Gregory L. Masters
202.719.7370
gmasters@wileyrein.com

2018 AUG 28 PM 2:02 2018 SEP -4 PM 2:04

ORIGINAL

August 28, 2018

BY HAND VIA COURIER

Accepted / Filed

AUG 28 2018

Federal Communications Commission
Office of the Secretary

Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
12th Street Lobby, TW-A325
Washington, DC 20554

Re: **Alpha Media Licensee LLC – FRN: 0022491476**
Station WHAG(AM), Halfway, MD (Fac. ID 23466)
Application for Station License

Dear Ms. Dortch:

On behalf of Alpha Media Licensee LLC, licensee of AM station WHAG, Halfway, Maryland, we are submitting herewith an original and two copies of an application on FCC Form 302-AM for a new license.

The fee due for this application, $1,505.00, has been paid, using the FCC Fee Filer system. A copy of Form 159 confirming the payment is included herewith.

Should there be any questions concerning this application, please contact the undersigned.

Sincerely,

Gregory L. Masters

Agency Tracking ID:PGC3137991
Authorization Number:225845
Successful Authorization -- Date Paid: 8/28/18
FILE COPY ONLY!!

READ INSTRUCTIONS CAREFULLY BEFORE PROCEEDING (1) LOCKBOX #979089	FEDERAL COMMUNICATIONS COMMISSION **REMITTANCE ADVICE** **FORM 159** PAGE NO 1 OF 1	APPROVED BY OMB 3060-059 SPECIAL USE FCC USE ONLY

SECTION A - Payer Information

(2) PAYER NAME (if paying by credit card, enter name exactly as it appears on your card)	(3) TOTAL AMOUNT PAID (dollars and cents)
Wiley Rein LLP	**$1505.00**

(4) STREET ADDRESS LINE NO. 1
1776 K Street, N.W.
(5) STREET ADDRESS LINE NO. 2

(6) CITY	(7) STATE	(8) ZIP CODE
Washington	**DC**	**20006-2304**

(9) DAYTIME TELEPHONE NUMBER (INCLUDING AREA CODE)	(10) COUNTRY CODE (IF NOT IN U.S.A.)
202-7197000 x7235	**US**

FCC REGISTRATION NUMBER (FRN) AND TAX IDENTIFICATION NUMBER (TIN) REQUIRED

(11) PAYER (FRN)	(12) FCC USE ONLY
0002151744	

IF PAYER NAME AND THE APPLICANT NAME ARE DIFFERENT, COMPLETE SECTION B
IF MORE THAN ONE APPLICANT, USE CONTINUATION SHEETS (FORM 159-C)

(13) APPLICANT NAME
Alpha Media Licensee LLC
(14) STREET ADDRESS LINE NO. 1
1211 SW 5th Avenue
(15) STREET ADDRESS LINE NO. 2
Suite 750

(16) CITY	(17) STATE	(18) ZIP CODE
Portland	**OR**	**97204**

(19) DAYTIME TELEPHONE NUMBER (INCLUDING AREA CODE)	(20) COUNTRY CODE (IF NOT IN U.S.A.)
503-5176200	**US**

FCC REGISTRATION NUMBER (FRN) AND TAX IDENTIFICATION NUMBER (TIN) REQUIRED

(21) APPLICANT (FRN)	(22) FCC USE ONLY
0022491476	

COMPLETE SECTION C FOR EACH SERVICE, IF MORE BOXES ARE NEEDED, USE CONTINUATION SHEET

(23A) FCC Call Sign/Other ID	(24A) Payment Type Code(PTC)	(25A) Quantity
WHAG	**MMR**	**1**
(26A) Fee Due for (PTC)	(27A) Total Fee	FCC Use Only
$700.00	**$700.00**	
(28A) FCC CODE 1	(29A) FCC CODE 2	
23466	**Form302-AM**	

(23B) FCC Call Sign/Other ID	(24B) Payment Type Code(PTC)	(25B) Quantity
WHAG	**MOR**	**1**
(26B) Fee Due for (PTC)	(27B) Total Fee	FCC Use Only
$805.00	**$805.00**	
(28B) FCC CODE 1	(29B) FCC CODE 2	

23466	**Form302-AM**

Accepted / Filed

AUG 28 2018

Federal Communications Commission
Office of the Secretary

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.

BMML

FOR COMMISSION USE ONLY
FILE NO. BL-20180828ACB

SECTION I - APPLICANT FEE INFORMATION

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

Alpha Media Licensee LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)
1211 SW 5th Avenue

MAILING ADDRESS (Line 2) (Maximum 35 characters)
Suite 750

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Portland	OR	97204

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
(503)517-6200	WHAG	23466

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

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

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

C. If Yes, provide the following information:

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

(A) FEE TYPE CODE	(B) FEE MULTIPLE	(C) FEE DUE FOR FEE TYPE CODE IN COLUMN (A)	FOR FCC USE ONLY
MMR	0001	$ 700.00	

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

(A)	(B)	(C)	FOR FCC USE ONLY
MOR	0001	$ 805.00	

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
	$ 1505.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT Alpha Media Licensee LLC		
MAILING ADDRESS 1211 SW 5th Avenue, Suite 750		
CITY Portland	STATE OR	ZIP CODE 97204

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
WHAG	Halfway, MD	N/A	N/A	N/A

3. Is the station now operating pursuant to automatic program test authority in accordance with 47 C.F.R. Section 73.1620?

☐ Yes ☐ No

If No, explain in an Exhibit. N/A See engineering statement.

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. N/A See engineering statement.

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. N/A See engineering statement.

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	
Donna L. Heffner	Donna L Heffner	
Title	Date	Telephone Number
Secretary	8/28/2018	(503)517-6200

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
ALPHA MEDIA LICENSEE LLC

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
WHAG		1410	UNLIMITED	0.099	1.0

2. Station location

State	City or Town
MARYLAND	HALFWAY

3. Transmitter location

State	County	City or Town	Street address (or other identification)
MD	WASHINGTON	HALFWAY	1250 MARYLAND AVE.

4. Main studio location

State	County	City or Town	Street address (or other identification)
MD	WASHINGTON	HALFWAY	1250 MARYLAND AVE.

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

State	County	City or Town	Street address (or other identification)
MD	WASHINGTON	HALFWAY	1250 MARYLAND AVE.

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.

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
1.41	4.65

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	50	+J0.3	+J0.3

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	1.0	1.0		
#2	1.058	1.058	+79.3	+79.3		

Manufacturer and type of antenna monitor: POTOMAC INSTRUMENTS 1900

SECTION III - Page 2

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

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded.	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit.
UNIFORM CROSS SECTION	53.2	54.1	54.1	Exhibit No. N/A

Excitation ☑ Series ☐ Shunt

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

North Latitude 39 o 37 ' 03 " | West Longitude 77 o 44 ' 17 "

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. SEE BELOW

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

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. THIS IS AN APPLICATION TO LICENSE USING MoM. THE FM ANTENNA FOR WDLD IS SIDE MOUNTED ON TWR #1, BMLH-20110422ABA

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

N/A

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

Name (Please Print or Type)	Signature (check appropriate box below)
Clarence M. Beverage	
Address (include ZIP Code)	Date
Communications Technologies, Inc. P.O. Box 1130 Marlton, NJ 08053	08/24/2018
	Telephone No. (Include Area Code)
	609-451-5296

☐ Technical Director ☐ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☑ Other (specify) BROADCAST ENGINEERING CONSULTANT

ENGINEERING STATEMENT

APPLICATION FOR MOMENT METHOD MODELING
LICENSED OPERATION

WHAG 1410 kHz

1 kW DAY (0.099 kW NIGHT) DA-1

HALFWAY, MD

AUGUST 2018

ENGINEERING STATEMENT

APPLICATION FOR MOMENT METHOD MODELING LICENSED OPERATION

WHAG 1410 kHz

1 kW DAY (0.099 kW NIGHT) DA-1

HALFWAY, MD

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AUGUST 2018

ENGINEERING STATEMENT

APPLICATION FOR MOMENT METHOD MODELING LICENSED OPERATION

WHAG 1410 kHz

1 kW DAY (0.099 kW NIGHT) DA-1

HALFWAY, MD

AUGUST 2018

SUMMARY

The following engineering statement has been prepared on behalf of Alpha Media Licensee LLC ("**Alpha**") licensee of standard broadcast station WHAG. The WHAG facilities described herein are currently licensed under FCC File Number BML-20050728BGJ. This document includes MoM based performance verification for the DA-1 directional antenna system operation. WHAG is currently operating under STA, BESTA-20180522AAE, due to a fire which destroyed the phasor building. The STA request indicated that a MoM license would be filed.

The applicant requests authorization to operate the WHAG antenna system using computer modeling and sample system verification as provided for in the Second Report and Order in MM Docket No. 93-177 released September 26, 2008 pending grant of the license application submitted herein. The rules specify that the directional antenna parameters be set to the operating parameters determined by the moment method without deviation. That operation has been completed and this statement is being submitted, along with Section III of FCC Form 302-AM, specifying the calculated MoM parameters for licensed operation.

METHOD OF MOMENTS MODEL – SELF IMPEDANCE ANALYSIS

In an effort to model the antenna system as accurately as possible, detailed mechanical data was obtained from the licensee and FCC tower registration data and is summarized below:

> Two identical unregistered guyed towers, square cross section, .4572m on each face for an effective radius of .29106, each 53.15M tall.

The choice of calculating engine and software implementation chosen for this filing is the ACSModel Version 1.030 employing MININEC3. The circuit analysis software employed is WCAP Professional

Version 1.1.10.

The wire model data are compiled in Table 1. The values there comply with the 73.151 requirement that the radius of the wire model cylinder be within 80 and 150 percent of the radius of a circle with a circumference equal to the sum of the faces, that the height be between 75 and 125 percent of the physical length and that no segment be greater than 10 electrical degrees.

Table 2 is a summary of measured and calculated self-impedance, circuit model data and calculated tolerances. The tower measured base self-impedances, with all other towers floating, as measured at the J plug, are listed in Table 2. The Mininec tower models for self-impedance determination, with all other towers floating, may be found in *Exhibit I*. A circuit model has been constructed for each tower to account for shunt and series reactance across the tower base. All calculations have been made employing WCAP Professional version 1.1.10 as seen in *Figures 1 & 2* for self-impedance. The measured and calculated self-impedance values are well within the tolerance specified in 73.151(c)(2)(ii) as seen in Table 2. ND source data found in Table 3.

METHOD OF MOMENTS MODEL – BASE OPERATING PARAMETERS

The modeled tower array was employed, as constructed for the derivation of self-impedance, for the determination of DA-1 directional operating parameters. The FCC theoretical values were converted to base excitation values. The base driving point parameters for the DA-1 directional array are on *Exhibit II page 4*. Table 3 summarizes the Mininec voltage source values for each tower base.

The calculated base operating parameters and the phase monitor parameters as adjusted and reflected on Form 302-AM, attached, are found on Table 4. The toroidal sample transformers are summarized in table 6. The calculated MoM base operating parameters are found on *Exhibit II* for the DA-1 directional operation.

DIRECT MEASUREMENT OF POWER

Common point impedance as measured, and common point currents, are listed in Table 5. This data is found on Section III FCC Form 302-AM attached.

SAMPLING SYSTEM

The sampling system equipment is summarized in Table 6. Delta TCT-3 toroids serial numbers 18638 and 18639, were tested for accuracy by removing the units from the tuning units at the base of each tower and placing the devices in series on the same conductor in the phasor cabinet. The sample devices were then measured when connected to the phase monitor with coax jumpers having exact equal electrical length.

The sampling device accuracy is well within the manufacturer tolerance of ±2% in magnitude and ±3 degrees in phase. Phase monitor accuracy was confirmed by feeding the tower inputs through a splitter and equal length jumpers to confirm equal magnitude and phase on each tower. There were no observable errors.

Impedance and electrical length for each of the two sample lines were measured. The measurement was made at the transmitter building with the sample lines unterminated on the tuning unit end. The results are in Table 7.

It may be seen that the sample lines are essentially equal in length at the specified frequencies. The sample system meets the rule requirement that the sample lines be equal to within one degree.

The impedance of the sample lines was determined by measuring the open circuit impedance 45 degrees above and below the resonant length of the sample lines. The measured data is presented below. The impedance is determined using the formula:

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

The results are tabulated in Table 8. The characteristic impedance of the transmission lines is within the allowable tolerance of 2 ohms.

Sampling system impedance was measured with each of the sampling lines terminated in its respective toroid sampling device. Impedance was measured by connecting each sample line directly to the measurement device.

GROUND SYSTEM

The ground system consists of 120 equally-spaced, buried, copper wire radials, around the base of each tower, each 53 meters in length except where foreshortened where intersecting radials are shortened and bonded to a transverse copper strap midway between adjacent towers.

REFERENCE FIELD STRENGTH MEASUREMENTS

Reference field strength measurements were taken by William P. Weeks using a Potomac Instruments FIM-41, serial number 1918, last calibrated by the factory on 9/27/2015 but calibration checked against meters calibrated within the last two years. The measurement data appears in *Appendix 1*.

CONCLUSION

All adjustments, measurements and field work were undertaken under the direction of the affiant.

The foregoing was prepared on behalf of Alpha Media Licensee LLC by Clarence M. Beverage of *Communications Technologies, Inc.*, Marlton, New Jersey, whose qualifications are a matter of record with the Federal Communications Commission. The statements herein are true and correct of his own knowledge, except such statements made on information and belief, and as to these statements he believes them to be true and correct.

Clarence M. Beverage
for Communications Technologies, Inc.
Marlton, New Jersey

August 24, 2018

EXHIBIT 1 – TOWER #1 ND

```
****************************************
                ACSModel
          (MININEC 3.1 Core)
      08-24-2018          11:37:28
****************************************

WHAG FCC ND PATTERN
WHAG ND FOR #1 05142018


Frequency = 1.410 MHz     Wavelength = 212.62412 Meters

No. of Wires: 2

Wire No. 1   Coordinates                                End          No.
of
   X             Y             Z          Radius     Connection
Segments
 0             0             0                        -1
 0             0             57.76289     0.3881       0              20

Wire No. 2   Coordinates                                End          No.
of
   X             Y             Z          Radius     Connection
Segments
-42.45229     -31.9901       0                        -2
-42.45229     -31.9901       56.2568      0.3881       0              20

                **** ANTENNA GEOMETRY ****

Wire No.  1  Coordinates                                Connection  Pulse
X             Y             Z             Radius       End1 End2   No.
 0             0             0            0.3881       -1   1      1
 0             0             2.888144     0.3881       1    1      2
 0             0             5.776289     0.3881       1    1      3
 0             0             8.664433     0.3881       1    1      4
 0             0             11.55258     0.3881       1    1      5
 0             0             14.44072     0.3881       1    1      6
 0             0             17.32887     0.3881       1    1      7
 0             0             20.21701     0.3881       1    1      8
 0             0             23.10515     0.3881       1    1      9
 0             0             25.9933      0.3881       1    1      10
 0             0             28.88144     0.3881       1    1      11
 0             0             31.76959     0.3881       1    1      12
 0             0             34.65773     0.3881       1    1      13
 0             0             37.54588     0.3881       1    1      14
 0             0             40.43402     0.3881       1    1      15
 0             0             43.32217     0.3881       1    1      16
 0             0             46.21031     0.3881       1    1      17
 0             0             49.09845     0.3881       1    1      18
 0             0             51.9866      0.3881       1    1      19
 0             0             54.87474     0.3881       1    0      20
```

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
-42.45229	-31.9901	0	0.3881	-2	2	21
-42.45229	-31.9901	2.81284	0.3881	2	2	22
-42.45229	-31.9901	5.62568	0.3881	2	2	23
-42.45229	-31.9901	8.438519	0.3881	2	2	24
-42.45229	-31.9901	11.25136	0.3881	2	2	25
-42.45229	-31.9901	14.0642	0.3881	2	2	26
-42.45229	-31.9901	16.87704	0.3881	2	2	27
-42.45229	-31.9901	19.68988	0.3881	2	2	28
-42.45229	-31.9901	22.50272	0.3881	2	2	29
-42.45229	-31.9901	25.31556	0.3881	2	2	30
-42.45229	-31.9901	28.1284	0.3881	2	2	31
-42.45229	-31.9901	30.94124	0.3881	2	2	32
-42.45229	-31.9901	33.75408	0.3881	2	2	33
-42.45229	-31.9901	36.56692	0.3881	2	2	34
-42.45229	-31.9901	39.37976	0.3881	2	2	35
-42.45229	-31.9901	42.1926	0.3881	2	2	36
-42.45229	-31.9901	45.00544	0.3881	2	2	37
-42.45229	-31.9901	47.81828	0.3881	2	2	38
-42.45229	-31.9901	50.63112	0.3881	2	2	39
-42.45229	-31.9901	53.44396	0.3881	2	0	40

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 487.1, 52.3

Number of Loads: 1
Pulse No., Resistance, Reactance: 21 , 0.1 ,-5643.8

********** SOURCE DATA **********
Pulse 1 Voltage = (298.0814, 385.2507j)
Current = (5.9017, 0.6251j)
Impedance = (56.785, 59.264j)
Power = 1000.0 Watts

********** CURRENT DATA **********

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	5.9017	0.6251	5.9347	6.0462
2	6.19	0.387	6.2021	3.5777
3	6.3005	0.2567	6.3057	2.333
4	6.3453	0.1475	6.3471	1.3315
5	6.3323	0.0539	6.3325	0.488
6	6.266	-0.027	6.2661	-0.247
7	6.1493	-0.0967	6.15	-0.9008
8	5.9842	-0.1558	5.9862	-1.491
9	5.7725	-0.2046	5.7761	-2.03
10	5.516	-0.2434	5.5214	-2.5266
11	5.2167	-0.2723	5.2238	-2.9879
12	4.8765	-0.2914	4.8852	-3.4193

13	4.4972	-0.3007	4.5072	-3.8252
14	4.0809	-0.3004	4.0919	-4.2094
15	3.6293	-0.2904	3.6409	-4.575
16	3.144	-0.2709	3.1557	-4.9247
17	2.6259	-0.2418	2.637	-5.2609
18	2.0744	-0.2029	2.0843	-5.5863
19	1.4851	-0.1536	1.493	-5.9038
20	0.8484	-0.0925	0.8534	-6.2231
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	-0.0273	-0.03	0.0406	-132.2891
22	-0.1478	-0.1626	0.2198	-132.276
23	-0.2105	-0.2318	0.3131	-132.254
24	-0.2604	-0.2869	0.3874	-132.2266
25	-0.3001	-0.331	0.4468	-132.1944
26	-0.3314	-0.366	0.4937	-132.1578
27	-0.355	-0.3926	0.5293	-132.1169
28	-0.3713	-0.4114	0.5542	-132.0717
29	-0.3808	-0.4225	0.5688	-132.0222
30	-0.3835	-0.4264	0.5735	-131.9685
31	-0.3798	-0.4231	0.5686	-131.9106
32	-0.3698	-0.4128	0.5542	-131.8487
33	-0.3536	-0.3958	0.5308	-131.7829
34	-0.3316	-0.372	0.4984	-131.7137
35	-0.3039	-0.3418	0.4574	-131.6414
36	-0.2706	-0.3052	0.4079	-131.5666
37	-0.2319	-0.2622	0.3501	-131.4899
38	-0.1877	-0.2128	0.2837	-131.4118
39	-0.1375	-0.1563	0.2082	-131.3329
40	-0.0804	-0.0917	0.1219	-131.2521
E	0.0	0.0	0.0	0.0

EXHIBIT 1 – TOWER #2 ND

```
****************************************
                ACSModel
          (MININEC 3.1 Core)
      08-24-2018          11:42:20
****************************************

WHAG FCC ND PATTERN
WHAG ND FOR #2 05142018


Frequency = 1.410 MHz     Wavelength = 212.62412 Meters

No. of Wires: 2

Wire No. 1   Coordinates                                  End        No.
of
   X            Y            Z          Radius     Connection
Segments
 0             0            0                          -1
 0             0            57.76289    0.3881          0              20

Wire No. 2   Coordinates                                  End        No.
of
   X            Y            Z          Radius     Connection
Segments
-42.45229     -31.9901      0                          -2
-42.45229     -31.9901      56.2568     0.3881          0              20

                **** ANTENNA GEOMETRY ****

Wire No.  1  Coordinates                                  Connection Pulse
X             Y            Z          Radius     End1 End2  No.
 0             0            0          0.3881     -1   1     1
 0             0            2.888144   0.3881     1    1     2
 0             0            5.776289   0.3881     1    1     3
 0             0            8.664433   0.3881     1    1     4
 0             0            11.55258   0.3881     1    1     5
 0             0            14.44072   0.3881     1    1     6
 0             0            17.32887   0.3881     1    1     7
 0             0            20.21701   0.3881     1    1     8
 0             0            23.10515   0.3881     1    1     9
 0             0            25.9933    0.3881     1    1     10
 0             0            28.88144   0.3881     1    1     11
 0             0            31.76959   0.3881     1    1     12
 0             0            34.65773   0.3881     1    1     13
 0             0            37.54588   0.3881     1    1     14
 0             0            40.43402   0.3881     1    1     15
 0             0            43.32217   0.3881     1    1     16
 0             0            46.21031   0.3881     1    1     17
 0             0            49.09845   0.3881     1    1     18
 0             0            51.9866    0.3881     1    1     19
 0             0            54.87474   0.3881     1    0     20
```

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
-42.45229	-31.9901	0	0.3881	-2	2	21
-42.45229	-31.9901	2.81284	0.3881	2	2	22
-42.45229	-31.9901	5.62568	0.3881	2	2	23
-42.45229	-31.9901	8.438519	0.3881	2	2	24
-42.45229	-31.9901	11.25136	0.3881	2	2	25
-42.45229	-31.9901	14.0642	0.3881	2	2	26
-42.45229	-31.9901	16.87704	0.3881	2	2	27
-42.45229	-31.9901	19.68988	0.3881	2	2	28
-42.45229	-31.9901	22.50272	0.3881	2	2	29
-42.45229	-31.9901	25.31556	0.3881	2	2	30
-42.45229	-31.9901	28.1284	0.3881	2	2	31
-42.45229	-31.9901	30.94124	0.3881	2	2	32
-42.45229	-31.9901	33.75408	0.3881	2	2	33
-42.45229	-31.9901	36.56692	0.3881	2	2	34
-42.45229	-31.9901	39.37976	0.3881	2	2	35
-42.45229	-31.9901	42.1926	0.3881	2	2	36
-42.45229	-31.9901	45.00544	0.3881	2	2	37
-42.45229	-31.9901	47.81828	0.3881	2	2	38
-42.45229	-31.9901	50.63112	0.3881	2	2	39
-42.45229	-31.9901	53.44396	0.3881	2	0	40

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 432.5, 47.7

Number of Loads: 1
Pulse No., Resistance, Reactance: 1 , 0.1 ,-5643.8

********** SOURCE DATA **********
Pulse 21 Voltage = (290.8605, 320.149j)
Current = (6.2463, 0.5722j)
Impedance = (50.834, 46.597j)
Power = 1000.0 Watts

********** CURRENT DATA **********

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	-0.0294	-0.0313	0.043	-133.1634
2	-0.1607	-0.1714	0.2349	-133.1459
3	-0.2295	-0.2451	0.3358	-133.1162
4	-0.2842	-0.3039	0.4161	-133.0793
5	-0.3278	-0.3511	0.4803	-133.0364
6	-0.3621	-0.3885	0.531	-132.9881
7	-0.3879	-0.417	0.5695	-132.9347
8	-0.4058	-0.437	0.5964	-132.8764
9	-0.416	-0.449	0.6121	-132.8134
10	-0.4189	-0.4532	0.6171	-132.7459
11	-0.4146	-0.4497	0.6116	-132.6742
12	-0.4034	-0.4387	0.596	-132.5985

13	-0.3856	-0.4205	0.5705	-132.5194
14	-0.3613	-0.3951	0.5354	-132.4372
15	-0.3308	-0.3629	0.491	-132.3528
16	-0.2943	-0.3238	0.4375	-132.2667
17	-0.2519	-0.278	0.3751	-132.1798
18	-0.2036	-0.2253	0.3037	-132.0928
19	-0.1489	-0.1653	0.2225	-132.0066
20	-0.0868	-0.0967	0.13	-131.92
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	6.2463	0.5722	6.2725	5.2342
22	6.4794	0.3426	6.4885	3.0269
23	6.5576	0.2183	6.5612	1.9068
24	6.5745	0.1144	6.5755	0.9973
25	6.5365	0.0258	6.5365	0.2262
26	6.4475	-0.0506	6.4477	-0.4495
27	6.3101	-0.116	6.3111	-1.0535
28	6.126	-0.1712	6.1284	-1.6012
29	5.897	-0.2166	5.901	-2.1031
30	5.6249	-0.2522	5.6306	-2.5673
31	5.3114	-0.2783	5.3187	-2.9998
32	4.9583	-0.295	4.9671	-3.4053
33	4.5675	-0.3024	4.5775	-3.7879
34	4.1408	-0.3005	4.1517	-4.1508
35	3.6799	-0.2894	3.6913	-4.4968
36	3.1862	-0.2691	3.1975	-4.8284
37	2.6602	-0.2397	2.671	-5.1478
38	2.1013	-0.2008	2.1109	-5.4574
39	1.5049	-0.1518	1.5125	-5.76
40	0.8609	-0.0915	0.8658	-6.0648
E	0.0	0.0	0.0	0.0

EXHIBIT II

```
****************************************
                ACSModel
          (MININEC 3.1 Core)
      08-24-2018          13:04:37
****************************************
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WHAG FCC DAY PATTERN LIC
FCC DAY PATTERN FINAL 05142018

Frequency = 1.410 MHz Wavelength = 212.62412 Meters

No. of Wires: 2

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-1	
0	0	57.76289	0.3881	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
-42.45229	-31.9901	0		-2	
-42.45229	-31.9901	56.2568	0.3881	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
0	0	0	0.3881	-1	1	1
0	0	2.888144	0.3881	1	1	2
0	0	5.776289	0.3881	1	1	3
0	0	8.664433	0.3881	1	1	4
0	0	11.55258	0.3881	1	1	5
0	0	14.44072	0.3881	1	1	6
0	0	17.32887	0.3881	1	1	7
0	0	20.21701	0.3881	1	1	8
0	0	23.10515	0.3881	1	1	9
0	0	25.9933	0.3881	1	1	10
0	0	28.88144	0.3881	1	1	11
0	0	31.76959	0.3881	1	1	12
0	0	34.65773	0.3881	1	1	13
0	0	37.54588	0.3881	1	1	14
0	0	40.43402	0.3881	1	1	15
0	0	43.32217	0.3881	1	1	16
0	0	46.21031	0.3881	1	1	17
0	0	49.09845	0.3881	1	1	18
0	0	51.9866	0.3881	1	1	19
0	0	54.87474	0.3881	1	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
-42.45229	-31.9901	0	0.3881	-2	2	21
-42.45229	-31.9901	2.81284	0.3881	2	2	22

-42.45229	-31.9901	5.62568	0.3881	2	2	23
-42.45229	-31.9901	8.438519	0.3881	2	2	24
-42.45229	-31.9901	11.25136	0.3881	2	2	25
-42.45229	-31.9901	14.0642	0.3881	2	2	26
-42.45229	-31.9901	16.87704	0.3881	2	2	27
-42.45229	-31.9901	19.68988	0.3881	2	2	28
-42.45229	-31.9901	22.50272	0.3881	2	2	29
-42.45229	-31.9901	25.31556	0.3881	2	2	30
-42.45229	-31.9901	28.1284	0.3881	2	2	31
-42.45229	-31.9901	30.94124	0.3881	2	2	32
-42.45229	-31.9901	33.75408	0.3881	2	2	33
-42.45229	-31.9901	36.56692	0.3881	2	2	34
-42.45229	-31.9901	39.37976	0.3881	2	2	35
-42.45229	-31.9901	42.1926	0.3881	2	2	36
-42.45229	-31.9901	45.00544	0.3881	2	2	37
-42.45229	-31.9901	47.81828	0.3881	2	2	38
-42.45229	-31.9901	50.63112	0.3881	2	2	39
-42.45229	-31.9901	53.44396	0.3881	2	0	40

Sources: 2
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 501.7, 53.3
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 132.3, 127.9

Number of Loads: 0

********** SOURCE DATA **********
Pulse 1 Voltage = (299.7492, 402.3429j)
Current = (4.1035, 0.7736j)
Impedance = (88.391, 81.384j)
Power = 770.65 Watts

Pulse 21 Voltage = (-81.2324, 104.4353j)
Current = (-0.2727, 4.1802j)
Impedance = (26.14, 17.727j)
Power = 229.35 Watts

Total Power = 1000.000 Watts

********** CURRENT DATA **********

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	4.1035	0.7736	4.1758	10.6769
2	4.4105	0.5339	4.4427	6.9022
3	4.5436	0.4019	4.5614	5.0546
4	4.6199	0.2905	4.629	3.5975
5	4.6472	0.1941	4.6512	2.392
6	4.6302	0.1098	4.6315	1.3585
7	4.5715	0.0362	4.5716	0.4532
8	4.4729	-0.0275	4.4729	-0.3522
9	4.3358	-0.0815	4.3366	-1.0772
10	4.1619	-0.1262	4.1638	-1.7362
11	3.9524	-0.1615	3.9557	-2.3401
12	3.7088	-0.1877	3.7135	-2.8975
13	3.4327	-0.2049	3.4388	-3.4154
14	3.1254	-0.213	3.1327	-3.8994

15	2.7885	-0.2123	2.7966	-4.3543
16	2.423	-0.2028	2.4315	-4.7844
17	2.0296	-0.1845	2.0379	-5.1935
18	1.6078	-0.1572	1.6154	-5.5851
19	1.1542	-0.1206	1.1604	-5.9635
20	0.6611	-0.0735	0.6652	-6.3406
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	-0.2727	4.1802	4.189	93.7328
22	-0.19	4.232	4.2362	92.5709
23	-0.1446	4.2298	4.2322	91.958
24	-0.106	4.1975	4.1988	91.4466
25	-0.0724	4.1369	4.1375	91.0023
26	-0.0427	4.0494	4.0496	90.6038
27	-0.0164	3.9358	3.9358	90.2394
28	0.0065	3.797	3.797	89.9017
29	0.0263	3.6341	3.6342	89.5854
30	0.0429	3.4479	3.4482	89.2865
31	0.0564	3.2395	3.24	89.0021
32	0.0667	3.0101	3.0108	88.7297
33	0.0739	2.7606	2.7616	88.4673
34	0.0777	2.4922	2.4934	88.2132
35	0.0783	2.206	2.2074	87.966
36	0.0756	1.9027	1.9042	87.7244
37	0.0695	1.5828	1.5843	87.4874
38	0.0598	1.2458	1.2473	87.2535
39	0.0463	0.8891	0.8903	87.0212
40	0.0285	0.5069	0.5077	86.7834
E	0.0	0.0	0.0	0.0

********** BASE OPERATING PARAMETERS **********

Twr.	Ratio	Phase
1	1.000	0.0
2	1.003	83.1

Table 1: Wire Model Data

Tower	1	2
Actual Radius, Meters	0.29106	0.29106
Model Radius, Meters	0.3881	0.3881
Percentage of Acual radius	133.3%	133.3%
FCC Height, Meters	53.15	53.15
Model Height, Meters	57.76289	56.2568
Percentage of Actual Height	108.7%	105.8%
Number of Segments	20	20

Table 2: Measured and Calculated Self Impedances

Tower	1	2
Measured self impedance R at ATU	61.69	50.99
Measured self impedance X at ATU	98.6	74.02
Shunt capacitance pf	20	20
Series Inductance uh	4.5	3.14
Shunt Inductance uh	1580	1580
Shunt capacitance pf	7.1	--
Modeled self impedance R at ATU	61.62	51.14
Modeled self impedance X at ATU	98.67	74.12
Resistance Tolerance, ohms, ±	4.47	4.04
Reactance Tolerance, ohms, ±	5.94	4.96

Base Insulator

SDC-2F STATIC DRAIN
FMC 7.5 ISOCOUPLER

Table 4: DA-Day Current and Phase Calculations

	Circuit Model		Corrections to Modeled Values to Derive Antenna Monitor Values		Modeled Base		Antenna Monitor	
	Ratio	Phase	Ratio	Phase	Ratio	Phase	Ratio	Phase
1	5.29	-3.953	0.95	3.953	1	0	1.000	0.0
2	5	-0.159	1.00	0.159	1.003	83.1	1.058	79.3

Table 5: Common Point

Common Point Impedance Measured with	Delta OIB-1 SN 266
Common Point Current Measured with	Delta TCA 5 EXR/TCT 4 SN 13426
Measured Day Common Point Resistance	50
Measured Day Common Point Reactance	0.34
Day Power, KW	1
Day Common Point Current,, Amperes	4.65

Table 6: Sample System Devices

Tower	Device	Serial	Ratio	Phase	Impedance at Sample Port	Impedance Through Sample Line
1	Delta TCT 3	18368	1.002	0	50.4 -j.25	52.24 -j2.82
2	Delta TCT 3	18367	1.002	0.4	50.3 -j.3	52.02 -j2.68
Sample Lines are:	FSJ-1					
Phase Monitor is:	Potomac Instruments 1900					

Table 7: Sample Line Lengths

Carrier Frequency, KHz	1410	
Velocity Factor	0.82	
Tower	1	2
Odd Quarter Wave Below Carrier	0.25	0.25
Open Circuit Resonant Frequency, KHz	495	494.5
Resultant Length, Feet	407.32	407.73
Resultant Length, Degrees at Carrier	256.4	256.6
Odd Quarter Wave Above Carrier	0.75	0.75
Open Circuit Resonant Frequency, KHz	1505	1504.5
Resultant Length, Feet	401.90	402.04
Resultant Length, Degrees at Carrier	253.0	253.0
Average Length at Carrier, Degrees	254.7	254.8

Table 8: Sample Line Characteristic Impedance

Tower	+1/8 from 3/4 Wave, Frequency, kHz	Measured Resistance	Measured Reactance	-1/8 from 3/4 wave, Frequency, kHz	Measured Resistance	Measured Reactance	Calculated Impedance by Formula
1	1756	11.12	48.74	1254	7.61	-49.21	49.89
2	1755	11.21	48.56	1254	7.7	-49.06	49.75

FIGURE 1

WCAP - **WHAG TOWER #1 ND**
WCAP OUTPUT AT FREQUENCY: 1.410 MHz

NODE VOLTAGES

Node:	1	427.4525 ∠	43.7252° V
Node:	2	581.6959 ∠	58.0146° V
Node:	3	427.4525 ∠	43.7251° V
Node:	4	427.4885 ∠	43.7207° V
Node:	5	581.6694 ∠	58.0188° V
Node:	6	427.4525 ∠	43.7249° V

	WCAP PART		CURRENT IN BRANCH VOLTAGE		CURRENT OUT BRANCH CURRENT	
R	2→5	0.01000000	0.05 ∠	0.000° V	5.00 ∠	0.000° A
L	5→4	4.50000000	197.93 ∠	90.254° V	4.96 ∠	0.254° A
R	4→1	0.01000000	0.05 ∠	0.254° V	4.96 ∠	0.254° A
C	3→0	0.00002000	427.45 ∠	43.725° V	0.08 ∠	133.725° A
R	1→0	56.78500000	427.45 ∠	43.725° V	5.21 ∠	-2.499° A
R	1→3	0.01000000	0.01 ∠	133.725° V	0.08 ∠	133.725° A
L	5→0	1580.00000000	581.67 ∠	58.019° V	0.04 ∠	-31.981° A
R	1→6	0.01000000	0.00 ∠	133.725° V	0.27 ∠	133.725° A
C	6→0	0.00007100	427.45 ∠	43.725° V	0.27 ∠	133.725° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→5	0.01000000	61.63 + j 98.677	61.62 + j 98.677
L	5→4	4.50000000	62.49 + j 99.100	62.49 + j 59.234
R	4→1	0.01000000	62.49 + j 59.234	62.48 + j 59.234
C	3→0	0.00002000	0.00 - j 5643.792	0.00 + j 0.000
R	1→0	56.78500000	56.79 + j 59.264	0.00 + j 0.000
R	1→3	0.01000000	0.01 - j 5643.792	-0.01 - j 5643.792
L	5→0	1580.00000000	0.00 + j 13997.680	0.00 + j 0.000
R	1→6	0.01000000	0.01 - j 1589.801	-0.01 - j 1589.801
C	6→0	0.00007100	0.00 - j 1589.801	0.00 + j 0.000

WCAP INPUT DATA:

	1.4100	0.00000000	0	
I	5.00000000	0	2	0.00000000
R	0.01000000	2	5	0.00000000
L	4.50000000	5	4	0.00000000
R	0.01000000	4	1	0.00000000
C	0.00002000	3	0	
R	56.78500000	1	0	59.26400000
R	0.01000000	1	3	0.00000000
L	1580.00000000	5	0	0.00000000
R	0.01000000	1	6	0.00000000
C	0.00007100	6	0	

Center Frequency: 1.41 MHz

Frequency Range: ±0 kHz

Frequency Step: 0 kHz

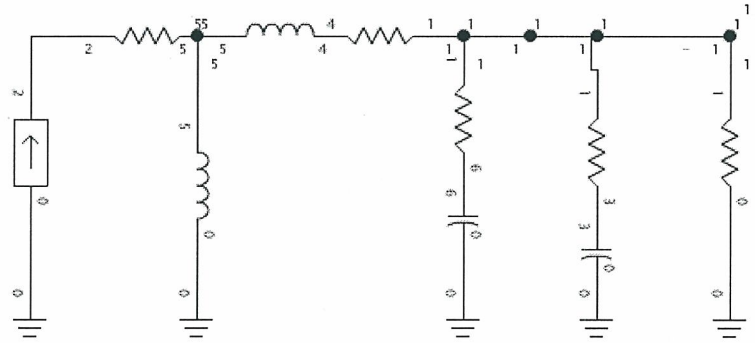


FIGURE 2

WCAP - **WHAG TOWER #2 ND**
WCAP OUTPUT AT FREQUENCY: 1.410 MHz

NODE VOLTAGES

Node:	1	345.8135 ∠	42.2000° V
Node:	2	450.3294 ∠	55.3915° V
Node:	3	345.8135 ∠	42.1999° V
Node:	4	345.8505 ∠	42.1945° V
Node:	5	450.3011 ∠	55.3968° V

	WCAP PART	WCAP PART	CURRENT IN BRANCH VOLTAGE	CURRENT OUT BRANCH CURRENT
R	2→5	0.01000000	0.05 ∠ 0.000° V	5.00 ∠ 0.000° A
L	5→4	3.14000000	138.36 ∠ 90.210° V	4.97 ∠ 0.210° A
R	4→1	0.01000000	0.05 ∠ 0.210° V	4.97 ∠ 0.210° A
C	3→0	0.00002000	345.81 ∠ 42.200° V	0.06 ∠ 132.200° A
R	1→0	50.83400000	345.81 ∠ 42.200° V	5.01 ∠ -0.310° A
R	1→3	0.01000000	0.01 ∠ 132.200° V	0.06 ∠ 132.200° A
L	5→0	1580.00000000	450.30 ∠ 55.397° V	0.03 ∠ -34.603° A

	WCAP PART	WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R	2→5	0.01000000	51.15 + j 74.129	51.14 + j 74.129
L	5→4	3.14000000	51.69 + j 74.334	51.69 + j 46.516
R	4→1	0.01000000	51.69 + j 46.516	51.68 + j 46.516
C	3→0	0.00002000	0.00 - j 5643.792	0.00 + j 0.000
R	1→0	50.83400000	50.83 + j 46.597	0.00 + j 0.000
R	1→3	0.01000000	0.01 - j 5643.792	0.00 - j 5643.792
L	5→0	1580.00000000	0.01 + j 13997.680	0.00 + j 0.000

WCAP INPUT DATA:

	1.4100	0.00000000	0	
I	5.00000000	0	2	0.00000000
R	0.01000000	2	5	0.00000000
L	3.14000000	5	4	0.00000000
R	0.01000000	4	1	0.00000000
C	0.00002000	3	0	
R	50.83400000	1	0	46.59700000
R	0.01000000	1	3	0.00000000
L	1580.00000000	5	0	0.00000000

Center Frequency: 1.41 MHz

Frequency Range: ±0 kHz

Frequency Step: 0 kHz

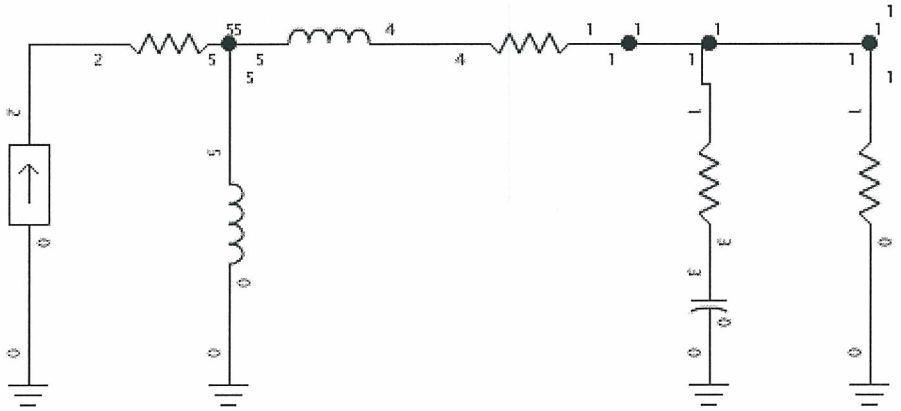


FIGURE 3

WCAP - **WHAG TOWER #1 DA FINAL**
WCAP OUTPUT AT FREQUENCY: 1.410 MHz

NODE VOLTAGES

Node:	1	635.6453 ∠	38.6840° V
Node:	2	773.8545 ∠	50.2456° V
Node:	3	635.6453 ∠	38.6839° V
Node:	4	635.6842 ∠	38.6812° V
Node:	5	773.8225 ∠	50.2485° V
Node:	6	635.6453 ∠	38.6836° V

	WCAP PART WCAP PART		CURRENT IN BRANCH VOLTAGE		CURRENT OUT BRANCH CURRENT	
R	2→5	0.01000000	0.05 ∠	0.000° V	5.00 ∠	0.000° A
L	5→4	4.50000000	197.64 ∠	90.409° V	4.96 ∠	0.409° A
R	4→1	0.01000000	0.05 ∠	0.409° V	4.96 ∠	0.409° A
C	3→0	0.00002000	635.65 ∠	38.684° V	0.11 ∠	128.684° A
R	1→0	88.39100000	635.65 ∠	38.684° V	5.29 ∠	-3.953° A
R	1→3	0.01000000	0.00 ∠	128.684° V	0.11 ∠	128.684° A
L	5→0	1580.00000000	773.82 ∠	50.248° V	0.06 ∠	-39.752° A
R	1→6	0.01000000	0.00 ∠	128.684° V	0.40 ∠	128.684° A
C	6→0	0.00007100	635.65 ∠	38.684° V	0.40 ∠	128.684° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	2→5	0.01000000	98.98 + j	118.987	98.97 + j	118.987
L	5→4	4.50000000	100.66 + j	119.289	100.66 + j	79.422
R	4→1	0.01000000	100.66 + j	79.422	100.65 + j	79.422
C	3→0	0.00002000	0.00 - j	5643.792	0.00 + j	0.000
R	1→0	88.39100000	88.39 + j	81.384	0.00 + j	0.000
R	1→3	0.01000000	0.01 - j	5643.792	0.01 - j	5643.792
L	5→0	1580.00000000	-0.01 + j	13997.680	0.00 + j	0.000
R	1→6	0.01000000	0.01 - j	1589.801	0.00 - j	1589.801
C	6→0	0.00007100	0.00 - j	1589.801	0.00 + j	0.000

WCAP INPUT DATA:

	1.4100	0.00000000	0	
I	5.00000000	0	2	0.00000000
R	0.01000000	2	5	0.00000000
L	4.50000000	5	4	0.00000000
R	0.01000000	4	1	0.00000000
C	0.00002000	3	0	
R	88.39100000	1	0	81.38400000
R	0.01000000	1	3	0.00000000
L	1580.00000000	5	0	0.00000000
R	0.01000000	1	6	0.00000000
C	0.00007100	6	0	

Center Frequency: 1.41 MHz

Frequency Range: ±0 kHz

Frequency Step: 0 kHz

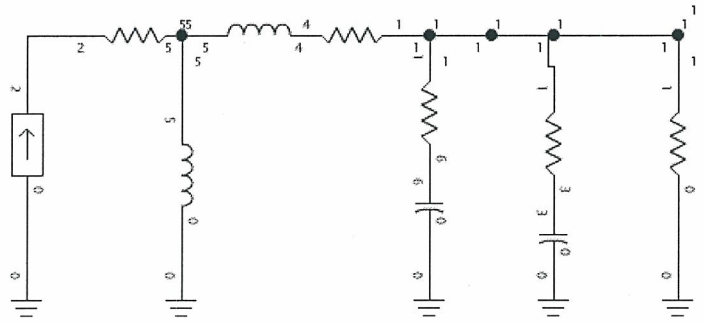


FIGURE 4

WCAP - **WHAG TOWER #2 DA FINAL**
WCAP OUTPUT AT FREQUENCY: 1.410 MHz

NODE VOLTAGES

Node:	1	157.9023 ∠	33.9846° V
Node:	2	261.8889 ∠	60.0439° V
Node:	3	157.9023 ∠	33.9844° V
Node:	4	157.9437 ∠	33.9745° V
Node:	5	261.8639 ∠	60.0533° V

	WCAP PART	WCAP PART	CURRENT IN BRANCH VOLTAGE		CURRENT OUT BRANCH CURRENT	
R	2→5	0.01000000	0.05 ∠	0.000° V	5.00 ∠	0.000° A
L	5→4	3.14000000	138.64 ∠	90.107° V	4.98 ∠	0.107° A
R	4→1	0.01000000	0.05 ∠	0.107° V	4.98 ∠	0.107° A
C	3→0	0.00002000	157.90 ∠	33.984° V	0.03 ∠	123.984° A
R	1→0	26.14000000	157.90 ∠	33.985° V	5.00 ∠	-0.159° A
R	1→3	0.01000000	0.00 ∠	123.984° V	0.03 ∠	123.984° A
L	5→0	1580.00000000	261.86 ∠	60.053° V	0.02 ∠	-29.947° A

	WCAP PART	WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R	2→5	0.01000000	26.15 + j 45.381	26.14 + j 45.381
L	5→4	3.14000000	26.31 + j 45.479	26.31 + j 17.661
R	4→1	0.01000000	26.31 + j 17.661	26.30 + j 17.661
C	3→0	0.00002000	0.00 - j 5643.792	0.00 + j 0.000
R	1→0	26.14000000	26.14 + j 17.727	0.00 + j 0.000
R	1→3	0.01000000	0.01 - j 5643.792	-0.00 - j 5643.792
L	5→0	1580.00000000	0.00 + j 13997.680	0.00 + j 0.000

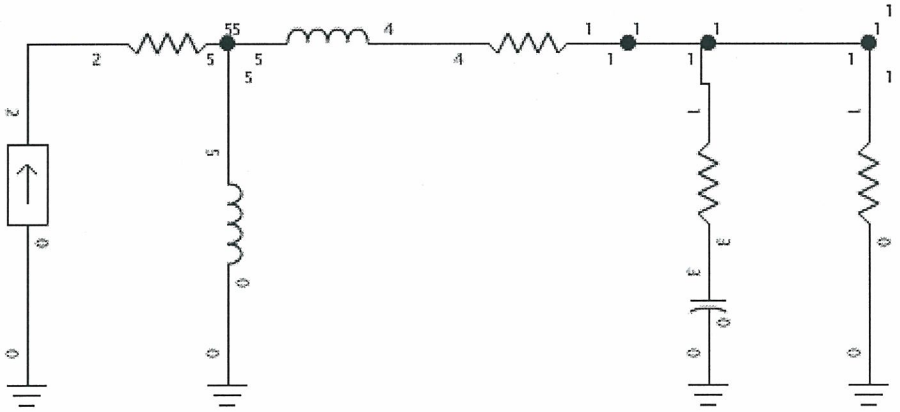
WCAP INPUT DATA:

	1.4100	0.00000000	0	
I	5.00000000	0	2	0.00000000
R	0.01000000	2	5	0.00000000
L	3.14000000	5	4	0.00000000
R	0.01000000	4	1	0.00000000
C	0.00002000	3	0	
R	26.14000000	1	0	17.72700000
R	0.01000000	1	3	0.00000000
L	1580.00000000	5	0	0.00000000

Center Frequency: 1.41 MHz

Frequency Range: ±0 kHz

Frequency Step: 0 kHz



WHAG
1kW
Reference Field Strength Measurements
June 24, 2018

Radial	Point	Distance KM	2018 Tme	2018 Field mV/m	Coordinates (WGS84)		Description
35°	1	1.04	10:50 AM	310	39.626812	77.729419	Sidewalk of wrehouse halfway between Maryland Ave and DoNut Alley on First St
	2	1.45	10:57 AM	190	39.629831	77.726691	Middle of Garrett St 20' E of opposing driveways
	3	1.75	11:01 AM	170	39.632082	77.724607	PL of public works building, 3rd space away from Memorial Drive
120°	1	1.14	11:11 AM	160	39.61401	77.724796	Sidewalk at # 142 Buttercup
	2	1.39	11:15 AM	115	39.612911	77.72232	Sidewalk at garage door of #229 Winding Oak Drive
	3	1.96	11:21 AM	70	39.610323	77.716521	East side Oak Ridge Place opposite Flohr Pools driveway
197.5°	1	3.41	11:34 AM	8.5	39.594802	77.760603	Mennonite Church PL at edge of Rench road
	2	4.47	12:00 PM	5	39.587025	77.76783	College Road at small stream.
	3	6.14	11:56 AM	2.6	39.57534	77.780069	Parking lot W of railroad tracks 30' N of Lappans Road
217.5°	1	2.95	11:40 AM	2.4	39.593817	77.746742	Rench Road 200' east of overflow dam
	2	5.01	11:44 AM	1.4	39.576123	77.754001	Turnaround at the end of Branded Terrace
	3	6.21	11:51 AM	0.72	39.565788	77.757963	Center of Lappans Road at pole #58

Note:

Transmitter North Latitude: 39.619156

Transmitter West Longitude decimal degrees: 77.736383

All measurements taken by William Weeks, weather clear and warm.

FIM 41 SN 1918, last calibrated 9/27/2015, recently compared with more recently calibrated meter.