-133.55	-8.56E-06	-9.E-06
20	1.675	0	68.2	8.E-06	-133.66	-5.52E-06	-5.79E-06
END	3.35	0	68.2	0	0	0	0
2J6	0	0	68.2	1.23E-05	-133.25	-8.46E-06	-8.99E-06
22	-.8375	1.45059	68.2	7.94E-06	-133.3	-5.44E-06	-5.78E-06
END	-1.675	2.90119	68.2	0	0	0	0
2J6	0	0	68.2	1.2E-05	-131.9	-8.02E-06	-8.94E-06
24	-.8375	-1.45059	68.2	7.68E-06	-131.67	-5.11E-06	-5.74E-06
END	-1.675	-2.90119	68.2	0	0	0	0
GND	116.345	138.654	0	9.86E-03	77.45	2.14E-03	9.63E-03
26	116.345	138.654	4.53333	8.91E-03	76.16	2.13E-03	8.65E-03
27	116.345	138.654	9.06667	8.39E-03	75.52	2.1E-03	8.12E-03
END	116.345	138.654	13.6	7.86E-03	74.95	2.04E-03	7.59E-03
2J10	116.345	138.654	13.6	7.86E-03	74.95	2.04E-03	7.59E-03
29	116.345	138.654	18.1667	7.38E-03	74.51	1.97E-03	7.12E-03
30	116.345	138.654	22.7333	6.86E-03	74.09	1.88E-03	6.6E-03
END	116.345	138.654	27.3	6.27E-03	73.68	1.76E-03	6.02E-03

FIGURE 6B
WIP MOMENT MODEL SUMMARY FOR INDIVIDUAL TOWERS
TOWER 2
CONTINUED

WIP REVISED - TOWER 2 INDIVIDUAL Con'td

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
2J11	116.345	138.654	27.3	6.27E-03	73.68	1.76E-03	6.02E-03
32	116.345	138.654	31.8333	5.75E-03	73.35	1.65E-03	5.5E-03
33	116.345	138.654	36.3667	5.16E-03	73.02	1.51E-03	4.93E-03
END	116.345	138.654	40.9	4.5E-03	72.68	1.34E-03	4.3E-03
2J12	116.345	138.654	40.9	4.5E-03	72.68	1.34E-03	4.3E-03
35	116.345	138.654	45.4333	3.92E-03	72.4	1.19E-03	3.74E-03
36	116.345	138.654	49.9667	3.28E-03	72.12	1.01E-03	3.12E-03
END	116.345	138.654	54.5	2.56E-03	71.83	7.99E-04	2.43E-03
2J13	116.345	138.654	54.5	2.56E-03	71.83	7.99E-04	2.43E-03
38	116.345	138.654	56.7667	2.27E-03	71.72	7.12E-04	2.16E-03
39	116.345	138.654	59.0333	1.95E-03	71.6	6.16E-04	1.85E-03
END	116.345	138.654	61.3	1.6E-03	71.48	5.08E-04	1.52E-03
2J14	116.345	138.654	61.3	1.6E-03	71.48	5.08E-04	1.52E-03
41	116.345	138.654	63.4667	1.32E-03	71.38	4.2E-04	1.25E-03
42	116.345	138.654	65.6333	1.01E-03	71.29	3.25E-04	9.59E-04
END	116.345	138.654	67.8	7.32E-04	71.25	2.35E-04	6.94E-04
2J15	116.345	138.654	67.8	2.42E-04	71.25	7.79E-05	2.3E-04
44	118.016	138.656	67.8	1.56E-04	71.28	5.02E-05	1.48E-04
END	119.687	138.659	67.8	0	0	0	0
2J15	116.345	138.654	67.8	2.44E-04	71.25	7.84E-05	2.31E-04
46	115.521	137.19	67.8	1.57E-04	71.28	5.05E-05	1.49E-04
END	114.698	135.727	67.8	0	0	0	0
2J15	116.345	138.654	67.8	2.46E-04	71.25	7.9E-05	2.33E-04
48	115.494	140.113	67.8	1.58E-04	71.28	5.08E-05	1.5E-04
END	114.643	141.573	67.8	0	0	0	0

FIGURE 7
WIP DERIVED DIRECTIONAL PARAMETERS
REVISED JUNE 4, 2010

Tower	Normalized Base Current Moment Ratio	Normalized Base Current Moment Phase	Base Network Input/Output Ratio	Base Network Input/Output Phase	Normalized TCT Value Ratio	Normalized TCT Value Phase
1	1.000	0.0°	1.0095	+0.1°	1.000	0.0°
2	.668	-0.6°	1.0105	+0.1°	.669	-0.6°

FIGURE 8
WIP MOMENT MODEL ARRAY SYNTHESIS
REVISED JUNE 4, 2010

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = .61 MHz

tower	field ratio magnitude	phase (deg)
1	1.54	0
2	1.	0

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	1,224.32	-76.61	16.8406	3.05
25	880.552	-80.04	11.263	2.43

Sum of square of source currents = 820.924

Total power = 5,000. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.00330537	.0140497
Y(1, 2)	-.00111717	-.000788729
Y(2, 1)	-.00111717	-.000788727
Y(2, 2)	.00315957	.0138685

TOWER IMPEDANCE MATRIX

impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	15.2703	-67.6512
Z(1, 2)	-3.25541	-5.8192
Z(2, 1)	-3.2554	-5.81921
Z(2, 2)	15.0101	-68.7549

FIGURE 9
WIP MOMENT MODEL SUMMARY FOR DIRECTIONAL MODE

WIP REVISED DIRECTIONAL

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

wire	caps	Radius	Angle	Z	radius	segs
1	none	0	0	0	2.4061	3
		0	0	13.6		
2	none	0	0	13.6	2.0051	3
		0	0	27.3		
3	none	0	0	27.3	1.6041	3
		0	0	40.9		
4	none	0	0	40.9	1.203	3
		0	0	54.5		
5	none	0	0	54.5	.8521	3
		0	0	61.7		
6	none	0	0	61.7	.6391	3
		0	0	68.2		
7	none	0	0	68.2	.08	2
		3.35	0	68.2		
8	none	0	0	68.2	.08	2
		3.35	120.	68.2		
9	none	0	0	68.2	.08	2
		3.35	240.	68.2		
10	none	181.	50.	0	2.4061	3
		181.	50.	13.6		
11	none	181.	50.	13.6	2.0051	3
		181.	50.	27.3		
12	none	181.	50.	27.3	1.6041	3
		181.	50.	40.9		
13	none	181.	50.	40.9	1.203	3
		181.	50.	54.5		
14	none	181.	50.	54.5	.8521	3
		181.	50.	61.3		
15	none	181.	50.	61.3	.6391	3
		181.	50.	67.8		
16	none	181.	50.	67.8	.08	2
		183.17	49.2	67.8		
17	none	181.	50.	67.8	.08	2
		177.7	49.8	67.8		
18	none	181.	50.	67.8	.08	2
		182.17	51.	67.8		

Number of wires = 18
current nodes = 48

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	2	4.56667	16	1.67125
radius	7	.08	1	2.4061

ELECTRICAL DESCRIPTION
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	.61	0	1	4.64E-03	.0126852

Sources

source	node	sector	magnitude	phase	type
1	1	1	1,731.45	-76.61	voltage
2	25	1	1,245.29	-80.04	voltage

IMPEDANCE
normalization = 50.

FIGURE 9
WIP MOMENT MODEL SUMMARY FOR DIRECTIONAL MODE CONTINUED

WIP REVISED DIRECTIONAL Cont'd

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR dB	S11 dB	S12 dB
source = 1; node 1, sector 1							
.61	13.556	-72.87	74.12	-79.46	11.709	-1.4873	-16.061
source = 2; node 25, sector 1							
.61	10.666	-79.118	79.834	-82.32	16.579	-1.0491	-18.879
Parallel combination of all sources.							
.61	6.12113	-37.9572	38.4476	-80.84	12.921	-1.3472	-16.853

CURRENT rms
Frequency = .61 MHz
Input power = 5,000. watts
Efficiency = 100. %

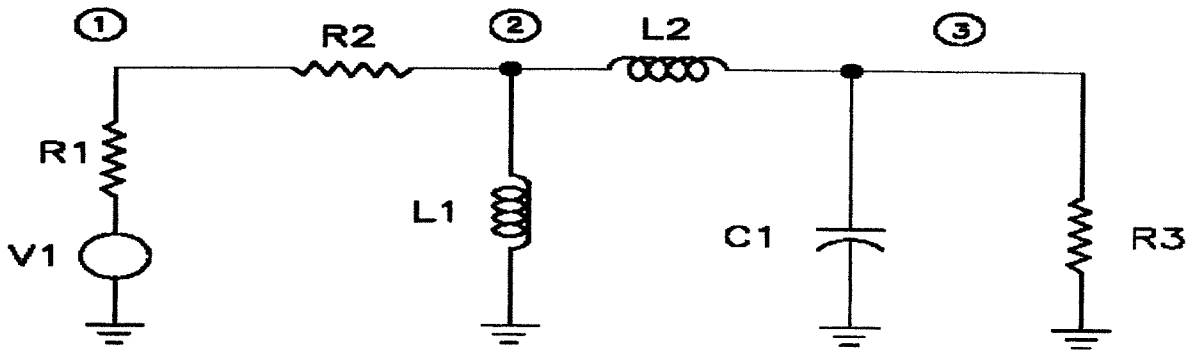
current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	16.5244	2.85	16.5039	.822979
2	0	0	4.53333	14.8603	1.73	14.8535	.447615
3	0	0	9.06667	13.9644	1.16	13.9615	.282916
END	0	0	13.6	13.0625	.66	13.0617	.150189
2J1	0	0	13.6	13.0625	.66	13.0617	.150189
5	0	0	18.1667	12.2572	.27	12.2571	.0575911
6	0	0	22.7333	11.3752	-.11	11.3752	-.0208714
END	0	0	27.3	10.3963	-.47	10.3959	-.0857159
2J2	0	0	27.3	10.3963	-.47	10.3959	-.0857159
8	0	0	31.8333	9.51737	-.77	9.51651	-.127499
9	0	0	36.3667	8.54265	-1.06	8.54118	-.158667
END	0	0	40.9	7.45719	-1.37	7.45507	-.177799
2J3	0	0	40.9	7.45719	-1.37	7.45507	-.177799
11	0	0	45.4333	6.50535	-1.61	6.50278	-.182858
12	0	0	49.9667	5.45265	-1.86	5.44977	-.177203
END	0	0	54.5	4.27701	-2.12	4.27408	-.158517
2J4	0	0	54.5	4.27701	-2.12	4.27408	-.158517
14	0	0	56.9	3.77134	-2.23	3.76848	-.146638
15	0	0	59.3	3.21523	-2.34	3.21255	-.131408
END	0	0	61.7	2.60817	-2.46	2.60577	-.111951
2J5	0	0	61.7	2.60817	-2.46	2.60577	-.111951
17	0	0	63.8667	2.14479	-2.54	2.14267	-.0951885
18	0	0	66.0333	1.64719	-2.62	1.64546	-.0753649
END	0	0	68.2	1.18977	-2.66	1.18849	-.0552544
2J6	0	0	68.2	.396491	-2.63	.396073	-.018204
20	1.675	0	68.2	.255686	-2.6	.255423	-.0115959
END	3.35	0	68.2	0	0	0	0
2J6	0	0	68.2	.396539	-2.65	.396117	-.0183053
22	-.8375	1.45059	68.2	.255724	-2.62	.255457	-.0116743
END	-1.675	2.90119	68.2	0	0	0	0
2J6	0	0	68.2	.39674	-2.71	.396297	-.018745
24	-.8375	-1.45059	68.2	.255877	-2.69	.255595	-.0120126
END	-1.675	-2.90119	68.2	0	0	0	0
GND	116.345	138.654	0	11.034	2.28	11.0253	.438993
26	116.345	138.654	4.53333	9.83169	1.38	9.82882	.237505
27	116.345	138.654	9.06667	9.19488	.93	9.19366	.149246
END	116.345	138.654	13.6	8.56318	.52	8.56282	.0782764
2J10	116.345	138.654	13.6	8.56318	.52	8.56282	.0782764
29	116.345	138.654	18.1667	8.00673	.21	8.00668	.0289075
30	116.345	138.654	22.7333	7.40393	-.1	7.40392	-.0127743
END	116.345	138.654	27.3	6.74145	-.4	6.74129	-.0470456
2J11	116.345	138.654	27.3	6.74145	-.4	6.74129	-.0470456
32	116.345	138.654	31.8333	6.15153	-.64	6.15114	-.0689698

FIGURE 9
WIP MOMENT MODEL SUMMARY FOR DIRECTIONAL MODE
CONTINUED

WIP REVISED DIRECTIONAL Cont'd

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
33	116.345	138.654	36.3667	5.50177	-.89	5.50111	-.0851366
END	116.345	138.654	40.9	4.78273	-1.14	4.78179	-.0947945
2J12	116.345	138.654	40.9	4.78273	-1.14	4.78179	-.0947945
35	116.345	138.654	45.4333	4.15561	-1.34	4.15448	-.097005
36	116.345	138.654	49.9667	3.46524	-1.55	3.46398	-.0934618
END	116.345	138.654	54.5	2.69694	-1.76	2.69567	-.0829331
2J13	116.345	138.654	54.5	2.69694	-1.76	2.69567	-.0829331
38	116.345	138.654	56.7667	2.38774	-1.84	2.38651	-.0767754
39	116.345	138.654	59.0333	2.04805	-1.93	2.04689	-.0690206
END	116.345	138.654	61.3	1.67799	-2.02	1.67695	-.0592355
2J14	116.345	138.654	61.3	1.67799	-2.02	1.67695	-.0592355
41	116.345	138.654	63.4667	1.3795	-2.09	1.37858	-.0503622
42	116.345	138.654	65.6333	1.05949	-2.16	1.05873	-.0398781
END	116.345	138.654	67.8	.765997	-2.19	.765437	-.0292677
2J15	116.345	138.654	67.8	.253739	-2.26	.253542	-.0100188
44	118.016	138.656	67.8	.163792	-2.26	.163665	-6.45E-03
END	119.687	138.659	67.8	0	0	0	0
2J15	116.345	138.654	67.8	.254972	-2.08	.254804	-9.25E-03
46	115.521	137.19	67.8	.164404	-2.03	.1643	-5.84E-03
END	114.698	135.727	67.8	0	0	0	0
2J15	116.345	138.654	67.8	.257286	-2.23	.257091	-.0100038
48	115.494	140.113	67.8	.165752	-2.21	.165628	-6.4E-03
END	114.643	141.573	67.8	0	0	0	0

FIGURE 10
WIP TOWER BASE CIRCUIT ANALYSIS MODEL



The above circuit was analyzed with the Engineering Circuit Analysis program (ECA) for each Tower. Resistors R1 (100k Ω) and R2 (0.1 Ω) were located in the circuit for measurement locations of impedance and current.

For each of the individual Tower impedance calculations, the complex value of R3 was that obtained from the program Expert Mininec Broadcast Professional Version 6.0 for that specific Tower. The input impedance to the circuit was calculated to represent the value at the test jack located at the Antenna Tuning Unit (ATU) output.

In the case of the Directional Array, the complex value of R3 for each Tower was set to the Expert Mininec Broadcast Professional Version 6.0 calculated impedance at each source location. The current magnitude and phase variation was calculated for each Tower from the input to the output of each circuit. These values, once normalized, were used to modify the calculated source current magnitude and phase to determine the sampling TCT values.

FIGURE 11A
WIP CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS

WIP REVISED TOWER 1 (OTHER OPEN)

BRANCH	LABEL	NODES		VALUE	
1	V1	0	0	100.	
2	R1	1	0	100.K	
3	R2	1	2	0.1	
4	L1	2	0	0.0083491	
5	L2	2	3	5.22u	
6	C1	3	0	40.p	
7	R3	3	0	15.8	J-68.8

FREQ.	PROBE	VALUE	dB	PHASE	PHASE DELAY
610.K	V:1	0.0506375	-25.911	-72.010	327.916n
610.K	V:2	0.0506068	-25.916	-72.118	328.406n
610.K	V:3	0.0699482	-23.104	-77.148	351.312n
610.K	Z:R1	50.6375	17.045	-72.010	327.916n

Z (IN) = 15.6 -J 48.2

FIGURE 11B
WIP CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS

WIP REVISED TOWER 2 (OTHER OPEN)

BRANCH	LABEL	NODES		VALUE	
1	V1	0	0	100.	
2	R1	1	0	100.K	
3	R2	1	2	0.1	
4	L1	2	0	0.0083491	
5	L2	2	3	6.65u	
6	C1	3	0	40.p	
7	R3	3	0	15.6	J-70.

FREQ.	PROBE	VALUE	dB	PHASE	PHASE DELAY
610.K	V:1	0.04648	-26.655	-70.613	321.551n
610.K	V:2	0.0464469	-26.661	-70.729	322.081n
610.K	V:3	0.0710419	-22.970	-77.520	353.004n
610.K	Z:R1	46.48	16.673	-70.613	321.551n

Z (IN) = 15.4 -J 43.8

FIGURE 12A
WIP CIRCUIT ANALYSIS FOR DIRECTIONAL MODE

WIP REVISED TOWER 1 DIRECTIONAL

BRANCH	LABEL	NODES		VALUE	
1	V1	0	0	100.	
2	R1	1	0	100.K	
3	R2	1	2	0.1	
4	L1	2	0	0.0083491	
5	L2	2	3	5.22u	
6	C1	3	0	40.p	
7	R3	3	0	13.6	J-72.9

FREQ.	PROBE	VALUE	dB	PHASE	PHASE DELAY
610.K	V:1	0.0538907	-25.370	-75.526	343.924n
610.K	V:2	0.0538658	-25.374	-75.629	344.393n
610.K	V:3	0.0734477	-22.680	-79.497	362.008n
610.K	Z:R1	53.8907	17.315	-75.526	343.924n
610.K	I:R2	999.865u	-60.001	0.030	-136.161p
610.K	I:R3	990.425u	-60.084	-0.064	293.199p

Z (IN) = 13.5 -J 52.2

I (IN/OUT) = 1.0095, 0.1 DEG.

FIGURE 12B
WIP CIRCUIT ANALYSIS FOR DIRECTIONAL MODE

WIP REVISED TOWER 2 DIRECTIONAL

BRANCH	LABEL	NODES		VALUE	
1	V1	0	0	100.	
2	R1	1	0	100.K	
3	R2	1	2	0.1	
4	L1	2	0	0.0083491	
5	L2	2	3	6.65u	
6	C1	3	0	40.p	
7	R3	3	0	10.7	J-79.1

FREQ.	PROBE	VALUE	dB	PHASE	PHASE DELAY
610.K	V:1	0.0538094	-25.383	-78.632	358.07n
610.K	V:2	0.0537898	-25.386	-78.736	358.545n
610.K	V:3	0.0789856	-22.049	-82.340	374.955n
610.K	Z:R1	53.8094	17.309	-78.632	358.07n
610.K	I:R2	999.894u	-60.001	0.030	-137.654p
610.K	I:R3	989.542u	-60.091	-0.044	199.913p

Z (IN) = 10.6 -J 52.8

I (IN/OUT) = 1.0105, 0.1 DEG.

FIGURE 13
WIP REFERENCE FIELD INTENSITY MEASUREMENTS

WIP REFERENCE POINT MEASUREMENTS – FEBRUARY 3, 2010

CO-ORD NAD27

Radial		Dist km	mV/m	Time		Deg	Min	Sec	Description
N 44 E	1	2.82	56.5	1145	N	39	53	1.2	NJ 168 behind Midas Muffler shop -- on edge of grass in line with home plate of softball field
					W	75	5	11.2	
	2	3.16	67.0	1153	N	39	53	8.6	Near int of Lake + Maple on sidewalk next to creek at end of guard rail
					W	755	5	0.2	
	3	3.83	41.5	1200	N	39	53	25.1	N side of Cedarcroft @ Audubon -- on sidewalk in front of house #125
					W	75	4	41.9	
N 56 E	1	2.92	52.0	1223	N	39	52	48.3	Wayne + St. Martins -- NE corner @ street sign
					W	75	4	51.4	
	2	3.99	39.0	1216	N	39	53	8.5	Walnut S of Wyoming -- E sidewalk in front of wooden garage building
					W	75	4	14.6	
	3	4.61	35.8	1209	N	39	53	19.3	On sidewalk in front of 23 W. Vassar
					W	75	3	52.4	
N 140 E	1	3.55	213.0	1249	N	39	50	27.9	At driveway 932 Evesham
					W	75	4	57.0	
	2	4.35	180.0	1255	N	39	50	7.8	Ridge + Front @ street sign + pole 5176
					W	75	4	35.8	
	3	5.04	163.0	1303	N	39	49	50.6	Cemetery entrance off Lower Landing Rd -- at drain inside gate
					W	75	4	17.3	

FIGURE 13
WIP REFERENCE FIELD INTENSITY MEASUREMENTS
CONTINUED

WIP REFERENCE POINT MEASUREMENTS – FEBRUARY 3, 2010

Radial		Dist km	mV/m	Time		CO-ORD NAD27 Deg	Min	Sec	Description
N 218 E	1	4.49	43.0	1328	N	39	50	0.9	Between 510 + 532 Cooper -- 15' W of pole
					W	75	8	29.5	#61965WB on sidewalk
	2	5.41	38.7	1340	N	39	49	37.4	On sidewalk in front of house "33 Andy Snyder"
					W	75	8	53.5	(at corner of Elm)
	3	6.21	39.0	1347	N	39	49	16.6	At driveway of 425 Holly
					W	75	9	13.3	
N 242 E	1	3.99	41.5	1429	N	39	50	54.7	On sidewalk in front of 107 Hess
					W	75	9	1.6	
	2	4.68	49.0	1423	N	39	50	44.5	On sidewalk in front of 20 Lynn
					W	75	9	27.8	
	3	5.58	29.5	1403	N	39	50	30.7	Childs N of Delaware -- on E sidewalk at first tree
					W	75	10	0.9	past speed limit sign
N 320 E	1	6.15	144.0	1506	N	39	54	27.9	Packer Ave @ produce market (terminal) entrance
					W	75	9	19.9	@ stop sign
	2	7.34	85.0	1516	N	39	54	56.8	10th + Oregon on S sidewalk 20' E of 10th
					W	75	9	53.2	
	3	8.10	99.0	1525	N	39	55	14.6	Broad + Ritner NW corner
					W	75	10	15.5	