iHeart MEDIA

2625 S Memorial Drive
Suite A
Tulsa, OK 74129

o 918.664.4581
f 918.664.3066

www.iHeartMedia.com
www.iHeartRadio.com
#iheartradio

2019 OCT -2 PM 2:21

Accepted / Filed

OCT - 1 2019

Federal Communications Commission
Office of the Secretary

October 1st, 2019

COURIER DELIVERY

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

RE: Citicasters Licenses, Inc. (FRN No. 0018273367)
Application for New License on FCC Form 302-AM
WONE (AM), 980 kHz, Dayton, OH; Facility ID No. 1903

Dear Ms. Dortch:

On behalf of Citicasters Licenses, Inc., the licensee of the above-referenced station, enclosed is an original and four copies of an application for New License submitted on FCC Form 302-AM.

Also enclosed is Form 159, Remittance Advice, with credit card payment of the $1,560.00 filing fee.

Please stamp and return the additional copy of this application and contact the undersigned with any communications concerning this application.

Respectfully submitted,
Citicasters Licenses, Inc.

By: _____
Stephen G. Davis
SVP, RE, Facilities & Corporate Development

cc: Public Inspection File

Agency Tracking ID:PGC3307614 Authorization Number:163743
Successful Authorization -- Date Paid: 10/1/19
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)
Citicasters Licenses, Inc.	**$1560.00**

(4) STREET ADDRESS LINE NO 1
7136 S. Yale Avenue
(5) STREET ADDRESS LINE NO 2
Suite 501

(6) CITY	(7) STATE	(8) ZIP CODE
Tulsa	**OK**	**74136**

(9) DAYTIME TELEPHONE NUMBER (INCLUDING AREA CODE)	(10) COUNTRY CODE (IF NOT IN U.S.A.)
918-6644581	**US**

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

(11) PAYER (FRN)	(12) FCC USE ONLY
0018273367	

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
Citicasters Licenses, Inc.
(14) STREET ADDRESS LINE NO 1
7136 S. Yale Avenue
(15) STREET ADDRESS LINE NO 2
Suite 501

(16) CITY	(17) STATE	(18) ZIP CODE
Tulsa	**OK**	**74136**

(19) DAYTIME TELEPHONE NUMBER (INCLUDING AREA CODE)	(20) COUNTRY CODE (IF NOT IN U.S.A.)
918-6644581	**US**

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

(21) APPLICANT (FRN)	(22) FCC USE ONLY
0018273367	

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
WONE	**MMR**	**1**
(26A) Fee Due for (PTC)	(27A) Total Fee	FCC Use Only
$725.00	**$725.00**	
(28A) FCC CODE 1	(29A) FCC CODE 2	
1903	**302PAPERAPP**	

(23B) FCC Call Sign/Other ID	(24B) Payment Type Code(PTC)	(25B) Quantity
WONE	**MOR**	**1**
(26B) Fee Due for (PTC)	(27B) Total Fee	FCC Use Only
$835.00	**$835.00**	
(28B) FCC CODE 1	(29B) FCC CODE 2	
1903	**302PAPERAPP**	

59626

Accepted / Filed

OCT – 1 2019

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.

FOR COMMISSION USE ONLY
FILE NO. BAML-20191001AEZ

SECTION I - APPLICANT FEE INFORMATION

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

CITICASTERS LICENSES, INC.

MAILING ADDRESS (Line 1) (Maximum 35 characters)
7136 S YALE

MAILING ADDRESS (Line 2) (Maximum 35 characters)
SUITE 501

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
TULSA	OK	74136

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
918-664-4611	WONE	1903

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	$ 725.00	

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	$ 835.00	

	TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
ADD ALL AMOUNTS SHOWN IN COLUMN C, AND ENTER THE TOTAL HERE. THIS AMOUNT SHOULD EQUAL YOUR ENCLOSED REMITTANCE.	$ 1560.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT CITICASTERS LICENSES, INC.		
MAILING ADDRESS 7136 S YALE SUITE 501		
CITY TULSA	STATE OK	ZIP CODE 74136

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
WONE	DAYTON, OH			

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

☑ Yes ☐ No

Exhibit No.

If No, explain in an Exhibit.

4. Have all the terms, conditions, and obligations set forth in the above described construction permit been fully met?

☑ Yes ☐ No

Exhibit No.

If No, state exceptions in an Exhibit.

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

Exhibit No.

If Yes, explain in an Exhibit.

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

Exhibit No.

If No, explain in an Exhibit.

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

Exhibit 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.

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	
Stephen G Davis		
Title	Date	Telephone Number
SVP, RE, Facilities & Corp Development	10/1/2019	918-664-4581

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
CITICASTERS LICENSES, INC.

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

☐ Station License ☑ Direct Measurement of Power

1. Facilities authorized in construction permit

Call Sign	File No. of Construction Permit (if applicable)	Frequency (kHz)	Hours of Operation	Power in kilowatts	
				Night	Day
WONE		980	UNLIMITED	5.0	5.0

2. Station location

State	City or Town
OHIO	DAYTON

3. Transmitter location

State	County	City or Town	Street address (or other identification)
OH	MONTGOMERY	DAYTON	96 West Rahn Rd

4. Main studio location

State	County	City or Town	Street address (or other identification)
OH	MONTGOMERY	DAYTON	101 PINE ST

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

State	County	City or Town	Street address (or other identification)
OH	MONTGOMERY	DAYTON	101 PINE ST

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
10.4	11.55
Measured antenna or common point resistance (in ohms) at operating frequency	**Measured antenna or common point reactance (in ohms) at operating frequency**
Night: 50.0 Day: 37.49	Night: +0.0 Day: +j19.0

Antenna indications for directional operation

Towers	Antenna monitor Phase reading(s) in degrees		Antenna monitor sample current ratio(s)		Antenna base currents	
	Night	Day	Night	Day	Night	Day
Tower #1	0.0	N/A	1.0	N/A		
Tower #2	8.5	N/A	1.024	N/A		
Tower #3	139.1	N/A	0.530	N/A		
Tower #4	128.0	N/A	1.096	N/A		

Manufacturer and type of antenna monitor: Potomac AM1901

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.
Exhibit A				Exhibit No. Exhibit 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	°	40	'	3	"	West Longitude	84	°	10	'	1	"

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.

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

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

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

see technical narrative

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)
Jacob Wyatt	
Address (include ZIP Code)	Date
113 West 4th St	9-27-2019
Ogallala, NE 69153	Telephone No. (Include Area Code) 308-289-1872

☑ Technical Director ☐ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☐ Other (specify)

Exhibit A

Description of antenna system

All towers uniform cross section, guyed	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)
1 (1015857)	74.1	76.1	76.9
2 (1015858)	74.1	76.1	77.0
3 (1015859)	96.02	99.0	99.8
4 (1015860)	74.1	76.0	76.9

APPLICATION FOR LICENSE INFORMATION

RADIO STATION WONE

CITICASTERS LICENSES, INC.
DAYTON, OHIO

FID 1903

980 KHZ 5.0KW NDD, 5.0KW DAN

September 23, 2019

APPLICATION FOR LICENSE INFORMATION
RADIO STATION WONE
DAYTON, OHIO

980 KHZ 5.0KW NDD, 5.0KW DAN

Table of Contents

EXECUTIVE SUMMARY

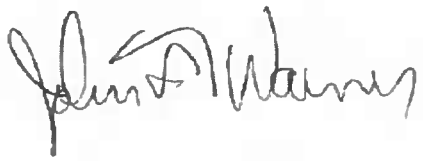
This engineering exhibit has been prepared in support of an application for licensing for radio station WONE, Dayton Ohio, Facility ID #1903. Measurements included comply with the requirements of Rule Section 73.151c.

The towers and ground system remain as described in current license BL-830105AE. The system was adjusted to operating parameters computed using the Moment Method process as described in Rule Section 73.151c. MiniNEC Broadcast Professional version 14.6 by EM Scientific Inc. was used in the analysis.

The system has been adjusted to produce nighttime directional antenna parameters within+/-5% in ratio and +/-3 degrees in phase of the modeled values as prescribed in the Rules.

All measurements contained in this report were made by Mr. Jacob Wyatt of the iHeart Media Corporate Engineering Staff or the undersigned.

Please refer any questions regarding this report to:



John F. Warner

johnwarner@iheartmedia.com

443-255-5299

Analysis of Tower Impedance Measurements to Verify Method of Moments Model

Impedance measurements were made of the individual towers with the other tower bases open. Measurements were made using a Hewlett Packard 8753ES network analyzer and a Tunwall Radio directional coupler in a calibrated measurement system. Measurements were made immediately adjacent to the toroidal antenna sampling transformers, inside the antenna coupling units. These measured values were related to the modeled values obtained using Expert MININEC Broadcast Professional V14.6. Heights of the towers were adjusted as permitted by Rule Section 73.151(c)(1).

The tower radii were modeled at their actual values. The towers were segmented so that each segment is less than ten (10) degrees in length.

Tower	Actual Height Degrees	Model Height Degrees	Model Percent of Height
1*	87.2	94.43	108.3
2*	87.2	94.2	108.0
3 **	113.0	118.18	104.6
4*	87.2	93.93	107.7

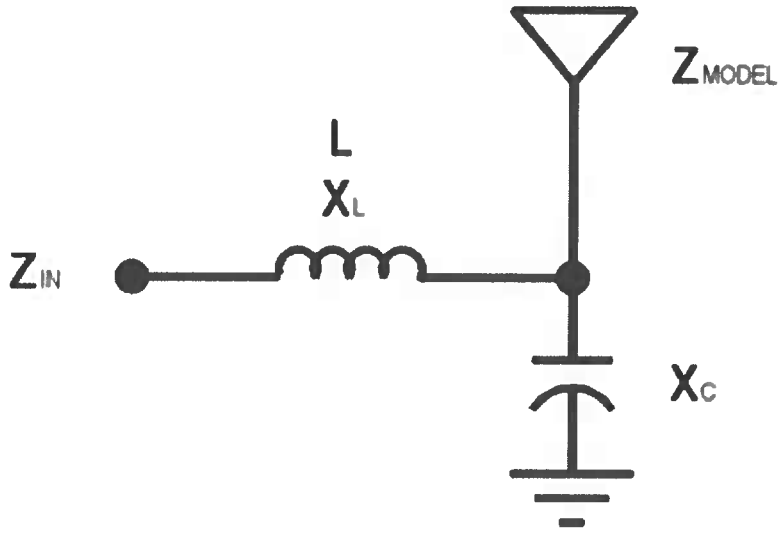
* Towers 1,2 and 4 are triangular shaped, self-supporting towers. Face width at the base of each tower is 12.5 feet and tapers uniformly up to the 123 (44.1 degrees) foot elevation.

Continuing up from the 123 foot elevation the tower face remains a constant 2 foot width. The lower portions of the towers were modeled using a stepped radius approach. Each step consists of a single wire broken into two segments with a calculated average radius per wire up to the 123' foot elevation.

** Tower #3 is a guyed, uniform cross section tower with a 32 inch face. An existing TV antenna mast with an 8 inch radius makes up the upper fifty five feet (260' to 315') of the third element.

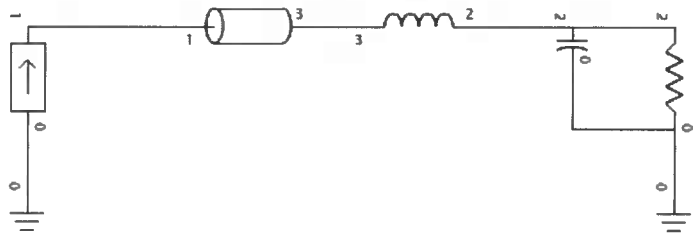
Method of Moments Model Details for Towers Driven Individually

The model was verified by comparison of modeled to measured tower impedances. The tower resistance and reactance were measured immediately adjacent to the toroidal base sampling transformers, inside the antenna tuning unit cabinets. The measured and modeled impedances were correlated using the Westberg Consulting WCAP Pro software program. WCAP is based on the SPICE nodal analysis program. The shunt capacitive reactance of the tower base insulator is represented in the drawing below as Xc. The series inductive reactance of the tower feed conductor is represented as Xl. Z model represents the modeled impedance of the tower and Zin represents the impedance measured at the sampling point. In the following WCAP tabulations, the modeled impedance is represented between nodes 3-0. The measured impedance is represented between nodes 2-0. Node 0 represents ground. The calculated reference point impedances appear under the "TO NODE IMPEDANCE" columns of the WCAP calculations, following the insignificantly short transmission line (TL 1-3) that was included in series with the drive current sources (I 0-1) to provide calculation points for the impedances.



Tower	L (uh)	Xl (+j)	Xc (-j)	Z Modeled	Z in Modeled	Z in Measured
1	4.45	27.40	-1299.0	38.1 -j7.27	37.65 +j19.07	37.49 +j19
2	4.4	27.09	-1299.0	34.96 -j7.78	34.52 +j18.44	34.33 +j18.43
3	2.0	12.32	-1624.0	111.8 +j158.07	136.42 +j177.03	136.56 +j176.91
4	4.2	25.86	-1299.0	36.66 –j9.2	36.41 +j15.7	36.23 +j15.59

WCAP – **WONE Tower 1 Driven, others floated**



WCAP OUTPUT AT FREQUENCY: 0.980 MHz

NODE VOLTAGES
Node: 1 4220.1666 ∠ 26.8700° V
Node: 2 4220.1524 ∠ 26.8696° V
Node: 3 3855.5275 ∠ -12.4736° V

	WCAP PART		CURRENT IN		CURRENT OUT	
TL	1→2	50.00000000	100.00 ∠	0.001° A	100.00 ∠	-0.000° A

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	3→0	38.10000000	3855.53 ∠	-12.474° V	99.40 ∠	-1.671° A
C	3→0	0.00012500	3855.53 ∠	-12.474° V	2.97 ∠	77.526° A
L	2→3	4.45000000	2740.10 ∠	90.000° V	100.00 ∠	-0.000° A

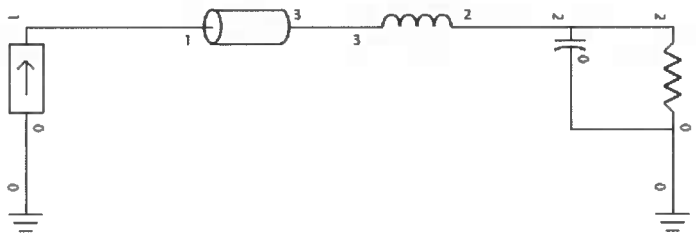
	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	3→0	38.10000000	38.10 - j	7.270	0.00 + j	0.000
C	3→0	0.00012500	0.00 - j	1299.224	0.00 + j	0.000
L	2→3	4.45000000	37.65 + j	19.074	37.65 - j	8.327
TL	1→2	50.00000000	37.65 + j	19.074	**37.65 + j**	**19.074**

	WCAP PART		VSWR
TL	1→2	50.00000000	1.6787

WCAP INPUT DATA:

```
   0.9800     0.00000000  0
R     38.10000000  3  0    -7.27000000
C      0.00012500  3  0
L      4.45000000  2  3     0.00000000
TL    50.00000000  1  2   100.00000000     0.00100000     0.00000000
I    100.00000000  0  1     0.00000000
```

WCAP – **WONE Tower 2 driven, others floated**



WCAP OUTPUT AT FREQUENCY: 0.980 MHz

NODE VOLTAGES
Node: 1 3913.5154 ∠ 28.1052° V
Node: 2 3558.9381 ∠ -14.0786° V
Node: 3 3913.5007 ∠ 28.1048° V

	WCAP PART		CURRENT IN		CURRENT OUT	
TL	1→3	50.00000000	100.00 ∠	-0.000° A	100.00 ∠	-0.000° A

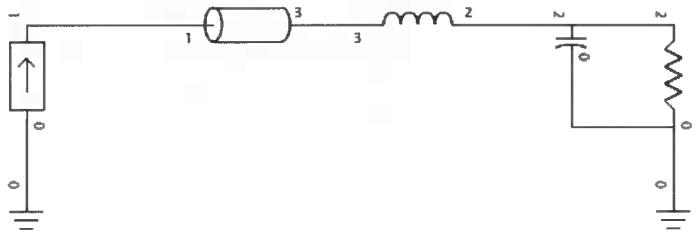
	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	2→0	34.96000000	3558.94 ∠	-14.079° V	99.37 ∠	-1.532° A
C	2→0	0.00012500	3558.94 ∠	-14.079° V	2.74 ∠	75.921° A
L	3→2	4.40000000	2709.32 ∠	90.000° V	100.00 ∠	-0.000° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	2→0	34.96000000	34.96 - j	7.780	0.00 + j	0.000
C	2→0	0.00012500	0.00 - j	1299.224	0.00 + j	0.000
L	3→2	4.40000000	34.52 + j	18.436	34.52 - j	8.657
TL	1→3	50.00000000	34.52 + j	18.436	**34.52 + j**	**18.436**

	WCAP PART		VSWR
TL	1→3	50.00000000	1.7711

WCAP INPUT DATA:
0.9800 0.00000000 0
R 34.96000000 2 0 -7.78000000
C 0.00012500 2 0
L 4.40000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I 100.00000000 0 1 0.00000000

WCAP – **WONE Tower 3 driven, others floated**



WCAP OUTPUT AT FREQUENCY: 0.980 MHz

NODE VOLTAGES
Node: 1 22349.4385 ∠ 52.3810° V
Node: 2 22349.4633 ∠ 52.3811° V
Node: 4 21387.1594 ∠ 50.3668° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	2→1 50.00000000	100.00 ∠ -0.000° A	100.00 ∠ -0.001° A

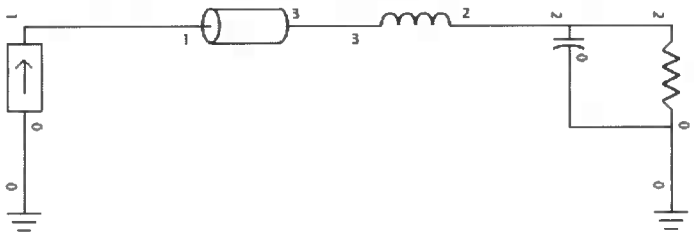
WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	4→0 111.80000000	21387.16 ∠ 50.367° V	110.46 ∠ -4.362° A
C	4→0 0.00010000	21387.16 ∠ 50.367° V	13.17 ∠ 140.367° A
L	1→4 2.00000000	1231.53 ∠ 89.999° V	100.00 ∠ -0.001° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	4→0 111.80000000	111.80 + j 158.070	0.00 + j 0.000
C	4→0 0.00010000	0.00 - j 1624.030	0.00 + j 0.000
L	1→4 2.00000000	136.42 + j 177.026	136.42 + j 164.711
TL	2→1 50.00000000	136.42 + j 177.027	**136.42 + j 177.026**

WCAP PART		VSWR
TL	2→1 50.00000000	7.5570

WCAP INPUT DATA:
0.9800 0.00000000 0
R 111.80000000 4 0 158.07000000
C 0.00010000 4 0
L 2.00000000 1 4 0.00000000
TL 50.00000000 2 1 100.00000000 0.00100000 0.00000000
I 100.00000000 0 2 0.00000000

WCAP – **WONE Tower 4 driven, others floated**



WCAP OUTPUT AT FREQUENCY: 0.980 MHz

NODE VOLTAGES
Node: 1 3965.2758 ∠ 23.3211° V
Node: 2 3780.5000 ∠ -15.5962° V
Node: 3 3965.2634 ∠ 23.3207° V

	WCAP PART		CURRENT IN		CURRENT OUT	
TL	1→3	50.00000000	100.00 ∠	0.001° A	100.00 ∠	-0.000° A

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	2→0	36.96000000	3780.50 ∠	-15.596° V	99.26 ∠	-1.618° A
C	2→0	0.00012500	3780.50 ∠	-15.596° V	2.91 ∠	74.404° A
L	3→2	4.20000000	2586.16 ∠	90.000° V	100.00 ∠	-0.000° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	2→0	36.96000000	36.96 - j	9.200	0.00 + j	0.000
C	2→0	0.00012500	0.00 - j	1299.224	0.00 + j	0.000
L	3→2	4.20000000	36.41 + j	15.698	36.41 - j	10.164
TL	1→3	50.00000000	36.41 + j	15.698	**36.41 + j**	**15.698**

	WCAP PART		VSWR
TL	1→3	50.00000000	1.6191

WCAP INPUT DATA:
0.9800 0.00000000 0
R 36.96000000 2 0 -9.20000000
C 0.00012500 2 0
L 4.20000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I 100.00000000 0 1 0.00000000

Tower 1 driven, others floated

```
IMPEDANCE
   normalization = 50.
freq      resist    react     imped     phase     VSWR     S11       S12
(MHz)     (ohms)    (ohms)    (ohms)    (deg)              dB        dB
source =  1; node 1, sector 1
.98       38.1      -7.2705   38.787    349.2     1.3746   -16.04    -.10945

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

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0            0            1.565        2
           0            0            14.7
 2    none 0            0            14.7         1.056        2
           0            0            29.4
 3    none 0            0            29.4         .546         2
           0            0            44.1
 4    none 0            0            44.1         .291         5
           0            0            94.43
 5    none 207.         70.          0            1.565        2
           207.         70.          14.7
 6    none 207.         70.          14.7         1.056        2
           207.         70.          29.4
 7    none 207.         70.          29.4         .546         2
           207.         70.          44.1
 8    none 207.         70.          44.1         .291         5
           207.         70.          94.2
 9    none 215.31       91.7         0            .388         12
           215.31       91.7         97.81
 10   none 215.31       91.7         97.81        .203         3
           215.31       91.7         118.18
 11   none 80.          165.         0            1.565        2
           80.          165.         14.7
 12   none 80.          165.         14.7         1.056        2
           80.          165.         29.4
 13   none 80.          165.         29.4         .546         2
           80.          165.         44.1
 14   none 80.          165.         44.1         .291         5
           80.          165.         93.93

Number of wires          =  14
          current nodes  =  48

                          minimum                  maximum
Individual wires      wire    value              wire  value
segment length         10     6.79                4    10.066
radius                 10     .203                1    1.565


ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                no. of  segment length (wavelengths)
```

no.	lowest	step	steps	minimum	maximum
1	.98	0	1	.0188611	.0279611

Sources

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

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	12	0	-1,299.	0	0	0
2	23	0	-1,624.	0	0	0
3	38	0	-1,299.	0	0	0

Tower 2 driven, others floated

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 12, sector 1							
.98	34.955	-7.7755	35.809	347.5	1.4954	-14.044	-.17462

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	1.565	2
		0	0	14.7		
2	none	0	0	14.7	1.056	2
		0	0	29.4		
3	none	0	0	29.4	.546	2
		0	0	44.1		
4	none	0	0	44.1	.291	5
		0	0	94.43		
5	none	207.	70.	0	1.565	2
		207.	70.	14.7		
6	none	207.	70.	14.7	1.056	2
		207.	70.	29.4		
7	none	207.	70.	29.4	.546	2
		207.	70.	44.1		
8	none	207.	70.	44.1	.291	5
		207.	70.	94.2		
9	none	215.31	91.7	0	.388	12
		215.31	91.7	97.81		
10	none	215.31	91.7	97.81	.203	3
		215.31	91.7	118.18		
11	none	80.	165.	0	1.565	2
		80.	165.	14.7		
12	none	80.	165.	14.7	1.056	2
		80.	165.	29.4		
13	none	80.	165.	29.4	.546	2
		80.	165.	44.1		

```
 14    none 80.          165.          44.1          .291          5
            80.          165.          93.93

Number of wires          =  14
          current nodes  =  48

                          minimum                    maximum
Individual wires       wire    value              wire  value
segment length          10     6.79                4    10.066
radius                  10     .203                1    1.565

ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                 no. of  segment length (wavelengths)
 no. lowest       step          steps   minimum        maximum
 1   .98          0              1      .0188611       .0279611

Sources
source node    sector  magnitude      phase          type
 1      12      1       1.             0              voltage

Lumped loads
              resistance    reactance     inductance  capacitance passive
load  node    (ohms)        (ohms)        (mH)        (uF)        circuit
 1     1      0             -1,299.       0           0           0
 2     23     0             -1,624.       0           0           0
 3     38     0             -1,299.       0           0           0
```

Tower 3 driven, others floated

```
IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(MHz)    (ohms)   (ohms)   (ohms)   (deg)             dB       dB
source =  1; node 23, sector 1
.98      111.8    158.07   193.61   54.7     7.0103  -2.4951  -3.595

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

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0            0            1.565        2
           0            0            14.7
 2    none 0            0            14.7         1.056        2
           0            0            29.4
 3    none 0            0            29.4         .546         2
           0            0            44.1
 4    none 0            0            44.1         .291         5
           0            0            94.43
 5    none 207.         70.          0            1.565        2
           207.         70.          14.7
 6    none 207.         70.          14.7         1.056        2
           207.         70.          29.4
```

```
 7    none 207.          70.          29.4          .546          2
           207.          70.          44.1
 8    none 207.          70.          44.1          .291          5
           207.          70.          94.2
 9    none 215.31        91.7         0             .388          12
           215.31        91.7         97.81
 10   none 215.31        91.7         97.81         .203          3
           215.31        91.7         118.18
 11   none 80.           165.         0             1.565         2
           80.           165.         14.7
 12   none 80.           165.         14.7          1.056         2
           80.           165.         29.4
 13   none 80.           165.         29.4          .546          2
           80.           165.         44.1
 14   none 80.           165.         44.1          .291          5
           80.           165.         93.93

Number of wires          =  14
          current nodes  =  48

                          minimum                    maximum
Individual wires       wire    value              wire  value
segment length          10     6.79                4    10.066
radius                  10     .203                1    1.565

ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                 no. of  segment length (wavelengths)
 no. lowest       step          steps   minimum        maximum
 1   .98          0              1      .0188611       .0279611

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

Lumped loads
              resistance    reactance     inductance  capacitance passive
load  node    (ohms)        (ohms)        (mH)        (uF)        circuit
 1     1      0             -1,299.       0           0           0
 2     12     0             -1,299.       0           0           0
 3     38     0             -1,299.       0           0           0
```

Tower 4 driven, others floated

```
IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(MHz)    (ohms)   (ohms)   (ohms)   (deg)             dB       dB
source =  1; node 38, sector 1
.98      36.964   -9.1996  38.092   346.     1.4463  -14.777  -.14703

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	1.565	2
		0	0	14.7		
2	none	0	0	14.7	1.056	2
		0	0	29.4		
3	none	0	0	29.4	.546	2
		0	0	44.1		
4	none	0	0	44.1	.291	5
		0	0	94.43		
5	none	207.	70.	0	1.565	2
		207.	70.	14.7		
6	none	207.	70.	14.7	1.056	2
		207.	70.	29.4		
7	none	207.	70.	29.4	.546	2
		207.	70.	44.1		
8	none	207.	70.	44.1	.291	5
		207.	70.	94.2		
9	none	215.31	91.7	0	.388	12
		215.31	91.7	97.81		
10	none	215.31	91.7	97.81	.203	3
		215.31	91.7	118.18		
11	none	80.	165.	0	1.565	2
		80.	165.	14.7		
12	none	80.	165.	14.7	1.056	2
		80.	165.	29.4		
13	none	80.	165.	29.4	.546	2
		80.	165.	44.1		
14	none	80.	165.	44.1	.291	5
		80.	165.	93.93		

Number of wires = 14
current nodes = 48

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	10	6.79	4	10.066
radius	10	.203	1	1.565

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.98	0	1	.0188611	.0279611

Sources

source	node	sector	magnitude	phase	type
1	38	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-1,299.	0	0	0
2	12	0	-1,299.	0	0	0
3	23	0	-1,624.	0	0	0

CURRENT NODES

wire	coordinates (degrees) X	Y	Z	connections end1	end2	node no.
1	0	0	0	GND	1	1
1	0	0	7.35	1	END	2
2	0	0	14.7	1	2	3
2	0	0	22.05	2	END	4
3	0	0	29.4	2	3	5
3	0	0	36.75	3	END	6
4	0	0	44.1	3	4	7
4	0	0	54.166	4	4	8
4	0	0	64.232	4	4	9
4	0	0	74.298	4	4	10
4	0	0	84.364	4	END	11
5	70.7982	-194.516	0	GND	5	12
5	70.7982	-194.516	7.35	5	END	13
6	70.7982	-194.516	14.7	5	6	14
6	70.7982	-194.516	22.05	6	END	15
7	70.7982	-194.516	29.4	6	7	16
7	70.7982	-194.516	36.75	7	END	17
8	70.7982	-194.516	44.1	7	8	18
8	70.7982	-194.516	54.12	8	8	19
8	70.7982	-194.516	64.14	8	8	20
8	70.7982	-194.516	74.16	8	8	21
8	70.7982	-194.516	84.18	8	END	22
9	-6.38744	-215.215	0	GND	9	23
9	-6.38744	-215.215	8.15083	9	9	24
9	-6.38744	-215.215	16.3017	9	9	25
9	-6.38744	-215.215	24.4525	9	9	26
9	-6.38744	-215.215	32.6033	9	9	27
9	-6.38744	-215.215	40.7542	9	9	28
9	-6.38744	-215.215	48.905	9	9	29
9	-6.38744	-215.215	57.0558	9	9	30
9	-6.38744	-215.215	65.2067	9	9	31
9	-6.38744	-215.215	73.3575	9	9	32
9	-6.38744	-215.215	81.5083	9	9	33
9	-6.38744	-215.215	89.6592	9	END	34
10	-6.38744	-215.215	97.81	9	10	35
10	-6.38744	-215.215	104.6	10	10	36
10	-6.38744	-215.215	111.39	10	END	37
11	-77.2741	-20.7055	0	GND	11	38
11	-77.2741	-20.7055	7.35	11	END	39
12	-77.2741	-20.7055	14.7	11	12	40
12	-77.2741	-20.7055	22.05	12	END	41
13	-77.2741	-20.7055	29.4	12	13	42
13	-77.2741	-20.7055	36.75	13	END	43
14	-77.2741	-20.7055	44.1	13	14	44
14	-77.2741	-20.7055	54.066	14	14	45
14	-77.2741	-20.7055	64.032	14	14	46
14	-77.2741	-20.7055	73.998	14	14	47
14	-77.2741	-20.7055	83.964	14	END	48

Derivation of Operating Parameters, Nighttime Directional Array

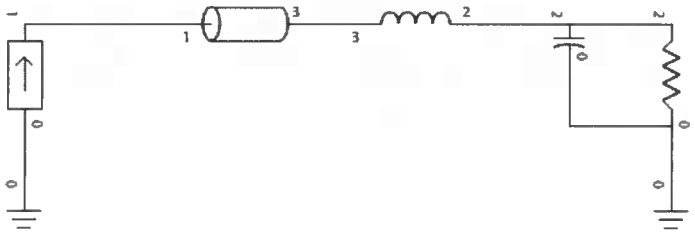
Following verification of the moment method model of the individual array elements, by comparison of the measured and modeled base impedances, directional antenna array base parameters were calculated. Calculations were made to determine the complex voltage sources which when applied to the base of each array element produce current moment sums which when normalized, equate to the theoretical field parameters of the authorized directional pattern. Using these voltages, the tower currents were calculated. The currents at the ATU sampling points were related to those of the moment method model by using the WCAP Pro nodal analysis program from Westberg Consulting. The assumptions that were used for the single tower calculations were used in the directional array case as well. In the following WCAP calculations node 3 represents the reference point, node 2 represents the tower feed point, and node 0 represents ground. The tower operating impedance is represented from node 2 to ground (R 2-0). The current magnitude and phases at the sample point is represented following the insignificantly short transmission line (TL 1-3). The value shown at TL 1-3 has been rounded by the program. The actual current values shown as "I" in the "WCAP INPUT DATA" represent the values before rounding and were used in the calculation of antenna monitor amplitude and phase indications to yield greater accuracy.

In so much as the sample lines are equal in length and the sample torroids responses are identical, the antenna monitor amplitudes and phases have been calculated directly from the reference point currents and phases.

Calculated Night Parameters

Tower	Model Pulse	Model Current Magnitude At Torroid, Amps	Model Current Phase at Torroid, Degrees	Modeled Antenna Monitor Ratio	Modeled Antenna Monitor Phase, Degrees
1	1	7.608	9.28	1.0	0.0
2	12	7.793	17.78	1.024	8.5
3	23	4.035	148.38	0.530	139.1
4	38	8.339	137.28	1.096	128.0

WCAP Circuit Diagram



WCAP - WONE T1 DAN-U

WCAP OUTPUT AT FREQUENCY: 0.980 MHz

NODE VOLTAGES
Node: 1 420.2663 ∠ 51.9018° V
Node: 2 420.2647 ∠ 51.9016° V
Node: 3 318.4770 ∠ 23.1075° V

	WCAP PART		CURRENT IN		CURRENT OUT	
TL	1→2	50.00000000	7.61 ∠	9.280° A	7.61 ∠	9.280° A

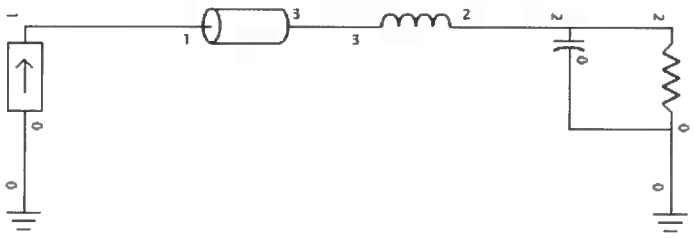
	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	3→0	39.99000000	318.48 ∠	23.108° V	**7.67 ∠**	**7.501° A**
C	3→0	0.00012500	318.48 ∠	23.108° V	0.25 ∠	113.108° A
L	2→3	4.45000000	208.47 ∠	99.280° V	7.61 ∠	9.280° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	3→0	39.99000000	39.99 + j	11.170	0.00 + j	0.000
C	3→0	0.00012500	0.00 - j	1299.224	0.00 + j	0.000
L	2→3	4.45000000	40.65 + j	37.406	40.65 + j	10.005
TL	1→2	50.00000000	40.65 + j	37.406	40.65 + j	37.406

	WCAP PART		VSWR
TL	1→2	50.00000000	2.2959

WCAP INPUT DATA:
0.9800 0.00000000 0
R 39.99000000 3 0 11.17000000
C 0.00012500 3 0
L 4.45000000 2 3 0.00000000
TL 50.00000000 1 2 100.00000000 0.00100000 0.00000000
I **7.60800000 0 1 9.28000000**

WCAP Circuit Diagram



WCAP – WONE T2 DAN-U

WCAP OUTPUT AT FREQUENCY: 0.980 MHz

NODE VOLTAGES
Node: 1 353.1040 ∠ 63.8004° V
Node: 2 248.9285 ∠ 27.7154° V
Node: 3 353.1023 ∠ 63.8001° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	1→3 50.00000000	7.79 ∠ 17.780° A	7.79 ∠ 17.780° A

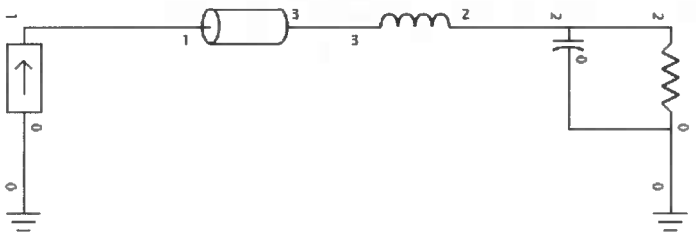
WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	2→0 31.18000000	248.93 ∠ 27.715° V	**7.83 ∠ 16.398° A**
C	2→0 0.00012500	248.93 ∠ 27.715° V	0.19 ∠ 117.715° A
L	3→2 4.40000000	211.14 ∠ 107.780° V	7.79 ∠ 17.780° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→0 31.18000000	31.18 + j 6.240	0.00 + j 0.000
C	2→0 0.00012500	-0.01 - j 1299.224	0.00 + j 0.000
L	3→2 4.40000000	31.46 + j 32.604	31.46 + j 5.511
TL	1→3 50.00000000	31.46 + j 32.605	31.46 + j 32.604

WCAP PART		VSWR
TL	1→3 50.00000000	2.4930

WCAP INPUT DATA:
0.9800 0.00000000 0
R 31.18000000 2 0 6.24000000
C 0.00012500 2 0
L 4.40000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I **7.79300000 0 1 17.78000000**

WCAP Circuit Diagram



WCAP - WONE T3 DAN-U

WCAP OUTPUT AT FREQUENCY: 0.980 MHz

NODE VOLTAGES
Node: 1 860.0607 ∠ -126.5948° V
Node: 2 860.0620 ∠ -126.5948° V
Node: 4 810.5668 ∠ -126.8994° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	2→1 50.00000000	4.04 ∠ 148.380° A	4.04 ∠ 148.380° A

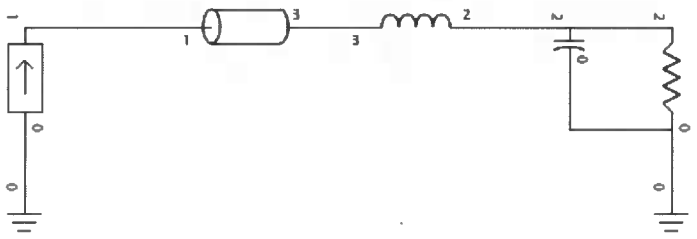
WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	4→0 14.65000000	810.57 ∠ -126.899° V	**4.53 ∠ 147.799° A**
C	4→0 0.00010000	810.57 ∠ -126.899° V	0.50 ∠ -36.899° A
L	1→4 2.00000000	49.69 ∠ -121.620° V	4.04 ∠ 148.380° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	4→0 14.65000000	14.65 + j 178.240	0.00 + j 0.000
C	4→0 0.00010000	0.00 - j 1624.030	0.00 + j 0.000
L	1→4 2.00000000	18.48 + j 212.342	18.48 + j 200.027
TL	2→1 50.00000000	18.48 + j 212.347	18.48 + j 212.342

WCAP PART		VSWR
TL	2→1 50.00000000	51.8454

WCAP INPUT DATA:
0.9800 0.00000000 0
R 14.65000000 4 0 178.24000000
C 0.00010000 4 0
L 2.00000000 1 4 0.00000000
TL 50.00000000 2 1 100.00000000 0.00100000 0.00000000
I **4.03500000 0 2 148.38000000**

WCAP Circuit Diagram



WCAP - WONE T4 DAN-U

WCAP OUTPUT AT FREQUENCY: 0.980 MHz

NODE VOLTAGES
Node: 1 159.8602 ∠ -151.7947° V
Node: 2 83.0652 ∠ 86.2512° V
Node: 3 159.8578 ∠ -151.7950° V

	WCAP PART		CURRENT IN	CURRENT OUT
TL	1→3	50.00000000	8.34 ∠ 137.280° A	8.34 ∠ 137.280° A

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	2→0	6.34000000	83.07 ∠ 86.251° V	**8.29 ∠ 137.002° A**
C	2→0	0.00012500	83.07 ∠ 86.251° V	0.06 ∠ 176.251° A
L	3→2	4.20000000	215.66 ∠ -132.720° V	8.34 ∠ 137.280° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→0	6.34000000	6.34 - j 7.760	0.00 + j 0.000
C	2→0	0.00012500	0.00 - j 1299.224	0.00 + j 0.000
L	3→2	4.20000000	6.26 + j 18.117	6.26 - j 7.744
TL	1→3	50.00000000	6.26 + j 18.118	6.26 + j 18.117

	WCAP PART		VSWR
TL	1→3	50.00000000	9.0437

WCAP INPUT DATA:
0.9800 0.00000000 0
R 6.34000000 2 0 -7.76000000
C 0.00012500 2 0
L 4.20000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I **8.33900000 0 1 137.28000000**

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = .98 MHz

tower	field ratio magnitude	phase (deg)
1	1.	0
2	1.	10.4
3	1.	146.
4	1.	135.6

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	318.434	23.1	7.67035	7.5
12	248.936	27.7	7.82793	16.4
23	810.493	233.1	4.53196	147.8
38	83.0942	86.3	8.29041	137.

Sum of square of source currents = 418.761
Total power = 5,000. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.0249484	-.0100967
Y(1, 2)	.00403758	.00684223
Y(1, 3)	-.000231972	.00076152
Y(1, 4)	-.0122807	.0193123
Y(2, 1)	.00403771	.00684207
Y(2, 2)	.0209679	.00343423
Y(2, 3)	.0012026	.00575005
Y(2, 4)	.000993993	.00228039
Y(3, 1)	-.000232865	.000761788
Y(3, 2)	.00120089	.00575374
Y(3, 3)	.00179982	-.00371683
Y(3, 4)	.00207525	-4.4883E-05
Y(4, 1)	-.0122816	.0193119
Y(4, 2)	.00099356	.00228019
Y(4, 3)	.00207454	-4.5435E-05
Y(4, 4)	.0276407	-.010606

TOWER IMPEDANCE MATRIX

impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	38.7396	-6.72722
Z(1, 2)	-12.5204	-3.95124
Z(1, 3)	-24.5319	-1.32856
Z(1, 4)	22.2618	-20.2792
Z(2, 1)	-12.5206	-3.95029
Z(2, 2)	36.6769	-7.64214
Z(2, 3)	36.0817	-35.182
Z(2, 4)	-13.5856	1.72863
Z(3, 1)	-24.5226	-1.32282
Z(3, 2)	36.0469	-35.1743
Z(3, 3)	113.571	158.864
Z(3, 4)	-22.6565	-5.59384
Z(4, 1)	22.2608	-20.2797

Z(4, 2)	-13.5852	1.72793
Z(4, 3)	-22.6636	-5.60089
Z(4, 4)	37.5809	-8.70211

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
.98	39.985	11.167	41.515	15.6	1.3964	-15.628	-.12051
source = 2; node 12, sector 1							
.98	31.182	6.2414	31.801	11.3	1.6437	-12.27	-.26544
source = 3; node 23, sector 1							
.98	14.647	178.24	178.84	85.3	47.064	-.36916	-10.889
source = 4; node 38, sector 1							
.98	6.3427	-7.7608	10.023	309.3	8.0761	-2.1621	-4.0654

CURRENT rms
Frequency = .98 MHz
Input power = 5,000. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	7.67032	7.5	7.60508	.998301
2	0	0	7.35	7.77859	3.4	7.76496	.460264
END	0	0	14.7	7.6429	1.7	7.63938	.232144
2J1	0	0	14.7	7.6429	1.7	7.63938	.232144
4	0	0	22.05	7.40893	.7	7.40844	.0858365
END	0	0	29.4	6.99596	359.7	6.99583	-.0418188
2J2	0	0	29.4	6.99596	359.7	6.99583	-.0418188
6	0	0	36.75	6.58556	359.	6.58461	-.111869
END	0	0	44.1	6.01055	358.4	6.00822	-.16721
2J3	0	0	44.1	6.01055	358.4	6.00822	-.16721
8	0	0	54.166	5.21388	357.8	5.21005	-.199701
9	0	0	64.232	4.20286	357.3	4.19807	-.200618
10	0	0	74.298	3.01512	356.8	3.01035	-.169419
11	0	0	84.364	1.66041	356.3	1.65701	-.106191
END	0	0	94.43	0	0	0	0
GND	70.7982	-194.516	0	7.82796	16.4	7.50955	2.20988
13	70.7982	-194.516	7.35	7.86116	13.2	7.65416	1.79213
END	70.7982	-194.516	14.7	7.68985	11.8	7.52603	1.57885
2J5	70.7982	-194.516	14.7	7.68985	11.8	7.52603	1.57885
15	70.7982	-194.516	22.05	7.43206	11.	7.29629	1.4141
END	70.7982	-194.516	29.4	6.99752	10.1	6.88833	1.23133
2J6	70.7982	-194.516	29.4	6.99752	10.1	6.88833	1.23133
17	70.7982	-194.516	36.75	6.57462	9.6	6.48244	1.09706
END	70.7982	-194.516	44.1	5.98871	9.1	5.91368	.944978
2J7	70.7982	-194.516	44.1	5.98871	9.1	5.91368	.944978
19	70.7982	-194.516	54.12	5.18786	8.6	5.13	.772628
20	70.7982	-194.516	64.14	4.17758	8.1	4.13593	.588451
21	70.7982	-194.516	74.16	2.99481	7.7	2.96797	.400019
22	70.7982	-194.516	84.18	1.64847	7.3	1.63515	.209143
END	70.7982	-194.516	94.2	0	0	0	0

GND	-6.38744	-215.215	0	4.53197	147.8	-3.83474	2.41527
24	-6.38744	-215.215	8.15083	5.20834	147.1	-4.3754	2.82536
25	-6.38744	-215.215	16.3017	5.55434	146.8	-4.64739	3.04178
26	-6.38744	-215.215	24.4525	5.74054	146.5	-4.78784	3.16708
27	-6.38744	-215.215	32.6033	5.78693	146.3	-4.81312	3.21286
28	-6.38744	-215.215	40.7542	5.70302	146.1	-4.73128	3.18423
29	-6.38744	-215.215	48.905	5.49564	145.9	-4.54833	3.08459
30	-6.38744	-215.215	57.0558	5.17152	145.7	-4.27023	2.91715
31	-6.38744	-215.215	65.2067	4.738	145.5	-3.90347	2.68544
32	-6.38744	-215.215	73.3575	4.2031	145.3	-3.45511	2.39338
33	-6.38744	-215.215	81.5083	3.57499	145.1	-2.9323	2.04503
34	-6.38744	-215.215	89.6592	2.86037	144.9	-2.34094	1.64369
END	-6.38744	-215.215	97.81	2.04678	144.7	-1.67118	1.18172
2J9	-6.38744	-215.215	97.81	2.04678	144.7	-1.67118	1.18172
36	-6.38744	-215.215	104.6	1.45579	144.6	-1.18677	.843148
37	-6.38744	-215.215	111.39	.795234	144.5	-.647229	.462052
END	-6.38744	-215.215	118.18	0	0	0	0
GND	-77.2741	-20.7055	0	8.29039	137.	-6.06372	5.65349
39	-77.2741	-20.7055	7.35	8.10224	136.3	-5.86034	5.59488
END	-77.2741	-20.7055	14.7	7.82643	136.	-5.63193	5.43455
2J11	-77.2741	-20.7055	14.7	7.82643	136.	-5.63193	5.43455
41	-77.2741	-20.7055	22.05	7.49693	135.8	-5.37508	5.22613
END	-77.2741	-20.7055	29.4	6.99529	135.6	-4.99646	4.89586
2J12	-77.2741	-20.7055	29.4	6.99529	135.6	-4.99646	4.89586
43	-77.2741	-20.7055	36.75	6.53255	135.4	-4.65373	4.58443
END	-77.2741	-20.7055	44.1	5.91186	135.3	-4.19967	4.16088
2J13	-77.2741	-20.7055	44.1	5.91186	135.3	-4.19967	4.16088
45	-77.2741	-20.7055	54.066	5.09053	135.1	-3.60519	3.5939
46	-77.2741	-20.7055	64.032	4.07644	134.9	-2.87806	2.88689
47	-77.2741	-20.7055	73.998	2.90753	134.7	-2.04639	2.06543
48	-77.2741	-20.7055	83.964	1.59308	134.6	-1.11769	1.13519
END	-77.2741	-20.7055	93.93	0	0	0	

Sampling System Measurements

The following calculations confirm that the sample system as installed complies with Rule Section 73.151(c)(2)(1) in all respects. The sample toroids are Delta model TCT3 and their outputs are in agreement within the manufacturer's specification of +/-2% and +/-2º. The antenna monitor is a Potomac AM 1901. The antenna monitor calibration was checked against a Hewlett Packard model 8753ES network analyzer in the amplitude and phase modes and the calibration of the monitor was found to be in agreement within the Potomac specifications. The sample lines are equal in length and constructed of 1/2" Cablewave FCC 12-50j coaxial cable that has a solid outer conductor and foam dielectric. The cables are equal in length within 1º as required. The cables have all been buried so as to be exposed to the same environmental conditions. The length of the cables was confirmed by measuring the impedance, looking into the line with the far end opened. The lines were found to be 3/4 wavelength long at the frequencies listed. These frequencies were used to calculate the electrical lengths of the lines at the operating frequency of 980kHz. Frequencies were calculated at which the lines were +/-45º the length of the resonate frequency. The impedance was then calculated using the following formula:

$$Zo = ((R1^2+X1^2)^{1/2} * (R2^2+X2^2)^{1/2})^{1/2}$$

Sample Line Length Calculation

Tower	Resonate Frequency At 270º, kHz	Electrical Length at 980 kHz, Degrees
1	1447.68	182.78
2	1445.65	183.03
3	1446.85	182.88
4	1450.11	182.47

Sample Line Impedance Calculation

Tower	270º Resonant Frequency kHz	45º Above Resonant Frequency kHz	Resistance Ohms	Reactance Ohms	45º Below Resonant Frequency kHz	Resistance Ohms	Reactance Ohms	Characteristic Impedance Ohms
1	1447.68	1688.96	4.59	49.66	1206.40	3.05	-49.30	49.63
2	1445.65	1686.59	4.62	49.39	1204.71	3.07	-49.34	49.52
3	1446.85	1687.99	4.77	49.60	1205.71	3.17	-49.52	49.72
4	1450.11	1691.80	4.61	49.45	1208.43	3.03	-49.55	49.65

The sample toroid calibration was confirmed by passing a common conductor through the toroids. The common conductor was driven by a Hewlett Packard 8753ES vector network analyzer that was properly calibrated for response measurement. The output from the tower #1 toroid was fed to the reference receiver of the analyzer and the remaining toroids outputs were alternately fed to the B input, and the results noted in the chart below.

Sample Toroid Calibration Verification

Tower	Serial Number	Indicated Ratio	Indicated Phase
1	18406	1.0	0.0
2	18407	1.012	-0.06
3	18408	1.012	-0.16
4	18409	1.013	-0.19

Sample Lines Terminated By Toroids

Tower	Serial Number	Impedance at Input to Sample Line with Torroid Connected
1	18406	50.91 +j2.32
2	18407	50.69 +j2.34
3	18408	51.03 +j2.55
4	18409	50.79 +j2.38

Direct Measurement of Power

The common point network in the nighttime phasor was adjusted to provide the proper operating resistance of 50 ohms and a reactance of 0 (zero) ohms to the transmitter output.

The antenna operating powers were calculated by adding 8.0% to the nominal operating power of 5.0kW. The common point current was then calculated as indicated below.

Daytime non directional mode power measurements are made at the base of tower #1. Daytime operating impedance measures 37.49 +j19. Tower #1 current was calculated as indicated below.

Pattern	Nominal Power Watts	Operating Power Watts	Operating Common Point Current, Amps
Night	5000	5400	10.4
Day	5000	5000	11.55

Reference Field Strength Measurements

Reference field strength measurements were made on radials having existing monitor point limits on the current license as well as on radials in the main lobes as follows:

WONE DAN-U

Reference Field Strength Measurements

Point #	Distance/km	Field Strength mv/m	Location Description	GPS Coordinates NAD27
35-1	3.13	19.2	Intersection Cloverfield Ave and Benfield Dr	N39° 41' 27.20" W84° 08' 47.28"
35-2	4.71	10.5	In front of 3020 Mohican Ave	N39° 42' 7.98" W84° 08' 7.21"
35-3	6.52	13.2	In front of 2151 W Bataan Dr	N39° 42' 56.03" W84° 07' 23.43"
105-1	3.55	24.2	Sidewalk in front of 5900 Bigger Road	N39° 39' 33.20" W84° 07' 37.08"
105-2	4.61	13.6	In front of 2549 Montbello Circle	N39° 39' 24.37" W84° 06' 54.36"
105-3	6.0	11.6	South East corner of Possum Run Rd and Sugarleaf Dr	N39° 39' 12.63" W84° 05' 56.97"
225-1	2.85	7.2	In front of 6618 Imperial Woods Rd	N39° 38' 57.41" W84° 11' 26.05"
225-2	3.67	3.4	In front of 1572 Roamont Dr	N39° 38' 38.85" W84° 11' 50.34"
225-3	5.04	5.0	In front of 7824 Washington Park Dr	N39° 38' 7.12" W84° 12' 30.71"
272-1	3.28	7.05	In front of 5699 Willowtwig Ln	N39° 40' 7.17" W84° 12' 19.38"
272-2	4.63	7.7	In front of 2787 Orchard Run Rd	N39° 40' 9.11" W84° 13' 16.65"
272-3	6.37	4.6	In front of 449 Astor Ave	N39° 40' 9.72" W84° 14' 29.28"

338-1	2.4	383	In front of 4154 Lotz Rd	N39° 41' 14.99" W84° 10' 38.98"
338-2	4.48	154	In front of 3033 Allendale Dr	N39° 42' 17.41" W84° 11' 11.91"
338-3	6.56	72.5	Intersection of Mayo Ave and Patterson Blvd	N39° 43' 19.75" W84° 11' 44.44"

All measurements were taken June 13th, 2019 with Potomac Instruments FIM-4100 field strength meter with serial number 133. The meter was calibrated by its manufacturer on May 6, 2019.

Item 7

RFR Compliance

Operation of WONE at 5.0 kW daytime and 5.0 kW nighttime will not result in exposure of workers or the general public to RF radiation in excess of levels specified in 47CFR 1.1310. Fences have been installed around all tower bases to comply with the minimum distance which exceeds the distances specified in OET Bulletin 65 for this frequency, calculated power levels in the towers and tower height to prevent electric and magnetic exposure greater than permissible levels. These fences limit access by the general public. If it becomes necessary for workers to enter the tower base areas for maintenance, the station will either reduce power or cease operation to provide RFR safety for the workers.

Item 8

Ground System Description

No changes were made to the ground system at WONE and remains as previously licensed:

Ground system consists of 120 – 165' equally spaced buried copper radials, plus a 48' x 48' ground screen about base of each tower. Radials are shortened and bonded to copper strap midway between elements or at property line.