35-06

2019 APR -1 AM 2:52

iHeart MEDIA

7136 S Yale Ave
Suite 501
Tulsa, OK 74136

o 918.664.4581
f 918.664.3066

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

Accepted / Filed

MAR 29 2019

Federal Communications Commission
Office of the Secretary

March 28, 2019

COURIER DELIVERY

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

RE: Capstar TX, LLC, as Debtor in Possession (FRN No. 0027342633)
Application for New License on FCC Form 302-AM
WMEQ (AM), 880 kHz, Menomonie, WI; Facility ID No. 52474

Dear Ms. Dortch:

On behalf of Capstar TX, LLC, as Debtor in Possession, the licensee of the above-referenced station, enclosed is an original and four copies of an application for license information 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 regarding this submission.

Respectfully submitted,

Capstar TX, LLC, as Debtor in Possession

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

Enclosures
cc: Public Inspection File

Agency Tracking ID:PGC3228975 Authorization Number:125213
Successful Authorization -- Date Paid: 3/28/19
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)
Capstar TX, LLC, as debtor in possession	**$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.)
918-664-4581	**US**

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

(11) PAYER (FRN)	(12) FCC USE ONLY
0027342633	

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
Capstar TX, LLC, as debtor in possession
(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.)
918-664-4581	**US**

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

(21) APPLICANT (FRN)	(22) FCC USE ONLY
0027342633	

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
WMEQ	**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	
52474	**302PAPERAPP**	

(23B) FCC Call Sign/Other ID	(24B) Payment Type Code(PTC)	(25B) Quantity
WMEQ	**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	
52474	**302PAPERAPP**	

Accepted / Filed

MAR 29 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

647357

FCC 302-AM
APPLICATION FOR AM BROADCAST STATION LICENSE

(Please read instructions before filling out form.

FOR COMMISSION USE ONLY
FILE NO. BMML-20190329ACG

SECTION I - APPLICANT FEE INFORMATION

1. PAYOR NAME (Last, First, Middle Initial)
CAPSTAR TX, LLC, AS DEBTOR IN POSSESSION

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	WMEQ	52474

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
	0 0 0 1	$	

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
	0 0 0 1	$	

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

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT CAPSTAR TX, LLC, AS DEBTOR IN POSSESSION		
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
WMEQ	MENOMONIE, WI			

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

☑ Yes ☐ No

If No, explain in an Exhibit.

Exhibit No.

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

☑ Yes ☐ No

If No, state exceptions in an Exhibit.

Exhibit No.

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

☐ Yes ☑ No

If Yes, explain in an Exhibit.

Exhibit No.

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

☑ Yes ☐ No

☐ Does not apply

If No, explain in an Exhibit.

Exhibit No.

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

☐ Yes ☑ No

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

Exhibit No.

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

☐ Yes ☑ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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

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

CERTIFICATION

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

☑ Yes ☐ No

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

Name	Signature	
Stephen G Davis		
Title	Date	Telephone Number
SVP, RE, Facilities & Corp Development	03/28/2019	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
CAPSTAR TX, LLC, AS DEBTOR IN POSSESSION

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
WMEQ		880	UNLIMITED	10.0	0.21

2. Station location

State	City or Town
WISCONSIN	MENOMONIE

3. Transmitter location

State	County	City or Town	Street address (or other identification)
WI	DUNN	MENOMONIE	N4502 610th St.

4. Main studio location

State	County	City or Town	Street address (or other identification)
WI	EAU CLAIRE	EAU CLAIRE	619 CAMERON

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

State	County	City or Town	Street address (or other identification)
WI	EAU CLAIRE	EAU CLAIRE	619 CAMERON

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
2.13	6.9

Measured antenna or common point resistance (in ohms) at operating frequency		Measured antenna or common point reactance (in ohms) at operating frequency	
Night	Day	Night	Day
50.0	210	-j7.0	+j306.6

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 1035641	-134.3	N/A	0.664	N/A		
Tower #2 ASR 1035642	0.0	N/A	1.0	N/A		
Tower #3 ASR 1035643	174.1	N/A	0.836	N/A		
Tower #4 ASR 1035644	-31.8	N/A	0.615	N/A		

Manufacturer and type of antenna monitor: Gorman CMR

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.
4ea. uniform cross section, guyed	4 ea. 113.56	4 ea. 114.6	4 ea. 115.5	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	44 °	50 '	44 "	West Longitude	91 °	50 '	45 "

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. Appendix A

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	3-25-2019
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 WMEQ

CAPSTAR TX, LLC, AS DEBTOR IN POSSESSION
MENOMONIE, WISCONSIN

FID 52474

880 KHZ 10KW NDD, .21KW DAN

March 25, 2019

APPLICATION FOR LICENSE INFORMATION
RADIO STATION WMEQ
MENOMONIE, WISCONSIN

880 KHZ 10KW NDD, .21KW DAN

Table of Contents

EXECUTIVE SUMMARY

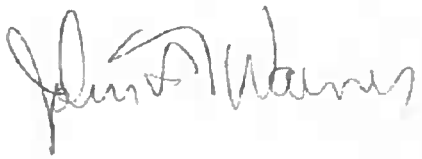
This engineering exhibit has been prepared in support of an application for licensing for radio station WMEQ, Menomonie Wisconsin, Facility ID #52474. Measurements included comply with the requirements of Rule Section 73.151c.

The towers and ground system remain as described in current license BL-19900327AI. 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

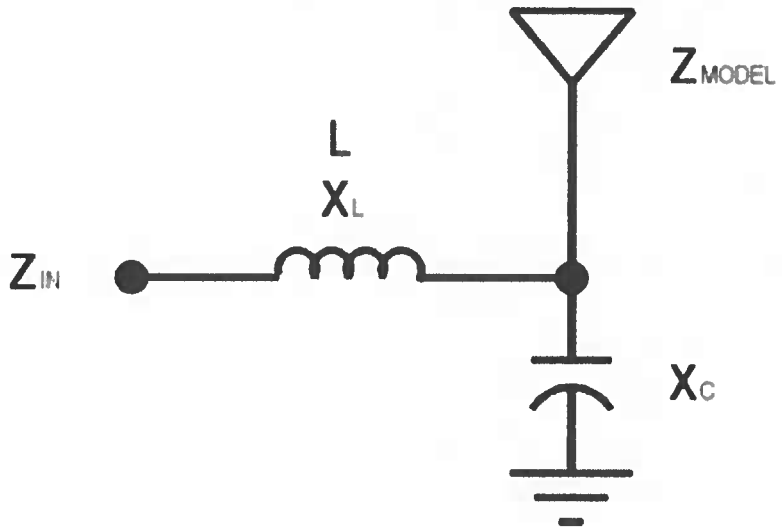
Impedance measurements were made of the individual towers with the other tower bases open. Measurements were made using a Hewlett Packard 8753ES network analyzer and a Tunwall Radio directional coupler in a calibrated measurement system. Measurements were made immediately adjacent to the toroidal antenna 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	Model Equivalent Radius Meters	Model Percent Of Radius
1	120.0	124.4	103.7	0.291	100
2	120.0	131.6	109.7	0.291	100
3	120.0	127.1	105.9	0.291	100
4	120.0	126.9	105.8	0.291	100

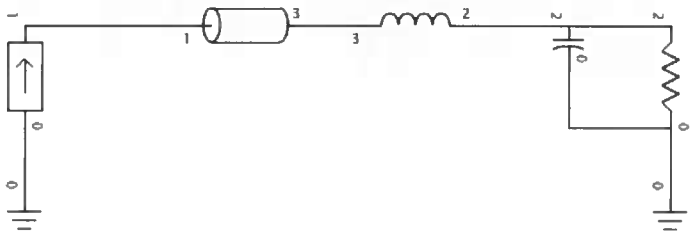
Method of Moments Model Details for Towers Driven Individually

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 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	4.5	24.88	-5167.4	153.29 +j258.44	169.69 +j291.63	168.84 +j291.92
2	0.9	4.98	-7234.3	210.58 +j325.43	230.67 +j338.70	230.9 +j338.81
3	3.7	20.46	-7234.3	162.0 +j282.93	175.36 +j310.82	175.81 +j310.69
4	0.7	3.87	-7234.3	179.23 +j276.21	193.61 +j286.06	192.8 +j285.86

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



WCAP OUTPUT AT FREQUENCY: 0.880 MHz

NODE VOLTAGES
Node: 1 33741.5975 ∠ 59.8051° V
Node: 2 31615.7058 ∠ 57.5366° V
Node: 3 33741.5732 ∠ 59.8051° V

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

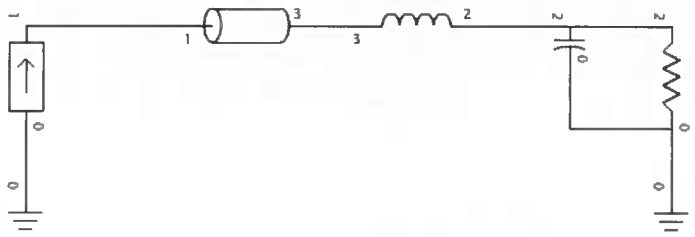
WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	2→0	153.29000000	31615.71 ∠ 57.537° V	105.22 ∠	-1.790° A
C	2→0	0.00003500	31615.71 ∠ 57.537° V	6.12 ∠	147.537° A
L	3→2	4.50000000	2488.22 ∠ 89.999° V	100.00 ∠	-0.001° A

WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	2→0	153.29000000	153.29 + j 258.440	0.00 + j	0.000
C	2→0	0.00003500	0.00 - j 5167.368	0.00 + j	0.000
L	3→2	4.50000000	169.69 + j 291.629	169.69 + j	266.747
TL	1→3	50.00000000	169.70 + j 291.635	**169.69 + j**	**291.629**

WCAP PART		VSWR	
TL	1→3	50.00000000	13.6390

WCAP INPUT DATA:
0.8800 0.00000000 0
R 153.29000000 2 0 258.44000000
C 0.00003500 2 0
L 4.50000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I 100.00000000 0 1 0.00000000

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



WCAP OUTPUT AT FREQUENCY: 0.880 MHz

NODE VOLTAGES
Node: 1 40980.8032 ∠ 55.7421° V
Node: 2 40570.4282 ∠ 55.3465° V
Node: 3 40980.7799 ∠ 55.7421° V

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

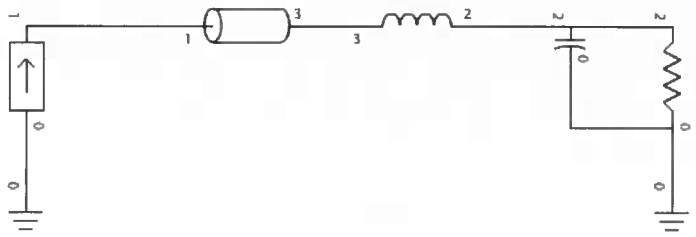
WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	2→0 210.58000000	40570.43 ∠ 55.347° V	104.67 ∠ -1.747° A
C	2→0 0.00002500	40570.43 ∠ 55.347° V	5.61 ∠ 145.347° A
L	3→2 0.90000000	497.65 ∠ 89.999° V	100.00 ∠ -0.001° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→0 210.58000000	210.58 + j 325.430	0.00 + j 0.000
C	2→0 0.00002500	0.01 - j 7234.316	0.00 + j 0.000
L	3→2 0.90000000	230.67 + j 338.704	230.67 + j 333.728
TL	1→3 50.00000000	230.69 + j 338.711	**230.67 + j 338.704**

WCAP PART		VSWR
TL	1→3 50.00000000	14.7089

WCAP INPUT DATA:
0.8800 0.00000000 0
R 210.58000000 2 0 325.43000000
C 0.00002500 2 0
L 0.90000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I 100.00000000 0 1 0.00000000

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



WCAP OUTPUT AT FREQUENCY: 0.880 MHz

NODE VOLTAGES
Node: 1 35688.5812 ∡ 60.5676° V
Node: 2 33921.6101 ∡ 58.8693° V
Node: 3 35688.5567 ∡ 60.5675° V

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

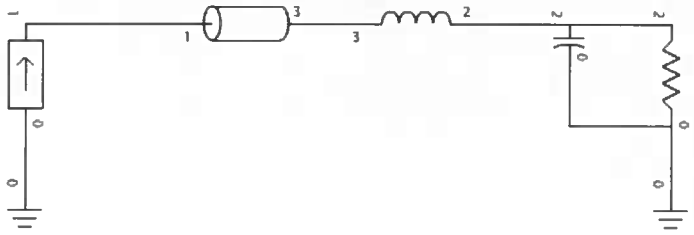
WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	2→0 162.00000000	33921.61 ∡ 58.869° V	104.05 ∡ -1.336° A
C	2→0 0.00002500	33921.61 ∡ 58.869° V	4.69 ∡ 148.869° A
L	3→2 3.70000000	2045.88 ∡ 89.999° V	100.00 ∡ -0.001° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→0 162.00000000	162.00 + j 282.930	0.00 + j 0.000
C	2→0 0.00002500	0.01 - j 7234.316	0.00 + j 0.000
L	3→2 3.70000000	175.36 + j 310.817	175.36 + j 290.359
TL	1→3 50.00000000	175.37 + j 310.825	**175.36 + j 310.817**

WCAP PART		VSWR
TL	1→3 50.00000000	14.7426

WCAP INPUT DATA:
```
   0.8800     0.00000000  0
R   162.00000000  2  0   282.93000000
C     0.00002500  2  0
L     3.70000000  3  2     0.00000000
TL    50.00000000  1  3   100.00000000     0.00100000     0.00000000
I   100.00000000  0  1     0.00000000
```

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



WCAP OUTPUT AT FREQUENCY: 0.880 MHz

NODE VOLTAGES
Node: 1 34543.1653 ∠ 55.9073° V
Node: 2 34223.2910 ∠ 55.5441° V
Node: 3 34543.1420 ∠ 55.9073° V

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

WCAP PART			BRANCH VOLTAGE		BRANCH CURRENT	
R	2→0	179.23000000	34223.29 ∠	55.544° V	103.94 ∠	-1.477° A
C	2→0	0.00002500	34223.29 ∠	55.544° V	4.73 ∠	145.544° A
L	3→2	0.70000000	387.06 ∠	89.999° V	100.00 ∠	-0.001° A

WCAP PART			FROM IMPEDANCE		TO IMPEDANCE	
R	2→0	179.23000000	179.23 + j	276.210	0.00 + j	0.000
C	2→0	0.00002500	0.00 - j	7234.316	0.00 + j	0.000
L	3→2	0.70000000	193.61 + j	286.058	193.61 + j	282.187
TL	1→3	50.00000000	193.63 + j	286.063	**193.61 + j**	**286.058**

WCAP PART			VSWR
TL	1→3	50.00000000	12.5034

WCAP INPUT DATA:
0.8800 0.00000000 0
R 179.23000000 2 0 276.21000000
C 0.00002500 2 0
L 0.70000000 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
.88       153.29    258.44    300.48    59.3      12.023    -1.4482   -5.4735

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

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0            0            .291         15
           0            0            124.4
 2    none 90.          113.5        0            .291         15
           90.          113.5        131.5
 3    none 180.         113.5        0            .291         15
           180.         113.5        127.
 4    none 270.         113.5        0            .291         15
           270.         113.5        126.9

Number of wires          =  4
          current nodes  =  60

                          minimum                  maximum
Individual wires       wire    value             wire  value
segment length          1      8.29333            2    8.76667
radius                  1      .291               1    .291

ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                 no. of  segment length (wavelengths)
 no. lowest       step          steps   minimum        maximum
 1   .88          0              1      .023037        .0243519

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

Lumped loads
              resistance    reactance     inductance  capacitance passive
load  node    (ohms)        (ohms)        (mH)        (uF)        circuit
 1     16     0             -7,234.3      0           0            0
 2     31     0             -7,234.3      0           0            0
 3     46     0             -7,234.3      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							
.88	210.58	325.43	387.62	57.1	14.438	-1.2051	-6.1562

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.291	15
		0	0	124.4		
2	none	90.	113.5	0	.291	15
		90.	113.5	131.6		
3	none	180.	113.5	0	.291	15
		180.	113.5	127.		
4	none	270.	113.5	0	.291	15
		270.	113.5	126.9		

Number of wires = 4
current nodes = 60

	minimum wire	minimum value	maximum wire	maximum value
Individual wires				
segment length	1	8.29333	2	8.77333
radius	1	.291	1	.291

ELECTRICAL DESCRIPTION
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	.88	0	1	.023037	.0243704

Sources

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

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-5,167.4	0	0	0
2	31	0	-7,234.3	0	0	0
3	46	0	-7,234.3	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							
.88	162.	282.93	326.02	60.2	13.357	-1.3031	-5.8635

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.291	15
		0	0	124.4		
2	none	90.	113.5	0	.291	15
		90.	113.5	131.6		
3	none	180.	113.5	0	.291	15
		180.	113.5	127.1		
4	none	270.	113.5	0	.291	15
		270.	113.5	126.9		

Number of wires = 4
current nodes = 60

	minimum wire	minimum value	maximum wire	maximum value
Individual wires				
segment length	1	8.29333	2	8.77333
radius	1	.291	1	.291

ELECTRICAL DESCRIPTION
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	.88	0	1	.023037	.0243704

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	-5,167.4	0	0	0
2	16	0	-7,234.3	0	0	0
3	46	0	-7,234.3	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							
.88	179.23	276.21	329.27	57.	12.296	-1.416	-5.5561

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.291	15
		0	0	124.4		
2	none	90.	113.5	0	.291	15
		90.	113.5	131.6		
3	none	180.	113.5	0	.291	15
		180.	113.5	127.1		
4	none	270.	113.5	0	.291	15
		270.	113.5	126.9		

Number of wires = 4
current nodes = 60

	minimum wire	minimum value	maximum wire	maximum value
Individual wires				
segment length	1	8.29333	2	8.77333
radius	1	.291	1	.291

ELECTRICAL DESCRIPTION
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	.88	0	1	.023037	.0243704

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	-5,167.4	0	0	0
2	16	0	-7,234.3	0	0	0
3	31	0	-7,234.3	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	8.29333	1	1	2
1	0	0	16.5867	1	1	3
1	0	0	24.88	1	1	4
1	0	0	33.1733	1	1	5
1	0	0	41.4667	1	1	6
1	0	0	49.76	1	1	7
1	0	0	58.0533	1	1	8
1	0	0	66.3467	1	1	9
1	0	0	74.64	1	1	10
1	0	0	82.9333	1	1	11
1	0	0	91.2267	1	1	12
1	0	0	99.52	1	1	13
1	0	0	107.813	1	1	14
1	0	0	116.107	1	END	15
2	-35.8874	-82.5354	0	GND	2	16
2	-35.8874	-82.5354	8.77333	2	2	17
2	-35.8874	-82.5354	17.5467	2	2	18
2	-35.8874	-82.5354	26.32	2	2	19
2	-35.8874	-82.5354	35.0933	2	2	20
2	-35.8874	-82.5354	43.8667	2	2	21
2	-35.8874	-82.5354	52.64	2	2	22
2	-35.8874	-82.5354	61.4133	2	2	23
2	-35.8874	-82.5354	70.1867	2	2	24
2	-35.8874	-82.5354	78.96	2	2	25
2	-35.8874	-82.5354	87.7333	2	2	26
2	-35.8874	-82.5354	96.5067	2	2	27
2	-35.8874	-82.5354	105.28	2	2	28
2	-35.8874	-82.5354	114.053	2	2	29
2	-35.8874	-82.5354	122.827	2	END	30
3	-71.7748	-165.071	0	GND	3	31
3	-71.7748	-165.071	8.47333	3	3	32
3	-71.7748	-165.071	16.9467	3	3	33
3	-71.7748	-165.071	25.42	3	3	34
3	-71.7748	-165.071	33.8933	3	3	35
3	-71.7748	-165.071	42.3667	3	3	36
3	-71.7748	-165.071	50.84	3	3	37
3	-71.7748	-165.071	59.3133	3	3	38
3	-71.7748	-165.071	67.7867	3	3	39
3	-71.7748	-165.071	76.26	3	3	40
3	-71.7748	-165.071	84.7333	3	3	41
3	-71.7748	-165.071	93.2067	3	3	42
3	-71.7748	-165.071	101.68	3	3	43
3	-71.7748	-165.071	110.153	3	3	44
3	-71.7748	-165.071	118.627	3	END	45
4	-107.662	-247.606	0	GND	4	46
4	-107.662	-247.606	8.46	4	4	47
4	-107.662	-247.606	16.92	4	4	48
4	-107.662	-247.606	25.38	4	4	49
4	-107.662	-247.606	33.84	4	4	50
4	-107.662	-247.606	42.3	4	4	51
4	-107.662	-247.606	50.76	4	4	52
4	-107.662	-247.606	59.22	4	4	53
4	-107.662	-247.606	67.68	4	4	54

4	-107.662	-247.606	76.14	4	4	55
4	-107.662	-247.606	84.6	4	4	56
4	-107.662	-247.606	93.06	4	4	57
4	-107.662	-247.606	101.52	4	4	58
4	-107.662	-247.606	109.98	4	4	59
4	-107.662	-247.606	118.44	4	END	60

Derivation of Operating Parameters, Nighttime Directional Array

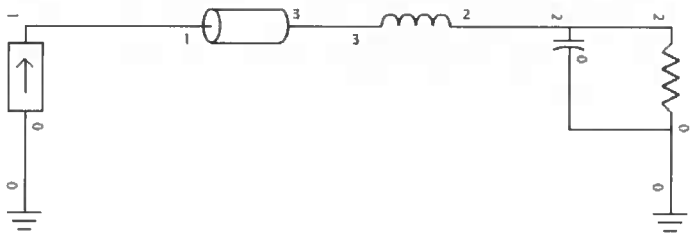
Following verification of the moment method model of the individual array elements, by comparison of the measured and modeled base impedances, directional antenna array base parameters were calculated. Calculations were made to determine the complex voltage sources which when applied to the base of each 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	0.925	4.60	0.664	-134.3
2	16	1.393	138.9	1.0	0.0
3	31	1.164	-47.0	0.836	174.1
4	46	0.857	107.1	0.615	-31.8

WCAP Circuit Diagram



WCAP - WMEQ T1 DAN-U

WCAP OUTPUT AT FREQUENCY: 0.880 MHz

NODE VOLTAGES
Node: 1 469.8900 ∠ 87.1331° V
Node: 2 447.0783 ∠ 86.7498° V
Node: 3 469.8898 ∠ 87.1331° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	1→3 50.00000000	0.92 ∠ 4.600° A	0.93 ∠ 4.600° A

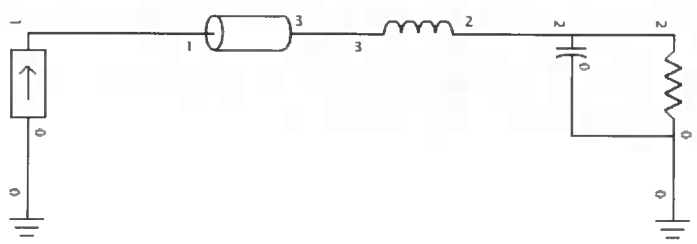
WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	2→0 55.28000000	447.08 ∠ 86.750° V	**1.01 ∠ 3.930° A**
C	2→0 0.00003500	447.08 ∠ 86.750° V	0.09 ∠ 176.750° A
L	3→2 4.50000000	23.02 ∠ 94.600° V	0.93 ∠ 4.600° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→0 55.28000000	55.28 + j 438.820	0.00 + j 0.000
C	2→0 0.00003500	0.00 - j 5167.368	0.00 + j 0.000
L	3→2 4.50000000	66.01 + j 503.653	66.01 + j 478.772
TL	1→3 50.00000000	66.01 + j 503.682	66.01 + j 503.653

WCAP PART		VSWR
TL	1→3 50.00000000	78.9251

WCAP INPUT DATA:
0.8800 0.00000000 0
R 55.28000000 2 0 438.82000000
C 0.00003500 2 0
L 4.50000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I **0.92500000 0 1 4.60000000**

WCAP Circuit Diagram



WCAP – WMEQ T2 DAN-U

WCAP OUTPUT AT FREQUENCY: 0.880 MHz

NODE VOLTAGES
Node: 1 670.8032 ∠ -133.6881° V
Node: 2 663.8776 ∠ -133.7151° V
Node: 3 670.8028 ∠ -133.6881° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	1→3 50.00000000	1.39 ∠ 138.900° A	1.39 ∠ 138.900° A

WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	2→0 19.14000000	663.88 ∠ -133.715° V	**1.48 ∠ 138.738° A**
C	2→0 0.00002500	663.88 ∠ -133.715° V	0.09 ∠ -43.715° A
L	3→2 0.90000000	6.93 ∠ -131.100° V	1.39 ∠ 138.900° A

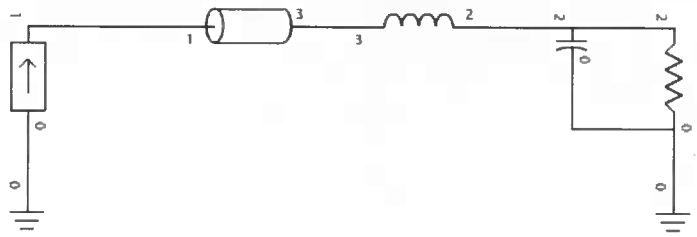
WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→0 19.14000000	19.14 + j 446.720	0.00 + j 0.000
C	2→0 0.00002500	0.00 - j 7234.316	0.00 + j 0.000
L	3→2 0.90000000	21.74 + j 481.035	21.74 + j 476.059
TL	1→3 50.00000000	21.74 + j 481.062	21.74 + j 481.035

WCAP PART		VSWR
TL	1→3 50.00000000	215.5843

WCAP INPUT DATA:

```
  0.8800     0.00000000  0
R     19.14000000  2  0   446.72000000
C      0.00002500  2  0
L      0.90000000  3  2     0.00000000
TL    50.00000000  1  3   100.00000000     0.00100000     0.00000000
I     1.39300000  0  1   138.90000000
```

WCAP Circuit Diagram



WCAP - WMEQ T3 DAN-U

WCAP OUTPUT AT FREQUENCY: 0.880 MHz

NODE VOLTAGES
Node: 1 530.3214 ∠ 35.8307° V
Node: 2 506.7016 ∠ 35.4947° V
Node: 3 530.3211 ∠ 35.8307° V

	WCAP PART		CURRENT IN	CURRENT OUT
TL	1→3	50.00000000	1.16 ∠ -47.000° A	1.16 ∠ -47.000° A

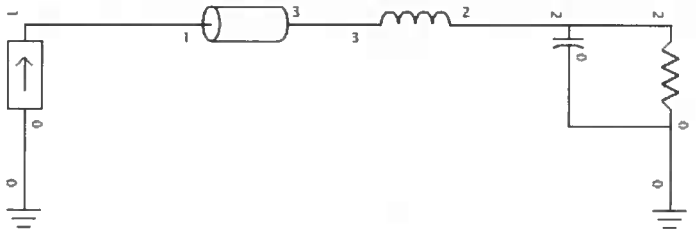
	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	2→0	50.63000000	506.70 ∠ 35.495° V	**1.23 ∠ -47.425° A**
C	2→0	0.00002500	506.70 ∠ 35.495° V	0.07 ∠ 125.495° A
L	3→2	3.70000000	23.81 ∠ 43.000° V	1.16 ∠ -47.000° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→0	50.63000000	50.63 + j 407.640	0.00 + j 0.000
C	2→0	0.00002500	0.00 - j 7234.316	0.00 + j 0.000
L	3→2	3.70000000	56.85 + j 452.018	56.85 + j 431.560
TL	1→3	50.00000000	56.86 + j 452.041	56.85 + j 452.018

	WCAP PART		VSWR
TL	1→3	50.00000000	73.8784

WCAP INPUT DATA:
0.8800 0.00000000 0
R 50.63000000 2 0 407.64000000
C 0.00002500 2 0
L 3.70000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I 1.16400000 0 1 313.00000000

WCAP Circuit Diagram



WCAP - WMEQ T4 DAN-U

WCAP OUTPUT AT FREQUENCY: 0.880 MHz

NODE VOLTAGES
Node: 1 215.2655 ∠ -173.6269° V
Node: 2 212.0070 ∠ -173.7938° V
Node: 3 215.2652 ∠ -173.6269° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	1→3 50.00000000	0.86 ∠ 107.100° A	0.86 ∠ 107.100° A

WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	2→0 43.76000000	212.01 ∠ -173.794° V	**0.89 ∠ 106.741° A**
C	2→0 0.00002500	212.01 ∠ -173.794° V	0.03 ∠ -83.794° A
L	3→2 0.70000000	3.32 ∠ -162.900° V	0.86 ∠ 107.100° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→0 43.76000000	43.76 + j 235.300	0.00 + j 0.000
C	2→0 0.00002500	0.00 - j 7234.316	0.00 + j 0.000
L	3→2 0.70000000	46.75 + j 246.789	46.75 + j 242.918
TL	1→3 50.00000000	46.75 + j 246.796	46.75 + j 246.789

WCAP PART		VSWR
TL	1→3 50.00000000	28.0243

WCAP INPUT DATA:
0.8800 0.00000000 0
R 43.76000000 2 0 235.30000000
C 0.00002500 2 0
L 0.70000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I **0.85700000 0 1 107.10000000**

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = .88 MHz

tower	field ratio magnitude	phase (deg)
1	1.	0
2	1.601	137.3
3	1.207	-51.1
4	.677	102.7

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	447.166	86.7	1.01104	3.9
16	664.154	226.2	1.48537	138.7
31	506.394	35.5	1.23281	312.6
46	211.987	186.2	.885727	106.7

Sum of square of source currents = 11.0657
Total power = 210. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.0019342	-.00249499
Y(1, 2)	.00115959	.00014253
Y(1, 3)	.000250358	-.000542196
Y(1, 4)	-.000239267	-.000167746
Y(2, 1)	.00115956	.000142465
Y(2, 2)	.00165323	-.00154233
Y(2, 3)	.00127013	.000171504
Y(2, 4)	.000212718	-.000495263
Y(3, 1)	.000250354	-.0005422
Y(3, 2)	.00127015	.000171548
Y(3, 3)	.00184276	-.00194479
Y(3, 4)	.00117763	.000145432
Y(4, 1)	-.000239271	-.000167749
Y(4, 2)	.000212732	-.000495261
Y(4, 3)	.00117763	.000145432
Y(4, 4)	.00180382	-.00222507

TOWER IMPEDANCE MATRIX

impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	154.775	256.718
Z(1, 2)	57.4276	-116.805
Z(1, 3)	-77.1801	-43.4915
Z(1, 4)	-27.7869	78.3293
Z(2, 1)	57.4355	-116.806
Z(2, 2)	213.938	323.584
Z(2, 3)	70.337	-99.5002
Z(2, 4)	-93.4046	-45.5042
Z(3, 1)	-77.1801	-43.4928
Z(3, 2)	70.3325	-99.5002
Z(3, 3)	164.423	281.952
Z(3, 4)	59.2111	-106.193
Z(4, 1)	-27.7877	78.3298

Z(4, 2)	-93.4048	-45.5017
Z(4, 3)	59.2107	-106.192
Z(4, 4)	180.622	274.884

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
.88	55.275	438.82	442.29	82.8	71.67	-.2424	-12.653
source = 2; node 16, sector 1							
.88	19.14	446.72	447.13	87.5	211.52	-8.2E-02	-17.274
source = 3; node 31, sector 1							
.88	50.625	407.64	410.77	82.9	67.631	-.25688	-12.408
source = 4; node 46, sector 1							
.88	43.761	235.3	239.34	79.5	27.286	-.63695	-8.6514

CURRENT rms
Frequency = .88 MHz
Input power = 210. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.01104	3.9	1.00874	.0681444
2	0	0	8.29333	1.34729	2.	1.34645	.047742
3	0	0	16.5867	1.55422	1.2	1.55386	.0332251
4	0	0	24.88	1.70114	.7	1.70101	.020616
5	0	0	33.1733	1.79631	.3	1.79629	9.55E-03
6	0	0	41.4667	1.84267	0.0	1.84267	1.38E-05
7	0	0	49.76	1.84182	359.8	1.84181	-7.92E-03
8	0	0	58.0533	1.79518	359.5	1.79513	-.0141369
9	0	0	66.3467	1.70451	359.4	1.70441	-.0185716
10	0	0	74.64	1.57197	359.2	1.57182	-.0211786
11	0	0	82.9333	1.40018	359.1	1.40001	-.0219621
12	0	0	91.2267	1.1921	359.	1.19192	-.0209715
13	0	0	99.52	.950657	358.9	.950481	-.0182908
14	0	0	107.813	.677999	358.8	.677854	-.0140146
15	0	0	116.107	.37305	358.7	.37296	-8.18E-03
END	0	0	124.4	0	0	0	0
GND	-35.8874	-82.5354	0	1.48538	138.7	-1.11577	.980512
17	-35.8874	-82.5354	8.77333	2.00802	138.	-1.4932	1.34257
18	-35.8874	-82.5354	17.5467	2.33343	137.8	-1.72747	1.56868
19	-35.8874	-82.5354	26.32	2.56667	137.6	-1.89455	1.73161
20	-35.8874	-82.5354	35.0933	2.71988	137.4	-2.00326	1.83975
21	-35.8874	-82.5354	43.8667	2.79712	137.3	-2.05658	1.89589
22	-35.8874	-82.5354	52.64	2.80055	137.2	-2.05609	1.90146
23	-35.8874	-82.5354	61.4133	2.73223	137.2	-2.00339	1.85783
24	-35.8874	-82.5354	70.1867	2.59492	137.1	-1.90052	1.76682
25	-35.8874	-82.5354	78.96	2.39224	137.	-1.7502	1.63083
26	-35.8874	-82.5354	87.7333	2.12864	137.	-1.55577	1.45282
27	-35.8874	-82.5354	96.5067	1.80928	136.9	-1.32106	1.23624
28	-35.8874	-82.5354	105.28	1.43943	136.8	-1.04999	.984613
29	-35.8874	-82.5354	114.053	1.02332	136.8	-.745752	.700744

30	-35.8874	-82.5354	122.827	.560507	136.7	-.408079	.38424
END	-35.8874	-82.5354	131.6	0	0	0	0
GND	-71.7748	-165.071	0	1.2328	312.6	.834034	-.907849
32	-71.7748	-165.071	8.47333	1.6189	310.8	1.05882	-1.22464
33	-71.7748	-165.071	16.9467	1.85631	310.1	1.19508	-1.42045
34	-71.7748	-165.071	25.42	2.02388	309.6	1.28916	-1.56017
35	-71.7748	-165.071	33.8933	2.13092	309.2	1.34664	-1.65148
36	-71.7748	-165.071	42.3667	2.18072	308.9	1.36953	-1.69704
37	-71.7748	-165.071	50.84	2.17508	308.7	1.35901	-1.69826
38	-71.7748	-165.071	59.3133	2.11572	308.5	1.31622	-1.65646
39	-71.7748	-165.071	67.7867	2.0048	308.3	1.24257	-1.5733
40	-71.7748	-165.071	76.26	1.84504	308.2	1.1398	-1.45088
41	-71.7748	-165.071	84.7333	1.63979	308.	1.01001	-1.29181
42	-71.7748	-165.071	93.2067	1.39276	307.9	.855559	-1.099
43	-71.7748	-165.071	101.68	1.10777	307.8	.678814	-.875428
44	-71.7748	-165.071	110.153	.787754	307.7	.481592	-.623398
45	-71.7748	-165.071	118.627	.431945	307.6	.263481	-.342279
END	-71.7748	-165.071	127.1	0	0	0	0
GND	-107.662	-247.606	0	.885726	106.7	-.254763	.848297
47	-107.662	-247.606	8.46	1.04356	105.1	-.271091	1.00774
48	-107.662	-247.606	16.92	1.13541	104.2	-.278362	1.10076
49	-107.662	-247.606	25.38	1.19402	103.6	-.280209	1.16068
50	-107.662	-247.606	33.84	1.22339	103.1	-.277129	1.19158
51	-107.662	-247.606	42.3	1.2251	102.7	-.26938	1.19511
52	-107.662	-247.606	50.76	1.20022	102.4	-.257186	1.17234
53	-107.662	-247.606	59.22	1.14984	102.1	-.240806	1.12434
54	-107.662	-247.606	67.68	1.07527	101.8	-.220558	1.0524
55	-107.662	-247.606	76.14	.97811	101.6	-.196815	.958103
56	-107.662	-247.606	84.6	.860249	101.4	-.170007	.843283
57	-107.662	-247.606	93.06	.723745	101.2	-.140594	.709958
58	-107.662	-247.606	101.52	.570631	101.	-.109028	.560118
59	-107.662	-247.606	109.98	.402479	100.8	-.0756641	.395303
60	-107.662	-247.606	118.44	.218981	100.7	-.0405095	.215201
END	-107.662	-247.606	126.9	0	0	0	0

Item 4

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 Gorman model CMR. 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 Gorman specifications. The sample lines are equal in length and constructed of 3/8" Cablewave FCC 38-50 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 880 kHz. 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 880 kHz, Degrees
1	963.55	246.59
2	963.61	246.57
3	963.6	246.58
4	961.8	247.04

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	963.55	1124.14	7.76	49.31	802.96	5.32	-49.39	49.80
2	963.61	1124.21	7.77	49.18	803.01	5.33	-49.52	49.80
3	963.6	1124.20	7.87	49.55	803.00	5.33	-49.50	49.98
4	961.8	1122.10	7.81	49.34	801.50	5.29	-49.42	49.83

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 #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	15146	1.019	-0.171
2	15154	1	0
3	15161	1.013	-0.442
4	15152	1.012	-0.283

Sample Lines Terminated By Toroids

Tower	Serial Number	Impedance at Input to Sample Line with Torroid Connected
1	15146	52.2 -j2.48
2	15154	52.39 -j2.2
3	15161	52.23 -j1.81
4	15152	52.26 -j2.07

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 0.21kW. The common point current was then calculated as indicated below.

Daytime non directional mode power measurements are made at the base of tower #2. Daytime operating impedance measures 210 +j306.6. Tower #2 current was calculated as indicated below.

Pattern	Nominal Power Watts	Operating Power Watts	Operating Common Point Current, Amps
Night	210	227	2.13
Day	10000	10000	6.9

Item 6

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:

WMEQ DAN-U

Reference Field Strength Measurements

Point #	Distance/km	Field Strength mv/m	Location Description	GPS Coordinates NAD27
60.5-1	2.29	1.5	248m West of intersection 690th St and 490th Ave	N44° 51' 26.2278" W91° 48' 58.6897"
60.5-2	3.07	2.94	420m North of intersection CR E and 730th St.	N44° 51' 46.0033" W91° 48' 10.1993
60.5-3	3.7	2.51	30m East of 3976 537th Ave	N44° 52' 4.0793" W91° 47' 26.1575"
84-1	2.43	5.95	1.71km south on 690th St from intersection CR E and 690th St.	N44° 50' 52.5477" W91° 48' 45.5999"
84-2	3.76	3.29	660 m south on 730th St from intersection CR E and 730th St.	N44° 50' 58.4186" W91° 47' 32.7137"
84-3	4.22	2.8	CR E Field approach north of residence.	N44° 51' 2.4355" W91° 46' 32.9335"
143-1	3.44	11.9	490 m East of intersection of 640th St and 420th Ave	N44° 49' 55.8478" W91° 49' 53.2463"
143-2	3.84	2.57	CR J 50m West of 370th Ave and CR J.	N44° 48' 34.7376" W91° 48' 27.9492"
143-3	4.5	.955	220m North of intersection 310th Ave and 730th St.	N44° 47' 40.8186" W91° 47' 29.8398"
166.5-1	2.25	1.32	290 m West of intersection of 640th St and 420th Ave	N44° 49' 56.3112" W91° 50' 28.9729"
166.5-2	3.04	2.26	1.3km South of intersection of 640th St and 420th Ave	N44° 49' 14.2884" W91° 50' 14.5309"
166.5-3	3.63	3.28	180m East of intersection 640th St and CR J	N44° 48' 51.2685" W91° 50' 6.4726"

239-1	2.46	39.1	255m South of intersection CR J and 430th Ave.	N44° 50' 3.1089" W91° 52' 21.5963"
239-2	3.51	16.7	870m West of intersection CR J and 410th Ave.	N44° 49' 44.8784" W91° 53' 2.7402"
239-3	4.56	14.5	600m Southeast of intersection CR Y and 410th Ave.	N44° 49' 27.7294" W91° 53' 43.1185"
293.3	2.86	89.4	210m Southeast of intersection CR J and 490th Ave.	N44° 51' 20.6658" W91° 52' 45.6272"
293.3	6.3	26.1	Intersection CR Y and 16th Ave E.	N44° 52' 5.5080" W91° 55' 9.5993"
293.3	7.82	36.5	160m North of intersection Riverside Rd and 12th Ave W.	N44° 52' 24.9744" W91° 56' 12.7617"

All measurements were taken February 14th, 2019 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 WMEQ at 10 kW daytime and 0.27 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 WMEQ and remains as previously licensed:

Ground system consists of 120 equally spaced, buried, copper radials about the base of each tower extending up to 85.21 m in length except where terminated by property boundaries or where intersecting radials are shortened and bonded.

Appendix A – STL Antenna Mounting on Tower #1