



iHeart
MEDIA

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Tulsa, OK 74129

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

ACCEPTED/FILED

February 27, 2018

FEB 27 2018

Federal Communications Commission
Office of the Secretary

COURIER DELIVERY

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

RE: CC Licenses, LLC (FRN No. 0014042816)
Application for New License on FCC Form 302-AM
WENE (AM), 1430 kHz, Endicott, NY; Facility ID No. 19625

Dear Ms. Dortch:

On behalf of CC Licenses, LLC, 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 \$1,505.00 filing fee.

Please stamp and return the additional copy of this submission in the enclosed Federal Express envelope. Please direct communications concerning this application to the undersigned.

Respectfully submitted,
CC Licenses, LLC

By: _____

Jeff L. Diejohn
EVP - Engineering & Systems Integration

cc: Public Inspection File

Agency Tracking ID:PGC3062427 Authorization Number:448630
Successful Authorization -- Date Paid: 2/27/18
FILE COPY ONLY!!

READ INSTRUCTIONS CAREFULLY BEFORE PROCEEDING		FEDERAL COMMUNICATIONS COMMISSION REMITTANCE ADVICE FORM 159 PAGE NO 1 OF 1		APPROVED BY OMB 3060-059	
(1) LOCKBOX #979839				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) CC Licenses, LLC				(3) TOTAL AMOUNT PAID (dollars and cents) \$1505.00	
(4) STREET ADDRESS LINE NO. 1 7136 S. Yale Avenue					
(5) STREET ADDRESS LINE NO. 2 Suite 501					
(6) CITY Tulsa				(7) STATE OK	(8) ZIP CODE 74136
(9) DAYTIME TELEPHONE NUMBER (INCLUDING AREA CODE) 918-6644581				(10) COUNTRY CODE (IF NOT IN U.S.A.) US	
FCC REGISTRATION NUMBER (FRN) AND TAX IDENTIFICATION NUMBER (TIN) REQUIRED					
(11) PAYER (FRN) 0014042816				(12) FCC USE ONLY	
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 CC Licenses, LLC					
(14) STREET ADDRESS LINE NO. 1 7136 S. Yale Avenue					
(15) STREET ADDRESS LINE NO. 2 Suite 501					
(16) CITY Tulsa				(17) STATE OK	(18) ZIP CODE 74136
(19) DAYTIME TELEPHONE NUMBER (INCLUDING AREA CODE) 918-6644581				(20) COUNTRY CODE (IF NOT IN U.S.A.) US	
FCC REGISTRATION NUMBER (FRN) AND TAX IDENTIFICATION NUMBER (TIN) REQUIRED					
(21) APPLICANT (FRN) 0014042816				(22) FCC USE ONLY	
COMPLETE SECTION C FOR EACH SERVICE, IF MORE BOXES ARE NEEDED, USE CONTINUATION SHEET					
(23A) FCC Call Sign Other ID WENE		(24A) Payment Type Code(PTC) MMR		(25A) Quantity 1	
(26A) Fee Due for (PTC) \$700.00		(27A) Total Fee \$700.00		FCC Use Only	
(28A) FCC CODE 1 19625		(29A) FCC CODE 2 302PAPERAPP			
(23B) FCC Call Sign Other ID WENE		(24B) Payment Type Code(PTC) MOR		(25B) Quantity 1	
(26B) Fee Due for (PTC) \$805.00		(27B) Total Fee \$805.00		FCC Use Only	
(28B) FCC CODE 1 19625		(29B) FCC CODE 2 302PAPERAPP			

FOR
FCC
USE
ONLY

FCC 302-AM
APPLICATION FOR AM
BROADCAST STATION LICENSE

(Please read instructions before filling out form.)

FOR COMMISSION USE ONLY
FILE NO.

SECTION I - APPLICANT FEE INFORMATION

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

CC LICENSES, LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)

7138 S YALE

MAILING ADDRESS (Line 2) (Maximum 35 characters)

SUITE 501

CITY

TULSA

STATE OR COUNTRY (if foreign address)

OK

ZIP CODE

74135

TELEPHONE NUMBER (include area code)

918-564-4511

CALL LETTERS

WENE

OTHER FCC IDENTIFIER (if applicable)

19625

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		
M	M	R

(B)

FEE MULTIPLE			
0	0	0	1

(C)

FEE DUE FOR FEE TYPE CODE IN COLUMN (A)
\$ 700.00

FOR FCC USE ONLY

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

(A)

M	O	R
---	---	---

(B)

0	0	0	1
---	---	---	---

(C)

\$ 805.00

FOR FCC USE ONLY

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

\$ 1,505.00

FOR FCC USE ONLY

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT CC LICENSES, LLC		
MAILING ADDRESS 7136 S YALE SUITE 501		
CITY TULSA	STATE OK	ZIP CODE 74138

2. This application is for:

- ☒ Commercial
 ☐ Noncommercial
☒ AM Directional
 ☐ AM Non-Directional

Call letters WENE	Community of License ENDICOTT NY	Construction Permit File No.	Modification of Construction Permit File No(s)	Expiration Date of Last Construction Permit
----------------------	-------------------------------------	------------------------------	--	---

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

☒ Yes ☐ No

If No, explain in an Exhibit.

Exhibit No.

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

☒ Yes ☐ No

If No, state exceptions in an Exhibit.

Exhibit No.

5. Apart from the changes already reported, has any cause or circumstance arisen since the grant of the underlying construction permit which would result in any statement or representation contained in the construction permit application to be now incorrect?

☐ Yes ☒ No

If Yes, explain in an Exhibit.

Exhibit No.

6. Has the permittee filed its Ownership Report (FCC Form 323) or ownership certification in accordance with 47 C.F.R. Section 73.3615(b)?

☒ Yes ☐ No

☐ Does not apply

If No, explain in an Exhibit.

Exhibit No.

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

☐ Yes ☒ No

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

Exhibit No.

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

☐ Yes ☒ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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

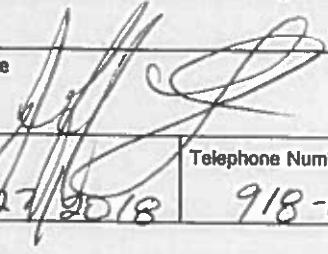
The APPLICANT acknowledges that all the statements made in this application and attached exhibits are considered material representations and that all the exhibits are a material part hereof and are incorporated herein as set out in full in

CERTIFICATION

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

☒ Yes ☐ No

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

Name JEFF LITTLEJOHN	Signature 	
Title EXEC VP ENGINEERING	Date 2/27/2018	Telephone Number 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

CC LICENSES, 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
WENE		1430	UNLIMITED	5.0	5.0

2. Station location

State NEW YORK	City or Town ENDICOTT
--------------------------	---------------------------------

3. Transmitter location

State NY	County BROOME	City or Town VESTAL	Street address (or other identification) 273 PIERCE HILL ROAD
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4. Main studio location

State NY	County BROOME	City or Town VESTAL	Street address (or other identification) 320 NORTH JENSEN ROAD
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5. Remote control point location (specify only if authorized directional antenna)

State NY	County BROOME	City or Town VESTAL	Street address (or other identification) 320 NORTH JENSEN ROAD
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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 10.39	RF common point or antenna current (in amperes) without modulation for day system 7.38
Measured antenna or common point resistance (in ohms) at operating frequency Night 50.0 Day 91.7	Measured antenna or common point reactance (in ohms) at operating frequency Night -j7.0 Day +j175.6

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 ASR 1003210	-149.0	N/A	0.605	N/A		
Tower #2 ASR 1003209	53.7	N/A	0.224	N/A		
Tower #3 ASR 1003211	0	N/A	1.0	N/A		
Tower #4 ASR 1003213	-84.4	N/A	0.264	N/A		
Tower #5 ASR 1003212	135.2	N/A	0.674	N/A		

Manufacturer and type of antenna monitor:

Potomac Instruments AM-19D

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.
Sea, uniform cross section, guyed	5 ea. 61	5 ea. 62.4	5 ea. 62.5	Exhibit No.

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	42	°	04	'	56	"	West Longitude	76	°	01	'	53	"
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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) Jacob Wyatt	Signature (check appropriate box below) 
Address (include ZIP Code) 113 West 4th St	Date
Ogallala, NE 69153	Telephone No. (Include Area Code) 308-289-1872



Technical Director



Registered Professional Engineer



Chief Operator



Technical Consultant



Other (specify)

APPLICATION FOR LICENSE INFORMATION

RADIO STATION WENE

CC LICENSES, LLC

ENDICOTT, NEW YORK

FID 19625

1430 KHZ 5KW NDD, 5KW DAN

February 22, 2018

**APPLICATION FOR LICENSE INFORMATION
RADIO STATION WENE
ENDICOTT, NEW YORK**

1430 KHZ 5KW NDD, 5KW DAN

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Item 7	RFR Compliance
Item 8	Ground System Detail

EXECUTIVE SUMMARY

This engineering exhibit has been prepared in support of an application for licensing for radio station WENE, Endicott New York, Facility ID #19625. Measurements included comply with the requirements of Rule Section 73.151c.

The towers and ground system remain as described in current license BZ-20000615AEV. The existing sample loops were removed in favor of Delta toroidal current transformers. 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 $\pm 5\%$ 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:

A handwritten signature in black ink, appearing to read "John F. Warner". The signature is stylized with a large initial "J" and a prominent "W".

John F. Warner

johnwarner@clearchannel.com

443-255-5299

Analysis of Tower Impedance Measurements to Verify Method of Moments Model

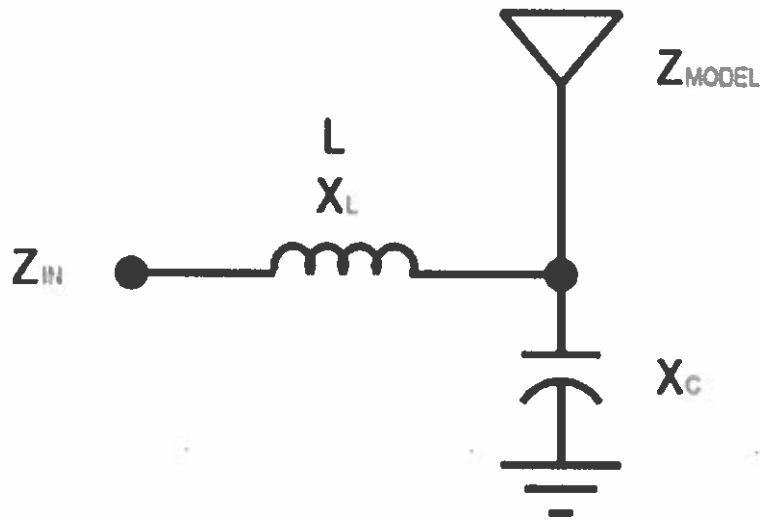
Impedance measurements were made of the individual towers with the other tower bases open. Measurements were made using a Hewlett-Packard 4396A network analyzer and a Tunwall Radio directional coupler in a calibrated measurement system. Measurements were made immediately adjacent to the toroidal antenna 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	Model Equivalent Radius Meters	Model Percent Of Radius
1	104.5	114.4	109.5	0.25	100
2	104.5	115.8	110.8	0.25	100
3	104.5	112.5	107.7	0.25	100
4	104.5	118.4	113.3	0.25	100
5	104.5	116.6	111.6	0.25	100

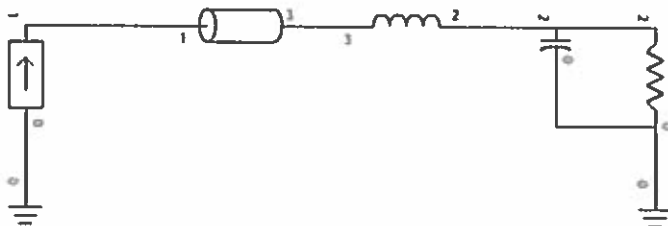
Method of Moments Model Details for Towers Driven Individually

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 X_c . The series inductive reactance of the tower feed conductor is represented as X_l . Z model represents the modeled impedance of the tower and Z_{in} 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	5.4	48.52	-4452	95.34 +j162.8	102.7 +j215.2	102.3 +j215.4
2	5.7	51.21	-4452	115.4 +j171.6	124.8 +j 226.4	124.7 +j226.2
3	5.9	53.01	-4452	97.6 +j148.8	104.4 +j204.6	104.4 +j204.2
4	5.4	48.52	-4452	128.2 +j189.5	139.7 +j242.3	139.4 +j242
5	4.9	44.03	-4452	104.6 +j180.3	113.6 +j229.1	113.3 +j229

WCAP – WENE Tower 1 Driven, others floated



WCAP OUTPUT AT FREQUENCY: 1.430 MHz

NODE VOLTAGES

Node: 1 238.4587 \angle 64.4965° V
Node: 2 195.7829 \angle 58.3712° V
Node: 3 238.4583 \angle 64.4964° V

WCAP PART	CURRENT IN	CURRENT OUT
TL 1→3 50.00000000	1.00 \angle -0.000° A	1.00 \angle -0.001° A

WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R 2→0 95.34000000	195.78 \angle 58.371° V	1.04 \angle -1.274° A
C 2→0 0.00002500	195.78 \angle 58.371° V	0.04 \angle 148.371° A
L 3→2 5.40000000	48.52 \angle 89.999° V	1.00 \angle -0.001° A

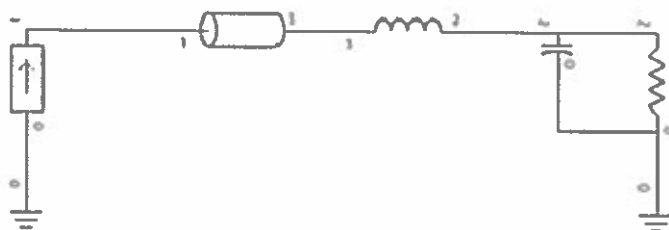
WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R 2→0 95.34000000	95.34 + j 162.800	0.00 + j 0.000
C 2→0 0.00002500	-0.00 - j 4451.887	0.00 + j 0.000
L 3→2 5.40000000	102.66 + j 215.216	102.66 + j 166.697
TL 1→3 50.00000000	102.67 + j 215.223	102.66 + j 215.216

WCAP PART	VSWR
TL 1→3 50.00000000	11.4764

WCAP INPUT DATA:

1.4300 0.00000000 0
R 95.34000000 2 0 162.80000000
C 0.00002500 2 0
I 1.00000000 0 1 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
L 5.40000000 3 2 0.00000000

WCAP – WENE Tower 2 driven, others floated



WCAP OUTPUT AT FREQUENCY: 1.430 MHz

NODE VOLTAGES

Node: 1 258.4727 \angle 61.1341° V
 Node: 2 215.0450 \angle 54.5319° V
 Node: 3 258.4723 \angle 61.1340° V

WCAP PART	CURRENT IN	CURRENT OUT
TL 1→3 50.00000000	1.00 \angle -0.000° A	1.00 \angle -0.001° A

WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R 2→0 115.42000000	215.05 \angle 54.532° V	1.04 \angle -1.546° A
C 2→0 0.00002500	215.05 \angle 54.532° V	0.05 \angle 144.532° A
L 3→2 5.70000000	51.22 \angle 89.999° V	1.00 \angle -0.001° A

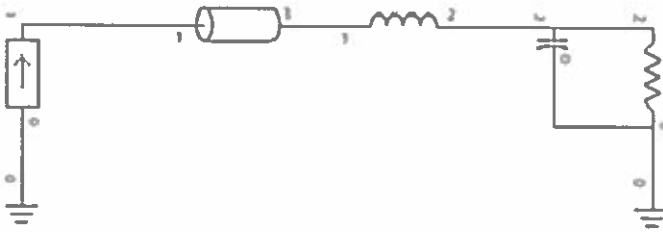
WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R 2→0 115.42000000	115.42 + j 171.620	0.00 + j 0.000
C 2→0 0.00002500	0.00 - j 4451.887	0.00 + j 0.000
L 3→2 5.70000000	124.77 + j 226.351	124.77 + j 175.137
TL 1→3 50.00000000	124.78 + j 226.358	124.77 + j 226.351

WCAP PART	VSWR
TL 1→3 50.00000000	11.0180

WCAP INPUT DATA:

1.4300 0.00000000 0
 R 115.42000000 2 0 171.62000000
 C 0.00002500 2 0
 TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
 I 1.00000000 0 1 0.00000000
 L 5.70000000 3 2 0.00000000

WCAP – WENE Tower 3 driven, others floated



WCAP OUTPUT AT FREQUENCY: 1.430 MHz

NODE VOLTAGES

Node: 1 22971.5375 \angle 62.9599° V
 Node: 2 18408.0660 \angle 55.4371° V
 Node: 3 22971.4969 \angle 62.9598° V

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

WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R 2→0 97.61000000	18408.07 \angle 55.437° V	103.44 \angle -1.301° A
C 2→0 0.00002500	18408.07 \angle 55.437° V	4.13 \angle 145.437° A
L 3→2 5.90000000	5301.32 \angle 89.999° V	100.00 \angle -0.001° A

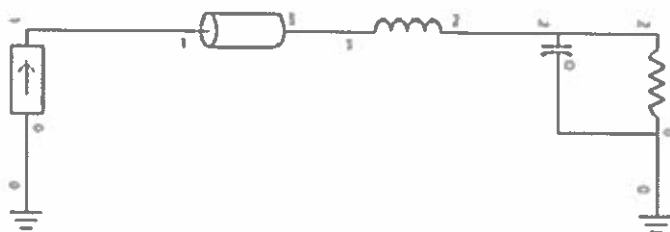
WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R 2→0 97.61000000	97.61 + j 148.810	0.00 + j 0.000
C 2→0 0.00002500	0.00 - j 4451.887	0.00 + j 0.000
L 3→2 5.90000000	104.42 + j 204.599	104.42 + j 151.587
TL 1→3 50.00000000	104.43 + j 204.605	104.42 + j 204.599

WCAP PART	VSWR
TL 1→3 50.00000000	10.4894

WCAP INPUT DATA:

1.4300	0.00000000	0
R	97.61000000	2 0 148.81000000
C	0.00002500	2 0
L	5.90000000	3 2 0.00000000
TL	50.00000000	1 3 100.00000000 0.00100000 0.00000000
I	100.00000000	0 1 0.00000000

WCAP – WENE Tower 4 driven, others floated



WCAP OUTPUT AT FREQUENCY: 1.430 MHz

NODE VOLTAGES

Node: 1 27966.2871 \angle 60.0270° V

Node: 2 23886.3222 \angle 54.2026° V

Node: 3 27966.2475 \angle 60.0269° V

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

WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R 2→0	128.18000000 23886.32 \angle 54.203° V	104.40 \angle -1.724° A
C 2→0	0.00002500 23886.32 \angle 54.203° V	5.37 \angle 144.203° A
L 3→2	5.40000000 4852.09 \angle 89.999° V	100.00 \angle -0.001° A

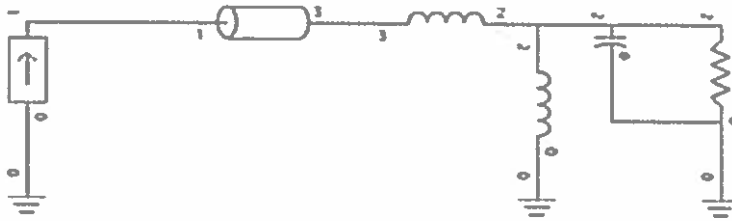
WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R 2→0	128.18000000 128.18+j 189.510	0.00+j 0.000
C 2→0	0.00002500 0.00 -j 4451.887	0.00+j 0.000
L 3→2	5.40000000 139.71+j 242.253	139.71+j 193.735
TL 1→3	50.00000000 139.72+j 242.261	139.71+j 242.253

WCAP PART	VSWR
TL 1→3	50.00000000 11.4663

WCAP INPUT DATA:

1.4300	0.00000000	0
R	128.18000000	2 0 189.51000000
C	0.00002500	2 0
L	5.40000000	3 2 0.00000000
TL	50.00000000	1 3 100.00000000 0.00100000 0.00000000
I	100.00000000	0 1 0.00000000

WCAP – WENE Tower 5 driven, others floated



WCAP OUTPUT AT FREQUENCY: 1.430 MHz

NODE VOLTAGES

Node: 1 25574.9713 \angle 63.6315° V
 Node: 2 21718.3709 \angle 58.4659° V
 Node: 3 25574.9304 \angle 63.6314° V

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

WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R 2→0	104.63000000 21718.37 \angle 58.466° V	104.19 \angle -1.404° A
C 2→0	0.00002500 21718.37 \angle 58.466° V	4.88 \angle 148.466° A
L 3→2	4.90000000 4402.81 \angle 89.999° V	100.00 \angle -0.001° A

WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R 2→0	104.63000000 104.63 + j 180.280	0.00 + j 0.000
C 2→0	0.00002500 0.00 - j 4451.887	0.00 + j 0.000
L 3→2	4.90000000 113.58 + j 229.133	113.58 + j 185.107
TL 1→3	50.00000000 113.59 + j 229.140	113.58 + j 229.133

WCAP PART	VSWR
TL 1→3	50.00000000 11.8725

WCAP INPUT DATA:

1.4300 0.00000000 0
 R 104.63000000 2 0 180.28000000
 C 0.00002500 2 0
 L 4.90000000 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 (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.43	95.335	162.8	188.66	59.6	7.8641	-2.221	-3.9756

GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	50.	0	.25	15
		90.	50.	114.4		
2	none	180.	52.	0	.25	15
		180.	52.	115.8		
3	none	6.	345.	0	.25	15
		6.	345.	112.5		
4	none	180.	232.	0	.25	15
		180.	232.	118.4		
5	none	90.	230.	0	.25	15
		90.	230.	116.6		

Number of wires = 5
current nodes = 75

	minimum	maximum
Individual wires	wire value	wire value
segment length	3 7.5	4 7.89333
radius	1 .25	1 .25

ELECTRICAL DESCRIPTION

Frequencies (MHz)

frequency		no. of steps	segment length (wavelengths)	
no. lowest	step		minimum	maximum
1	1.43	0	1 .0208333	.0219259

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	16	0	-4,452.	0	0	0
2	31	0	-4,452.	0	0	0
3	46	0	-4,452.	0	0	0
4	61	0	-4,452.	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 16, sector 1							
1.43	115.42	171.62	206.82	56.1	7.7155	-2.2643	-3.9116

GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	50.	0	.25	15
		90.	50.	114.4		
2	none	180.	52.	0	.25	15
		180.	52.	115.8		
3	none	6.	345.	0	.25	15
		6.	345.	112.5		
4	none	180.	232.	0	.25	15
		180.	232.	118.4		
5	none	90.	230.	0	.25	15
		90.	230.	116.6		

Number of wires = 5
current nodes = 75

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	3	7.5	4	7.89333
radius	1	.25	1	.25

ELECTRICAL DESCRIPTION

Frequencies (MHz)

frequency			no. of steps	segment length (wavelengths)	
no.	lowest	step		minimum	maximum
1	1.43	0	1	.0208333	.0219259

Sources

source	node	sector	magnitude	phase	type
1	16	1	1.	0	current

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-4,452.	0	0	0
2	31	0	-4,452.	0	0	0
3	46	0	-4,452.	0	0	0
4	61	0	-4,452.	0	0	0

Tower 3 driven, others floated

IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 31, sector 1							
1.43	97.606	148.81	177.96	56.7	6.8559	-2.552	-3.5227

GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	50.	0	.25	15
		90.	50.	114.4		
2	none	180.	52.	0	.25	15
		180.	52.	115.8		
3	none	6.	345.	0	.25	15
		6.	345.	112.5		
4	none	180.	232.	0	.25	15
		180.	232.	118.4		
5	none	90.	230.	0	.25	15
		90.	230.	116.6		

Number of wires = 5
current nodes = 75

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	3	7.5	4	7.89333
radius	1	.25	1	.25

ELECTRICAL DESCRIPTION

Frequencies (MHz)

frequency			no. of steps	segment length (wavelengths)	
no.	lowest	step		minimum	maximum
1	1.43	0	1	.0208333	.0219259

Sources

source	node	sector	magnitude	phase	type
1	31	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-4,452.	0	0	0
2	16	0	-4,452.	0	0	0
3	46	0	-4,452.	0	0	0
4	61	0	-4,452.	0	0	0

Tower 4 driven, others floated

IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 46, sector 1							
1.43	128.18	189.51	228.79	55.9	8.439	-2.0682	-4.215

GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	50.	0	.25	15
		90.	50.	114.4		
2	none	180.	52.	0	.25	15
		180.	52.	115.8		
3	none	6.	345.	0	.25	15
		6.	345.	112.5		
4	none	180.	232.	0	.25	15
		180.	232.	118.4		
5	none	90.	230.	0	.25	15
		90.	230.	116.6		

Number of wires = 5
current nodes = 75

	minimum		maximum	
	wire	value	wire	value
Individual wires	3	7.5	4	7.89333
segment length	1	.25	1	.25

ELECTRICAL DESCRIPTION

Frequencies (MHz)

frequency			no. of steps	segment length (wavelengths)	
no.	lowest	step		minimum	maximum
1	1.43	0	1	.0208333	.0219259

Sources

source	node	sector	magnitude	phase	type
1	46	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-4,452.	0	0	0
2	16	0	-4,452.	0	0	0
3	31	0	-4,452.	0	0	0
4	61	0	-4,452.	0	0	0

Tower 5 driven, others floated

IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 61, sector 1							
1.43	104.63	180.28	208.44	59.9	8.6672	-2.0133	-4.3066

GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	90.	50.	0	.25	15
		90.	50.	114.4		
2	none	180.	52.	0	.25	15
		180.	52.	115.8		
3	none	6.	345.	0	.25	15
		6.	345.	112.5		
4	none	180.	232.	0	.25	15
		180.	232.	118.4		
5	none	90.	230.	0	.25	15
		90.	230.	116.6		

Number of wires = 5
current nodes = 75

Individual wires	minimum		maximum	
	wire	value	wire	value
segment length	3	7.5	4	7.89333
radius	1	.25	1	.25

ELECTRICAL DESCRIPTION

Frequencies (MHz)

frequency			no. of steps	segment length (wavelengths)	
no.	lowest	step		minimum	maximum
1	1.43	0	1	.0208333	.0219259

Sources

source	node	sector	magnitude	phase	type
1	61	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-4,452.	0	0	0
2	16	0	-4,452.	0	0	0
3	31	0	-4,452.	0	0	0
4	46	0	-4,452.	0	0	0

CURRENT NODES

coordinates (degrees)		connections		node		
wire	X	Y	Z	end1	end2	no.
1	57.8509	-68.944	0	GND	1	1
1	57.8509	-68.944	7.62667	1	1	2
1	57.8509	-68.944	15.2533	1	1	3
1	57.8509	-68.944	22.88	1	1	4
1	57.8509	-68.944	30.5067	1	1	5
1	57.8509	-68.944	38.1333	1	1	6
1	57.8509	-68.944	45.76	1	1	7
1	57.8509	-68.944	53.3867	1	1	8
1	57.8509	-68.944	61.0133	1	1	9
1	57.8509	-68.944	68.64	1	1	10
1	57.8509	-68.944	76.2667	1	1	11
1	57.8509	-68.944	83.8933	1	1	12
1	57.8509	-68.944	91.52	1	1	13
1	57.8509	-68.944	99.1467	1	1	14
1	57.8509	-68.944	106.773	1	END	15
2	110.819	-141.842	0	GND	2	16
2	110.819	-141.842	7.72	2	2	17
2	110.819	-141.842	15.44	2	2	18
2	110.819	-141.842	23.16	2	2	19
2	110.819	-141.842	30.88	2	2	20
2	110.819	-141.842	38.6	2	2	21
2	110.819	-141.842	46.32	2	2	22
2	110.819	-141.842	54.04	2	2	23
2	110.819	-141.842	61.76	2	2	24
2	110.819	-141.842	69.48	2	2	25
2	110.819	-141.842	77.2	2	2	26
2	110.819	-141.842	84.92	2	2	27
2	110.819	-141.842	92.64	2	2	28
2	110.819	-141.842	100.36	2	2	29
2	110.819	-141.842	108.08	2	END	30
3	5.79556	1.55291	0	GND	3	31
3	5.79556	1.55291	7.5	3	3	32
3	5.79556	1.55291	15.	3	3	33
3	5.79556	1.55291	22.5	3	3	34
3	5.79556	1.55291	30.	3	3	35
3	5.79556	1.55291	37.5	3	3	36
3	5.79556	1.55291	45.	3	3	37
3	5.79556	1.55291	52.5	3	3	38
3	5.79556	1.55291	60.	3	3	39
3	5.79556	1.55291	67.5	3	3	40
3	5.79556	1.55291	75.	3	3	41
3	5.79556	1.55291	82.5	3	3	42
3	5.79556	1.55291	90.	3	3	43
3	5.79556	1.55291	97.5	3	3	44
3	5.79556	1.55291	105.	3	END	45
4	-110.819	141.842	0	GND	4	46
4	-110.819	141.842	7.89333	4	4	47
4	-110.819	141.842	15.7867	4	4	48
4	-110.819	141.842	23.68	4	4	49
4	-110.819	141.842	31.5733	4	4	50
4	-110.819	141.842	39.4667	4	4	51
4	-110.819	141.842	47.36	4	4	52
4	-110.819	141.842	55.2533	4	4	53
4	-110.819	141.842	63.1467	4	4	54

4	-110.819	141.842	71.04	4	4	55
4	-110.819	141.842	78.9333	4	4	56
4	-110.819	141.842	86.8267	4	4	57
4	-110.819	141.842	94.72	4	4	58
4	-110.819	141.842	102.613	4	4	59
4	-110.819	141.842	110.507	4	END	60
5	-57.8509	68.944	0	GND	5	61
5	-57.8509	68.944	7.77333	5	5	62
5	-57.8509	68.944	15.5467	5	5	63
5	-57.8509	68.944	23.32	5	5	64
5	-57.8509	68.944	31.0933	5	5	65
5	-57.8509	68.944	38.8667	5	5	66
5	-57.8509	68.944	46.64	5	5	67
5	-57.8509	68.944	54.4133	5	5	68
5	-57.8509	68.944	62.1867	5	5	69
5	-57.8509	68.944	69.96	5	5	70
5	-57.8509	68.944	77.7333	5	5	71
5	-57.8509	68.944	85.5067	5	5	72
5	-57.8509	68.944	93.28	5	5	73
5	-57.8509	68.944	101.053	5	5	74
5	-57.8509	68.944	108.827	5	END	75

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.

Additionally, a single tower lighting choke is installed on each tower and is represented from node 2 to ground (L_{2-0}). These lighting chokes were of unknown manufacturer with no indicated impedance. The chokes were disconnected and measured directly and tabulated accordingly.

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.

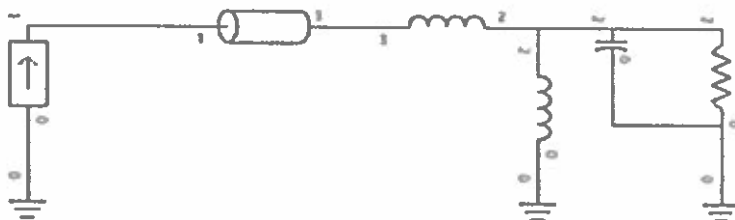
Calculated Night Parameters

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	6.47	218.7	0.605	-149.0
2	16	2.395	61.4	0.224	53.7
3	31	10.7	7.7	1.0	0.0
4	46	2.83	283.3	0.264	-84.4
5	61	7.214	142.9	0.674	135.2

Measured Tower Light Choke Impedances

Tower	L (uh)	XI (+j)
1	134.7uH	1210
2	136.9uH	1230
3	137.5uH	1235
4	128uH	1150
5	128uH	1150

WCAP Circuit Diagram



WCAP - WENE T1 DAN-U

WCAP OUTPUT AT FREQUENCY: 1.430 MHz

NODE VOLTAGES

Node: 1 2029.4526 \angle -47.8970° V

Node: 2 1716.1815 \angle -47.2694° V

Node: 3 2029.4496 \angle -47.8970° V

WCAP PART	CURRENT IN	CURRENT OUT
TL 1→3	50.00000000 6.47 \angle -141.330° A	6.47 \angle -141.330° A

WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R 2→0	-26.56000000 1716.18 \angle -47.269° V	5.44 \angle -142.100° A
C 2→0	0.00002500 1716.18 \angle -47.269° V	0.39 \angle 42.731° A
L 2→0	134.70000000 1716.18 \angle -47.269° V	1.42 \angle -137.269° A
L 3→2	5.40000000 313.93 \angle -51.330° V	6.47 \angle -141.330° A

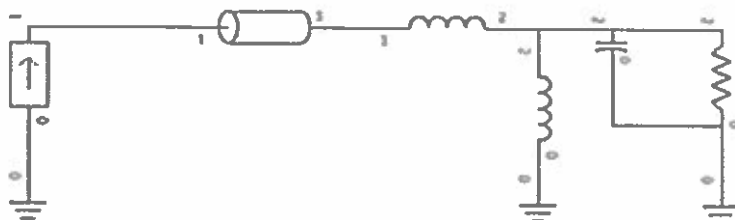
WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R 2→0	-26.56 + j 314.300	0.00 + j 0.000
C 2→0	0.00 - j 4451.887	0.00 + j 0.000
L 2→0	0.00 + j 1210.273	0.00 + j 0.000
TL 1→3	-18.78 + j 313.108	-18.78 + j 313.090
L 3→2	-18.78 + j 313.090	-18.78 + j 264.571

WCAP PART	VSWR
TL 1→3	50.00000000 107.4167

WCAP INPUT DATA:

1.4300	0.00000000	0
R	-26.56000000	2 0 314.30000000
C	0.00002500	2 0
I	6.47000000	0 1 218.67000000
L	134.70000000	2 0 0.00000000
TL	50.00000000	1 3 100.00000000 0.00100000 0.00000000
L	5.40000000	3 2 0.00000000

WCAP Circuit Diagram



WCAP - WENE T2 DAN-U

WCAP OUTPUT AT FREQUENCY: 1.430 MHz

NODE VOLTAGES

Node: 1 884.2106 \angle -167.6197° V

Node: 2 795.6324 \angle -161.8206° V

Node: 3 884.2098 \angle -167.6196° V

WCAP PART	CURRENT IN	CURRENT OUT
TL 1→3	50.00000000	2.39 \angle 61.430° A

WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R 2→0	-314.07000000	795.63 \angle -161.821° V
C 2→0	0.00002500	795.63 \angle -161.821° V
L 2→0	136.90000000	795.63 \angle -161.821° V
L 3→2	5.70000000	122.66 \angle 151.433° V

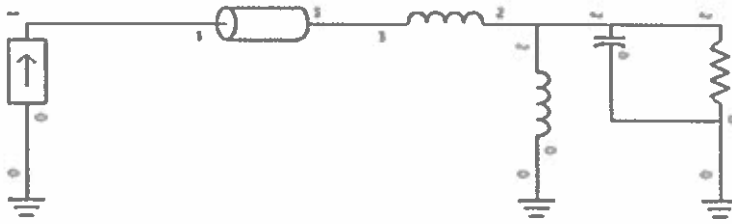
WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R 2→0	-314.07000000	-314.07 + j 211.200
C 2→0	0.00002500	-0.00 - j 4451.887
L 2→0	136.90000000	0.00 + j 1230.040
L 3→2	5.70000000	-241.94 + j 278.837
TL 1→3	50.00000000	-241.97 + j 278.841

WCAP PART	VSWR
TL 1→3	50.00000000

WCAP INPUT DATA:

1.4300	0.00000000	0
R	-314.07000000	2 0 211.20000000
C	0.00002500	2 0
I	2.39500000	0 1 61.43000000
L	136.90000000	2 0 0.00000000
L	5.70000000	3 2 0.00000000
TL	50.00000000	1 3 100.00000000 0.00100000 0.00000000

WCAP Circuit Diagram



WCAP - WENE T3 DAN-U

WCAP OUTPUT AT FREQUENCY: 1.430 MHz

NODE VOLTAGES

Node: 1 2590.6880 \angle 86.9867° V
Node: 2 2036.0851 \angle 84.0155° V
Node: 3 2590.6928 \angle 86.9867° V

WCAP PART	CURRENT IN	CURRENT OUT
TL 3→1	50.00000000 10.70 \angle 7.710° A	10.70 \angle 7.710° A

WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R 2→0	56.58000000 2036.09 \angle 84.015° V	9.55 \angle 9.401° A
C 2→0	0.00002500 2036.09 \angle 84.015° V	0.46 \angle 174.015° A
L 2→0	137.50000000 2036.09 \angle 84.015° V	1.65 \angle -5.985° A
L 1→2	5.90000000 567.24 \angle 97.710° V	10.70 \angle 7.710° A

WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R 2→0	56.58 + j 205.610	0.00 + j 0.000
C 2→0	0.00 - j 4451.887	0.00 + j 0.000
L 2→0	0.00 + j 1235.431	0.00 + j 0.000
L 1→2	45.05 + j 237.882	45.05 + j 184.871
TL 3→1	45.05 + j 237.893	45.05 + j 237.882

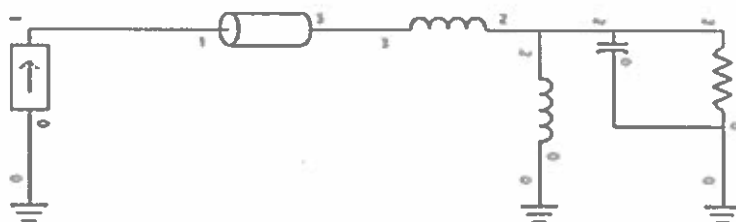
WCAP PART	VSWR
TL 3→1	50.00000000 27.0983

WCAP INPUT DATA:

1.4300 0.00000000 0

R	56.58000000	2	0	205.61000000
C	0.00002500	2	0	
I	10.70000000	0	3	7.71000000
L	137.50000000	2	0	0.00000000
L	5.90000000	1	2	0.00000000
TL	50.00000000	3	1	100.00000000 0.00100000 0.00000000

WCAP Circuit Diagram



WCAP - WENE T4 DAN-U

WCAP OUTPUT AT FREQUENCY: 1.430 MHz

NODE VOLTAGES

Node: 1 411.0972 \angle -1.3245° V
Node: 2 545.0651 \angle 2.3222° V
Node: 3 545.0664 \angle 2.3222° V

WCAP PART	CURRENT IN	CURRENT OUT
TL 3→2	50.00000000 2.83 \angle -76.700° A	2.83 \angle -76.700° A

WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R 1→0	44.32000000 411.10 \angle -1.325° V	2.57 \angle -75.211° A
C 1→0	0.00002500 411.10 \angle -1.325° V	0.09 \angle 88.675° A
L 1→0	128.00000000 411.10 \angle -1.325° V	0.36 \angle -91.325° A
L 2→1	5.40000000 137.31 \angle 13.300° V	2.83 \angle -76.700° A

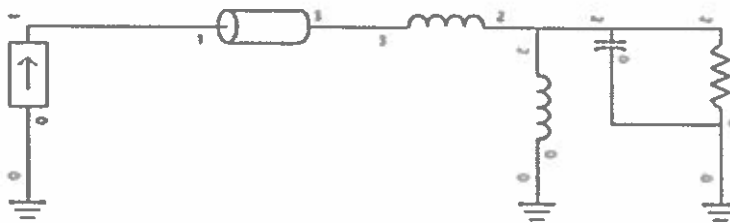
WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R 1→0	44.32000000 44.32 + j 153.410	0.00 + j 0.000
C 1→0	0.00002500 0.00 - j 4451.887	0.00 + j 0.000
L 1→0	128.00000000 0.00 + j 1150.074	0.00 + j 0.000
L 2→1	5.40000000 36.67 + j 189.072	36.67 + j 140.553
TL 3→2	50.00000000 36.68 + j 189.079	36.67 + j 189.072

WCAP PART	VSWR
TL 3→2	50.00000000 21.5452

WCAP INPUT DATA:

1.4300 0.00000000 0
R 44.32000000 1 0 153.41000000
C 0.00002500 1 0
I 2.83000000 0 3 283.30000000
L 128.00000000 1 0 0.00000000
L 5.40000000 2 1 0.00000000
TL 50.00000000 3 2 100.00000000 0.00100000 0.00000000

WCAP Circuit Diagram



WCAP - WENE T5 DAN-U

WCAP OUTPUT AT FREQUENCY: 1.430 MHz

NODE VOLTAGES

Node: 1 1302.3005 \angle -137.8844° V
Node: 2 1615.4031 \angle -135.7761° V
Node: 3 1615.4064 \angle -135.7761° V

WCAP PART	CURRENT IN	CURRENT OUT
TL 3→2	50.00000000 7.21 \angle 142.900° A	7.21 \angle 142.900° A

WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R 1→0	43.03700000 1302.30 \angle -137.884° V	6.39 \angle 144.309° A
C 1→0	0.00002500 1302.30 \angle -137.884° V	0.29 \angle -47.884° A
L 1→0	127.99000000 1302.30 \angle -137.884° V	1.13 \angle 132.116° A
L 2→1	4.90000000 317.62 \angle -127.100° V	7.21 \angle 142.900° A

WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R 1→0	43.03700000 43.04 +j 199.170	0.00 +j 0.000
C 1→0	0.00002500 0.00 -j 4451.887	0.00 +j 0.000
L 1→0	127.99000000 0.01 +j 1149.984	0.00 +j 0.000
L 2→1	4.90000000 33.78 +j 221.355	33.78 +j 177.329
TL 3→2	50.00000000 33.78 +j 221.364	33.78 +j 221.355

WCAP PART	VSWR
TL 3→2	50.00000000 31.1371

WCAP INPUT DATA:

1.4300 0.00000000 0
R 43.03700000 1 0 199.17000000
C 0.00002500 1 0
I 7.21400000 0 3 142.90000000
L 127.99000000 1 0 0.00000000
L 4.90000000 2 1 0.00000000
TL 50.00000000 3 2 100.00000000 0.00100000 0.00000000

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = 1.43 MHz

tower	field ratio magnitude	phase (deg)
1	.685	-140.
2	.26	80.
3	1.	4.
4	.26	-80.
5	.685	140.

VOLTAGES AND CURRENTS - rms

source voltage			current	
node	magnitude	phase (deg)	magnitude	phase (deg)
1	1,716.07	312.7	5.44055	217.9
16	795.389	198.2	2.10157	52.1
31	2,035.38	84.	9.54458	9.4
46	410.947	358.7	2.57351	284.8
61	1,279.88	222.1	6.39145	144.3

Sum of square of source currents = 345.178

Total power = 5,000. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.00277961	-.00311614
Y(1, 2)	.00185273	.000562997
Y(1, 3)	.00215948	.000781768
Y(1, 4)	-.000285181	-.000257568
Y(1, 5)	.000507023	-.000715469
Y(2, 1)	.00185273	.000562978
Y(2, 2)	.002779	-.0034866
Y(2, 3)	.000488001	-.000636217
Y(2, 4)	-.00013101	.000140521
Y(2, 5)	-.000284161	-.000254469
Y(3, 1)	.00215948	.000781809
Y(3, 2)	.00048801	-.000636208
Y(3, 3)	.00315464	-.00349886
Y(3, 4)	.000431375	-.000658449
Y(3, 5)	.00209072	.000591044
Y(4, 1)	-.000285182	-.000257564
Y(4, 2)	-.000131009	.000140521
Y(4, 3)	.000431364	-.000658463
Y(4, 4)	.00253519	-.00313699
Y(4, 5)	.00172069	.000441656
Y(5, 1)	.000507019	-.000715475
Y(5, 2)	-.000284162	-.000254473
Y(5, 3)	.00209071	.000590972
Y(5, 4)	.00172069	.000441678
Y(5, 5)	.00267111	-.00285357

TOWER IMPEDANCE MATRIX

impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	97.4317	162.232
Z(1, 2)	43.7173	-57.8342
Z(1, 3)	45.202	-48.4058
Z(1, 4)	-29.1957	36.6964

Z(1, 5)	-35.2861	-35.3053
Z(2, 1)	43.7182	-57.834
Z(2, 2)	115.948	171.586
Z(2, 3)	-42.6173	-34.6642
Z(2, 4)	38.5929	24.2855
Z(2, 5)	-29.4421	35.0701
Z(3, 1)	45.2009	-48.4063
Z(3, 2)	-42.6178	-34.6634
Z(3, 3)	98.2328	149.002
Z(3, 4)	-48.1541	-31.1865
Z(3, 5)	41.3137	-52.6231
Z(4, 1)	-29.1963	36.6961
Z(4, 2)	38.5929	24.2858
Z(4, 3)	-48.1538	-31.1882
Z(4, 4)	129.001	189.438
Z(4, 5)	47.319	-66.2733
Z(5, 1)	-35.2859	-35.3059
Z(5, 2)	-29.4424	35.0702
Z(5, 3)	41.3163	-52.6227
Z(5, 4)	47.3176	-66.2735
Z(5, 5)	106.991	179.391

IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.43	-26.564	314.3	315.42	94.8	****	****	****
source = 2; node 16, sector 1							
1.43	-314.07	211.2	378.47	146.1	****	****	****
source = 3; node 31, sector 1							
1.43	56.583	205.61	213.25	74.6	16.899	-1.0292	-6.7573
source = 4; node 46, sector 1							
1.43	44.321	153.41	159.68	73.9	12.555	-1.3866	-5.6332
source = 5; node 61, sector 1							
1.43	42.232	195.74	200.25	77.8	20.124	-.86394	-7.4378

CURRENT rms

Frequency = 1.43 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	57.8509	-68.944	0	5.44055	217.9	-4.2957	-3.33864
2	57.8509	-68.944	7.62667	6.81304	218.9	-5.30591	-4.27374
3	57.8509	-68.944	15.2533	7.58942	219.3	-5.87308	-4.80689
4	57.8509	-68.944	22.88	8.10897	219.6	-6.2478	-5.16918
5	57.8509	-68.944	30.5067	8.40969	219.8	-6.45827	-5.38644
6	57.8509	-68.944	38.1333	8.50733	220.	-6.51624	-5.4693
7	57.8509	-68.944	45.76	8.411	220.2	-6.42863	-5.4238
8	57.8509	-68.944	53.3867	8.12847	220.3	-6.20138	-5.25499
9	57.8509	-68.944	61.0133	7.668	220.4	-5.84082	-4.9682
10	57.8509	-68.944	68.64	7.03889	220.5	-5.35411	-4.56941
11	57.8509	-68.944	76.2667	6.25154	220.6	-4.74922	-4.06529
12	57.8509	-68.944	83.8933	5.31679	220.6	-4.03446	-3.46285
13	57.8509	-68.944	91.52	4.24448	220.7	-3.2174	-2.7684
14	57.8509	-68.944	99.1467	3.03966	220.8	-2.30188	-1.98517
15	57.8509	-68.944	106.773	1.69184	220.8	-1.28003	-1.10627
END	57.8509	-68.944	114.4	0	0	0	0
GND	110.819	-141.842	0	2.10156	52.1	1.29027	1.65885
17	110.819	-141.842	7.72	2.51663	64.6	1.07763	2.27423
18	110.819	-141.842	15.44	2.79317	70.6	.928566	2.6343
19	110.819	-141.842	23.16	2.99621	74.6	.79411	2.88906
20	110.819	-141.842	30.88	3.12743	77.6	.669504	3.05492
21	110.819	-141.842	38.6	3.18666	80.	.553554	3.13821
22	110.819	-141.842	46.32	3.17374	81.9	.446356	3.14219
23	110.819	-141.842	54.04	3.08918	83.5	.348496	3.06946
24	110.819	-141.842	61.76	2.93435	84.9	.260761	2.92274
25	110.819	-141.842	69.48	2.71144	86.1	.184003	2.70519
26	110.819	-141.842	77.2	2.42339	87.2	.119056	2.42046
27	110.819	-141.842	84.92	2.07353	88.2	.0667021	2.07246
28	110.819	-141.842	92.64	1.66498	89.	.0276442	1.66475
29	110.819	-141.842	100.36	1.19905	89.9	2.55E-03	1.19905
30	110.819	-141.842	108.08	.670949	90.7	-7.81E-03	.670903
END	110.819	-141.842	115.8	0	0	0	0
GND	5.79556	1.55291	0	9.54458	9.4	9.41648	1.55853
32	5.79556	1.55291	7.5	11.0921	7.1	11.0062	1.37744
33	5.79556	1.55291	15.	11.9257	6.	11.8605	1.24507
34	5.79556	1.55291	22.5	12.4319	5.2	12.3813	1.11985
35	5.79556	1.55291	30.	12.6543	4.5	12.6149	.997905
36	5.79556	1.55291	37.5	12.6123	4.	12.5816	.878454
37	5.79556	1.55291	45.	12.318	3.5	12.2944	.761859
38	5.79556	1.55291	52.5	11.7825	3.2	11.7646	.648969
39	5.79556	1.55291	60.	11.0178	2.8	11.0045	.540833
40	5.79556	1.55291	67.5	10.0372	2.5	10.0276	.438583
41	5.79556	1.55291	75.	8.85526	2.2	8.8486	.343347
42	5.79556	1.55291	82.5	7.48707	2.	7.48268	.256197
43	5.79556	1.55291	90.	5.94605	1.7	5.94338	.178086
44	5.79556	1.55291	97.5	4.23866	1.5	4.23724	.109767
45	5.79556	1.55291	105.	2.34992	1.3	2.34936	.0516009
END	5.79556	1.55291	112.5	0	0	0	0
GND	-110.819	141.842	0	2.57351	284.8	.658586	-2.48782
47	-110.819	141.842	7.89333	2.89111	282.9	.647028	-2.81777

48	-110.819	141.842	15.7867	3.05504	281.9	.630791	-2.98921
49	-110.819	141.842	23.68	3.14377	281.2	.60819	-3.08438
50	-110.819	141.842	31.5733	3.1664	280.5	.579282	-3.11296
51	-110.819	141.842	39.4667	3.12716	280.	.544362	-3.07942
52	-110.819	141.842	47.36	3.02903	279.6	.503887	-2.98683
53	-110.819	141.842	55.2533	2.87499	279.2	.45844	-2.8382
54	-110.819	141.842	63.1467	2.66836	278.8	.408721	-2.63687
55	-110.819	141.842	71.04	2.41294	278.5	.355525	-2.38661
56	-110.819	141.842	78.9333	2.11299	278.2	.299712	-2.09162
57	-110.819	141.842	86.8267	1.77288	277.9	.242162	-1.75626
58	-110.819	141.842	94.72	1.39673	277.6	.1837	-1.3846
59	-110.819	141.842	102.613	.987141	277.3	.124942	-.979202
60	-110.819	141.842	110.507	.541842	277.	.0659141	-.537818
END	-110.819	141.842	118.4	0	0	0	0
GND	-57.8509	68.944	0	6.39145	144.3	-5.18744	3.73378
62	-57.8509	68.944	7.77333	7.39663	142.5	-5.86949	4.50103
63	-57.8509	68.944	15.5467	7.93672	141.6	-6.22218	4.92707
64	-57.8509	68.944	23.32	8.26011	141.	-6.41692	5.20121
65	-57.8509	68.944	31.0933	8.39526	140.5	-6.47396	5.34493
66	-57.8509	68.944	38.8667	8.35477	140.	-6.40266	5.36733
67	-57.8509	68.944	46.64	8.14692	139.7	-6.20949	5.27395
68	-57.8509	68.944	54.4133	7.77945	139.3	-5.90067	5.06971
69	-57.8509	68.944	62.1867	7.26087	139.	-5.48302	4.75991
70	-57.8509	68.944	69.96	6.60085	138.8	-4.96424	4.35058
71	-57.8509	68.944	77.7333	5.81006	138.5	-4.35275	3.84843
72	-57.8509	68.944	85.5067	4.89961	138.3	-3.65727	3.26045
73	-57.8509	68.944	93.28	3.87969	138.1	-2.88581	2.59309
74	-57.8509	68.944	101.053	2.75624	137.8	-2.04317	1.84995
75	-57.8509	68.944	108.827	1.52139	137.6	-1.12398	1.02533
END	-57.8509	68.944	116.6	0	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 +/-2°. The antenna monitor is a Potomac Instruments model AM19D. The antenna monitor was compared with the Hewlett-Packard 4396A network analyzer and was found to agree within manufacturer's specification. The sample lines are equal in length and constructed of 1/2" Cablewave FLC 12 -50J coaxial cable that has a solid outer conductor and foam dielectric. The cables are equal in length within 1° as required. The cables are all supported above ground 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 1430 kHz. Frequencies were calculated at which the lines were +/- 45° the length of the resonate frequency. The impedance was then calculated using the following formula:

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

Sample Line Length Calculation

Tower	Resonate Frequency At 270°, kHz	Electrical Length at 1430 kHz, Degrees
1	1117.60	345.47
2	1117.90	345.38
3	1118.3	345.26
4	1117.2	345.60
5	1116.8	345.72

Sample Line Impedance Calculation

Tower	270° Resonant Frequency kHz	45° Above Resonant Frequency kHz	Resistance Ohms	Reactance Ohms	45° Below Resonant Frequency kHz	Resistance Ohms	Reactance Ohms	Characteristic Impedance Ohms
1	1117.60	1303.87	5.39	50.03	931.33	3.55	-50.11	50.28
2	1117.90	1304.22	5.30	50.07	931.58	3.62	-50.17	50.33
3	1118.3	1304.68	5.25	50.15	931.92	3.56	-50.11	50.33
4	1117.2	1303.40	5.30	50.00	931.00	3.61	-50.15	50.28
5	1116.8	1302.93	5.28	50.15	930.67	3.54	-50.06	50.30

The sample toroid calibration was confirmed by passing a common conductor through the toroids. The common conductor was driven by a Hewlett-Packard 4396A vector network analyzer that was properly calibrated for response measurement. The output from the tower #2 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	18336	1.0058	0.139°
2	18337	1.00	0.0°
3	18335	1.0031	-0.009°
4	18339	1.0058	0.0019°
5	18338	1.0062	-0.0028°

Sample Lines Terminated By Toroids

Tower	Serial Number	Impedance at Input to Sample Line with Torroid Connected
1	18336	49.54+j1.09
2	18337	49.73 +j0.76
3	18335	49.54 +j1.28
4	18339	49.45 +j0.91
5	18338	49.3 +j1.25

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. In order to compensate for hookup inductance between the power measurement point and the transmitter the common point reactance was set for a value of $-j7$ at the measurement point. 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 #3. Daytime operating impedance measures $91.7 + j175.6$. Tower #3 current was calculated as indicated below.

Pattern	Nominal Power Watts	Operating Power Watts	Operating Common Point Current, Amps
Night	5000	5400	10.39
Day	5000	5000	7.38

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:

WENE DAN-U

Reference Field Strength Measurements

Point #	Distance/ km	Field Strength mv/m	Location Description	GPS Coordinates NAD27
50-1	2.71	230	SW corner Lowes parking lot	N42° 05' 52.6" W76° 00' 21.3"
50-2	7.45	62	In front of 75 Richard St	N42° 07' 30.7" W75° 57' 44.6"
50-3	7.91	54	SE corner Fairview & Arch	N42° 07' 39.4" W75° 57' 29.2"
128-1	1.58	39	In front of 500 Sheedy	N42° 01' 40.0" W76° 59' 42.8"
128-2	2.75	24	Across from mailbox, 400 Meeker	N42° 04' 20.5" W76° 00' 58.6"
128-3	3.78	8.8	South side Foster at driveway 346	N42° 03' 43.5" W76° 00' 44.3"
142-1	1.49	17.1	Across from mailbox 324 Meeker	N42° 04' 17.6" W76° 01' 14.4"
142-2	2.45	4.5	South side Foster, GPS	N42° 03' 45.3" W76° 01' 00.8"
142-3	3.76	4.0	South side Sheedy at driveway 364	N42° 03' 19.0" W76° 00' 16.4"
187-1	1.84	29	In front of 152 Meeker	N42° 03' 56.9" W76° 02' 02.9"
187-2	2.35	26	SW corner Main St and Rt 26	N42° 03' 38.1" W76° 02' 04.9"
187-3	3.32	22.5	North side Sheedy in parking lot GPS	N42° 03' 08.0" W76° 02' 07.5"

229-1	1.79	41	In Weis parking lot 40'E of center line Glenwood Rd	N42° 04' 19.6" W76° 02' 51.7"
229-2	2.79	10.2	In front of 624 Echo	N42° 03' 56.1" W76° 03' 23.0"
229-3	3.65	10.0	Mailbox 639 Jones	N42° 03' 38.1" W76° 03' 59.3"
260-1	1.38	30	In front of 513 Delano	N42° 04' 45.7" W76° 02' 45.4"
260-2	1.52	21	In front of 169 Melbourne	N42° 04' 51.7" W76° 02' 52.5"
260-3	1.94	14	Clay street at dead end by hydrant	N42° 04' 46.9" W76° 02' 09.0"
323-1	2.30	56	Corner Washington & Rt26 in Wendy's parking lot	N42° 05' 55.6" W76° 02' 53.2"
323-2	2.85	24	In front of #15 Lincoln	N42° 06' 10.3" W76° 03' 07.7"
323-3	3.40	38.5	South side Ellis Ave 100' E of duplex #93	N42° 06' 23.5" W76° 03' 22.0"

All measurements were taken October 18, 2017 with Potomac Instruments FIM-4100 field strength meter with serial number 133. The meter was calibrated by its manufacturer on April 17, 2017.

Item 7

RFR Compliance

Operation of WENE at 5 kW daytime and 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 WENE and remains as previously licensed.

