7136 S Yale Ave
Suite 501
Tulsa, OK 74133

o 918.664.4581
f 918.664.3066

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

August 19, 2021

VIA EMAIL

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

RE: IHM LICENSES, LLC (FRN No. 0014042816)
Application for New License on FCC Form 302-AM
WMT (AM), 600 kHz, Cedar Rapids, IA; Facility ID No. 73593

Dear Ms. Dortch:

On behalf of IHM LICENSES, LLC, the licensee of the above-referenced station, enclosed is copy 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 $1905.00 filing fee.

Please contact the undersigned with any communications concerning this application.

Respectfully submitted,
IHM LICENSES, LLC

By:_____
Troy Langham
VP, Technical Regulatory Affairs

cc: Public Inspection File

Online Payment Information

Total Amount	$1,905.00
Payer FRN	0014042816
Payer Name	iHM Licenses, LLC
Remittance ID	3626756
Treasury Tracking ID	26T2O794

Thank you for your payment!

Federal Communications Commission
Washington, D. C. 20554

Approved by OMB
3060-0627
Expires 01/31/98

FOR FCC USE ONLY

FCC 302-AM
APPLICATION FOR AM BROADCAST STATION LICENSE

(Please read instructions before filling out form.)

FOR COMMISSION USE ONLY

FILE NO.

SECTION I - APPLICANT FEE INFORMATION

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

iHM Licenses, LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)

7136 S Yale Ave

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)
918-664-4581	WMT	73593

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

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

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

C. If Yes, provide the following information:

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

(A) FEE TYPE CODE	(B) FEE MULTIPLE	(C) FEE DUE FOR FEE TYPE CODE IN COLUMN (A)	FOR FCC USE ONLY
MMR	0001	$ 645.00	

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

(A)	(B)	(C)	FOR FCC USE ONLY
MOR	0001	$ 1260.00	

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

TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
$ 1905.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT iHM Licenses, LLC		
MAILING ADDRESS 7136 S Yale Ave, 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
WMT	Cedar Rapids, IA			

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. N/A

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. N/A

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	
Troy G Langham	Troy Langham Digitally signed by Troy Langham DN: cn=Troy Langham, o, ou, email=Troylangham@iheartmedia.com, c=US Date: 2021.08.17 11:56:49 -05'00'	
Title	Date	Telephone Number
VP, Technical Regulatory Affairs	8/16/2021	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
IHM 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
WMT		600	Unlimited	5.0	5.0

2. Station location

State	City or Town
IA	Cedar Rapids

3. Transmitter location

State	County	City or Town	Street address (or other identification)
IA	Linn	Marion	1837 Radio Road

4. Main studio location

State	County	City or Town	Street address (or other identification)
IA	Linn	Cedar Rapids	600 Old Marion Road

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

State	County	City or Town	Street address (or other identification)
IA	Linn	Cedar Rapids	600 Old Marion Road

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. Engineering

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system	RF common point or antenna current (in amperes) without modulation for day system
10.39	10.0

Measured antenna or common point resistance (in ohms) at operating frequency		Measured antenna or common point reactance (in ohms) at operating frequency	
Night	Day	Night	Day
50	50	-j 5	0

Antenna indications for directional operation

Towers	Antenna monitor Phase reading(s) in degrees		Antenna monitor sample current ratio(s)		Antenna base currents	
	Night	Day	Night	Day	Night	Day
1(W) ASR 1024391	0	N/A	1.000	N/A		
2(E) ASR 1024392	+128.7	N/A	0.374	N/A		
3(S) ASR 1320134	+38.4	N/A	0.808	N/A		

Manufacturer and type of antenna monitor: Potomac Instruments AM-1901

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

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit.
Uniform cross-section, guyed towers	1-125.6 2-125.6 3-91.46	1-128.1 2-128.0 3-94.2	1-129.2 2-129.1 3-95.4	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 °	03 '	40 "	West Longitude	91 °	32 '	42 "

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. Engineering

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

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

N/A

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

Tower 3(S) destroyed by high winds. Self supporting tower replaced with guyed tower.

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)
Randall L. Mullinax	
Address (include ZIP Code) 2859 Cascade Dr. Gainesville, GA 30504 e-mail randymullinax@iheartmedia.com	Date 8/9/2021 Telephone No. (Include Area Code) 770-534-1065

☑ Technical Director ☐ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☐ Other (specify)

ENGINEERING EXHIBIT
APPLICATION FOR STATION LICENSE
IHM LICENSES, LLC
RADIO STATION WMT
CEDAR RAPIDS, IOWA

August 9, 2021

600 KHz 5.0 KW-U DA-N

Table of Contents

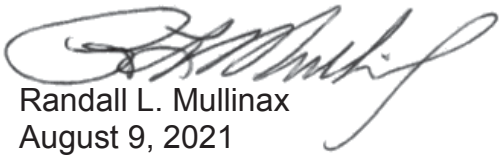
Engineering Statement

This application is being filed to relicense the existing operations of WMT(AM), Cedar Rapids, IA following replacement of Tower 3(S) which was destroyed by high winds in August, 2020. The applicant requests licensing of the nighttime directional operation of WMT pursuant to sections of 47 CFR 73.151 which allow performance verification by computer modeling and sampling system verification. The only change to the WMT radiators was the replacement of Tower 3(S) with a new tower of the same electrical height. All antenna system and Reference Point field measurements included in this application were made by Nicolas Blomstrand and the undersigned July 28th and 29th, 2021.

Analysis of this antenna system was performed using a combination of a method of moments model and a circuit model. The method of moments model was produced using the computer program Expert MININEC Broadcast Professional version 14.5 by EM Scientific Inc. The circuit model was produced using the nodal analysis program WCAP Pro version 1.1 by Westberg Consulting. The method of moments models and the circuit models for each radiator were adjusted to produce the same matrix impedances as those measured by varying the electrical height of the radiators and by adding shunt capacitive loads and series inductance using the circuit model.

Once the models were adjusted to match the measured matrix impedances, the array synthesis module of the program was used to calculate the proper base drive voltages to generate the fields necessary to form the required pattern for nighttime operation. The current distribution was calculated for each radiator and given that the sampling system utilizes base current sampling devices the operating parameters calculated from the resulting currents at each base node and the associated circuit model. The unused radiators are floated for daytime non-directional operation.

Program test authority is respectfully requested at the currently licensed power level.



Randall L. Mullinax
August 9, 2021

Description of Radiators

The WMT(AM) radiators are triangular, uniform cross section, guyed towers. Towers 1(W), and 2(E) are 90.5 electrical degrees in height and Tower 3(S) is 65.9 electrical degrees in height. All three towers have a face width of 61.0 centimeters. Tower 2(E) supports a side-mounted 4-bay FM antenna for KOSY-FM. The results of the post construction survey confirm that the radiators fall within the required 1.5 electrical degree tolerance.

Tower #	ASRN	Face Width	Electrical Height
1(W)	1024391	61 cm	90.5°
2(E)	1024392	61 cm	90.5°
3(S)	1320134	61 cm	65.9°

Description of Model

The overall model of the antenna system consists of two components: the method of moments model and the circuit model. The method of moments model was adjusted by varying the electrical height of the radiators to produce an impedance at the base node such that when combined with the circuit model produced an impedance within +/- 2Ω and +/- 4% of the measured matrix resistance and reactance at the sample point. The modeled electrical heights used fall within the range of 70-125% of the physical height. The effective radii used fall within the range of 80-150% of the radius of a circle with a circumference equal to the sum of the widths of the tower sides.

The circuit model consists of a lumped series inductive reactance and a lumped shunt capacitive reactance combined with the calculated base impedance produced by the method of moments model.

Description of Ground System

No changes were made to the ground system which consists of 100, 137.2 meter equally spaced, buried copper wire radials about the base of each tower, plus a 7.3 meter square ground screen at the base of each tower. Radials are shortened and bonded to copper strap where they would overlap between towers.

Description of Sampling System

The sampling system consists of equal lengths of 3/8" solid outer jacket coaxial cable connected to Delta Electronics model TCT-1 toroidal current transformers near the base of each tower. The sample lines are buried over their entire length. The antenna monitor is a Potomac Instruments Model AM1901, last calibrated by the manufacturer on September 24, 2014. A Keysight Technologies Model P5020A vector network analyzer was utilized to field-verify that the antenna monitor is operating within the manufacturer's specified tolerance.

Measured Matrix Impedances and WCAP Corrections

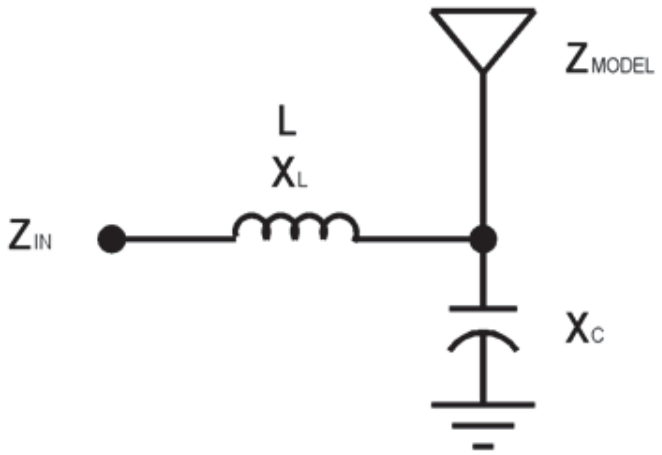
Tower 1 driven with Towers 2 and 3 floated 44.34 +j70.23Ω

Tower 2 driven with Towers 1 and 3 floated 44.89 +j72.35Ω

Tower 3 driven with Towers 1 and 2 floated 19.51 -j73.84Ω

TOWER	ZMODEL	ZIN (MODEL)	ZIN (MEASURED)	L(µH)	XL	XC
1(W)	44.10 +j35.11	44.39 +j70.21	44.34 +j70.23	9.33	+j35.17	-j10,610
2(E)	43.46 +j34.67	44.90 +j71.86	44.89 +j72.35	9.96	+j37.55	-j2,122*
3(S)	19.75 -j82.98	19.44 -j73.85	19.51 -j73.84	2.26	+j8.52	-j10,610

***Tower 2 Xc includes the parallel reactance of an isocoupler for KOSY-FM.**



All measurements were made with a Keysight Technologies Model P5020A vector network analyzer with a Tunwall Radio directional coupler in a calibrated measurement system.

MoM Calculated Impedances and WCAP Calculations

MoM Calculated Impedance Tower 1 Driven with Towers 2 and 3 Floated

```
C:\Users\ccratl1rlm\OneDrive - iHeartMedia Inc\Documents\Markets\Cedar Rapids\WMT-AM\Model
1\T1OF  07-28-2021   23:54:33

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

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0            0            .2911        15
           0            0            92.3
 2    none 120.         100.         0            .2911        15
           120.         100.         92.3
 3    none 167.5        135.         0            .2911        11
           167.5        135.         71.6

Number of wires          =  3
          current nodes  =  41

                         minimum                  maximum
Individual wires      wire    value            wire  value
segment length         1      6.15333           3    6.50909
radius                 1      .2911             1    .2911


ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                no. of  segment length (wavelengths)
 no. lowest       step         steps   minimum        maximum
 1   .6           0             1      .0170926       .0180808

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             -2,122.       0           0            0
 2     31    0             -10,610.      0           0            0

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IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(MHz)    (ohms)   (ohms)   (ohms)   (deg)            dB       dB
source =  1; node 1, sector 1
.6       44.102   35.114   56.373   38.5     2.0984  -9.0076  -.58325
```
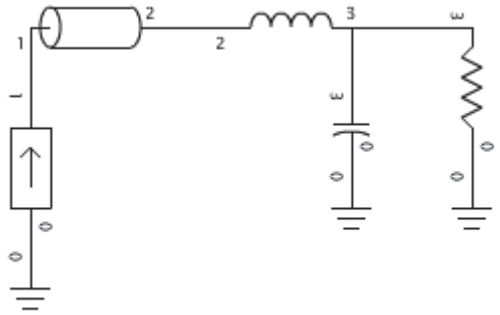

WCAP Calculations - Tower 1 Driven with Towers 2 and 3 Floated



WCAP OUTPUT AT FREQUENCY: 0.600 MHz

NODE VOLTAGES
Node: 1 83.0625 ∠ 57.6936° V
Node: 2 83.0625 ∠ 57.6936° V
Node: 3 56.5499 ∠ 38.2780° V

	WCAP PART		CURRENT IN		CURRENT OUT	
TL	1→2	50.00000000	1.00 ∠	0.000° A	1.00 ∠	-0.000° A

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
L	2→3	9.33000000	35.17 ∠	90.000° V	1.00 ∠	-0.000° A
C	3→0	0.00002500	56.55 ∠	38.278° V	0.01 ∠	128.278° A
R	3→0	44.10000000	56.55 ∠	38.278° V	1.00 ∠	-0.239° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
TL	1→2	50.00000000	44.39 + j	70.205	**44.39 + j**	**70.205**
L	2→3	9.33000000	44.39 + j	70.205	44.39 + j	35.031
C	3→0	0.00002500	-0.00 - j	10610.330	0.00 + j	0.000
R	3→0	44.10000000	**44.10 + j**	**35.100**	0.00 + j	0.000

	WCAP PART		VSWR
TL	1→2	50.00000000	3.9836

WCAP INPUT DATA:
0.6000 0.00000000 0
I 1.00000000 0 1 0.00000000
TL 50.00000000 1 2 100.00000000 0.00001000 0.00000000
L 9.33000000 2 3 0.00000000
C 0.00002500 3 0
R 44.10000000 3 0 35.10000000

Note: A mathematically insignificant length of transmission line was inserted into the circuit model at the sampling point to allow the program to calculate the impedance.

MoM Calculated Impedance Tower 2 Driven with Towers 1 and 3 Floated

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.2911	15
		0	0	92.3		
2	none	120.	100.	0	.2911	15
		120.	100.	92.3		
3	none	167.5	135.	0	.2911	11
		167.5	135.	71.6		

Number of wires = 3
current nodes = 41

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	6.15333	3	6.50909
radius	1	.2911	1	.2911

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.6	0	1	.0170926	.0180808

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	-10,610.	0	0	0
2	31	0	-10,610.	0	0	0

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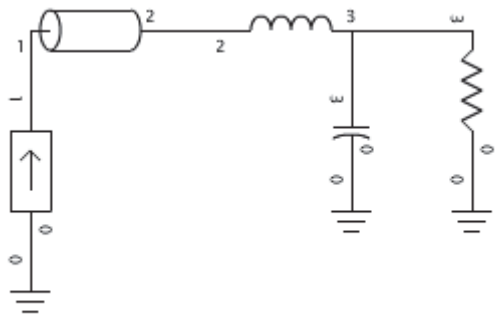
IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 16, sector 1							
.6	**43.457**	**34.671**	55.593	38.6	2.0958	-9.021	-.58134

WCAP Calculations - Tower 2 Driven with Towers 1 and 3 Floated



WCAP OUTPUT AT FREQUENCY: 0.600 MHz

NODE VOLTAGES
Node: 1 84.7316 ∠ 58.0038° V
Node: 2 84.7316 ∠ 58.0037° V
Node: 3 56.5059 ∠ 37.3882° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	1→2 50.00000000	1.00 ∠ -0.000° A	1.00 ∠ -0.000° A

WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
L	2→3 9.96000000	37.55 ∠ 90.000° V	1.00 ∠ -0.000° A
C	3→0 0.00012500	56.51 ∠ 37.388° V	0.03 ∠ 127.388° A
R	3→0 43.46000000	56.51 ∠ 37.388° V	1.02 ∠ -1.193° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
TL	1→2 50.00000000	44.90 + j 71.859	**44.90 + j 71.859**
L	2→3 9.96000000	44.90 + j 71.859	44.90 + j 34.311
C	3→0 0.00012500	0.00 - j 2122.066	0.00 + j 0.000
R	3→0 43.46000000	**43.46 + j 34.670**	0.00 + j 0.000

WCAP PART		VSWR
TL	1→2 50.00000000	4.0660

WCAP INPUT DATA:
0.6000 0.00000000 0
I 1.00000000 0 1 0.00000000
TL 50.00000000 1 2 100.00000000 0.00001000 0.00000000
L 9.96000000 2 3 0.00000000
C 0.00012500 3 0
R 43.46000000 3 0 34.67000000

Note: A mathematically insignificant length of transmission line was inserted into the circuit model at the sampling point to allow the program to calculate the impedance.

MoM Calculated Impedance Tower 3 Driven with Towers 1 and 2 Floated

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.2911	15
		0	0	92.3		
2	none	120.	100.	0	.2911	15
		120.	100.	92.3		
3	none	167.5	135.	0	.2911	11
		167.5	135.	71.6		

Number of wires = 3
current nodes = 41

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	6.15333	3	6.50909
radius	1	.2911	1	.2911

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.6	0	1	.0170926	.0180808

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	-10,610.	0	0	0
2	16	0	-2,122.	0	0	0

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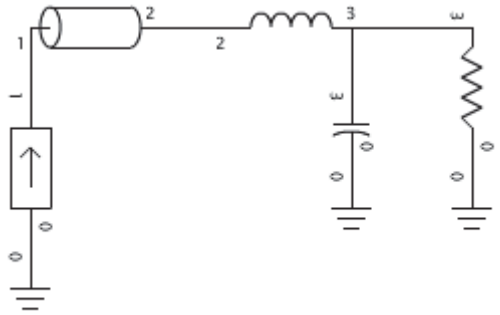
IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 31, sector 1							
.6	**19.75**	**-82.979**	85.297	283.4	9.7971	-1.7793	-4.7346

WCAP Calculations - Tower 3 Driven with Towers 1 and 2 Floated



WCAP OUTPUT AT FREQUENCY: 0.600 MHz

NODE VOLTAGES
Node: 1 76.3689 ∠ -75.2493° V
Node: 2 76.3689 ∠ -75.2493° V
Node: 3 84.6359 ∠ -76.7180° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	1→2	50.00000000 1.00 ∠ -0.000° A	1.00 ∠ -0.001° A

WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
L	2→3	2.26000000 8.52 ∠ 90.000° V	1.00 ∠ -0.001° A
C	3→0	0.00002500 84.64 ∠ -76.718° V	0.01 ∠ 13.282° A
R	3→0	19.75000000 84.64 ∠ -76.718° V	0.99 ∠ -0.106° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
TL	1→2	50.00000000 19.44 - j 73.852	**19.44 - j 73.852**
L	2→3	2.26000000 19.44 - j 73.852	19.44 - j 82.372
C	3→0	0.00002500 0.00 - j 10610.330	0.00 + j 0.000
R	3→0	19.75000000 **19.75 - j 82.980**	0.00 + j 0.000

WCAP PART		VSWR
TL	1→2	50.00000000 8.4519

WCAP INPUT DATA:
0.6000 0.00000000 0
I 1.00000000 0 1 0.00000000
TL 50.00000000 1 2 100.00000000 0.00001000 0.00000000
L 2.26000000 2 3 0.00000000
C 0.00002500 3 0
R 19.75000000 3 0 -82.98000000

Note: A mathematically insignificant length of transmission line was inserted into the circuit model at the sampling point to allow the program to calculate the impedance.

Nighttime Directional Operating Parameters
Derived from Modeled Currents

TOWER	Model Current Pulse	Model Current Magnitude (amperes)	Model Current Phase (degrees)	Model Drive Impedance (ohms)	Model Drive Power (watts)
1(W)	1	9.79	+4.9	52.33 +j32.70	5016
2(E)	16	3.69	+135.3	-51.26 +j28.41	-698
3(S)	31	7.82	+43.5	11.19 -j85.61	684

TOWER	Drive Impedance At Toroid (ohms)	Current Magnitude At Toroid (amperes)	Current Phase At Toroid (degrees)	Antenna Monitor Ratio	Antenna Monitor Phase (degrees)
1(W)	52.65 +j67.71	9.76	+5.18	1.000	0
2(E)	-52.63 +j65.06	3.65	+133.9	0.374	+128.7
3(S)	11.01 -j76.42	7.89	+43.56	0.808	+38.4

Nighttime Directional MoM Calculated Voltages and Currents

```
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1\WMT DA 08-02-2021   10:52:00

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency =  .6 MHz

       field ratio
tower  magnitude    phase (deg)
 1     2.           0
 2     .75          140.
 3     1.05         42.5

VOLTAGES AND CURRENTS - rms
source voltage                    current
node   magnitude    phase (deg)  magnitude    phase (deg)
 1     604.107      36.9         9.78888      4.9
 16    216.561      286.3        3.69819      135.4
 31    675.44       320.9        7.82429      43.5
Sum of square of source currents = 341.437
Total power = 5,000. watts

TOWER ADMITTANCE MATRIX
admittance   real (mhos)      imaginary (mhos)
Y(1, 1)      .0124476         -.00829738
Y(1, 2)      .00499874        .00385418
Y(1, 3)      -.00148965       .000955215
Y(2, 1)      .00499874        .00385414
Y(2, 2)      .0130364         -.0101572
Y(2, 3)      -.00477258       .000416823
Y(3, 1)      -.00148967       .000955291
Y(3, 2)      -.00477255       .000417081
Y(3, 3)      .0038357         .011592

TOWER IMPEDANCE MATRIX
impedance    real (ohms)      imaginary (ohms)
Z(1, 1)      44.3016          34.8705
Z(1, 2)      9.58115          -23.7069
Z(1, 3)      -4.88253         -13.2741
Z(2, 1)      9.58119          -23.7069
Z(2, 2)      43.5352          34.6263
Z(2, 3)      13.4815          -13.9864
Z(3, 1)      -4.88212         -13.2742
Z(3, 2)      13.4824          -13.9856
Z(3, 3)      19.9181          -83.002
```

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WMT

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.2911	15
		0	0	92.3		
2	none	120.	100.	0	.2911	15
		120.	100.	92.3		
3	none	167.5	135.	0	.2911	11
		167.5	135.	71.6		

Number of wires   = 3
          current nodes = 41

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	6.15333	3	6.50909
radius	1	.2911	1	.2911

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.6	0	1	.0170926	.0180808

Sources

source	node	sector	magnitude	phase	type
1	1	1	854.336	36.9	voltage
2	16	1	306.263	286.3	voltage
3	31	1	955.216	320.9	voltage

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IMPEDANCE
   normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
.6	52.334	32.696	61.708	32.	1.8782	-10.311	-.42439
source = 2; node 16, sector 1							
.6	-51.264	28.406	58.608	151.	****	****	****
source = 3; node 31, sector 1							
.6	11.187	-85.609	86.337	277.4	17.74	-.98028	-6.9453

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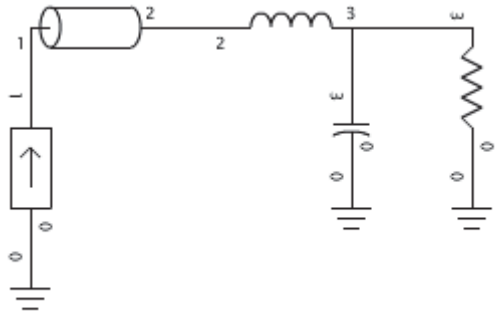
CURRENT rms
Frequency   = .6 MHz
Input power = 5,000. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	**9.78939**	**4.9**	9.75354	.837008
2	0	0	6.15333	9.9199	3.3	9.90373	.56615
3	0	0	12.3067	9.89126	2.2	9.88393	.380802
4	0	0	18.46	9.73914	1.3	9.7365	.226524
5	0	0	24.6133	9.46986	.6	9.46937	.0961397
6	0	0	30.7667	9.08798	359.9	9.08797	-.0128599
7	0	0	36.92	8.598	359.3	8.5974	-.101456
8	0	0	43.0733	8.00491	358.8	8.00311	-.170059
9	0	0	49.2267	7.31423	358.3	7.31095	-.218876
10	0	0	55.38	6.53212	357.8	6.5274	-.248057
11	0	0	61.5333	5.66474	357.4	5.65888	-.257757
12	0	0	67.6867	4.71797	357.	4.71144	-.248134
13	0	0	73.84	3.69614	356.6	3.68963	-.219274
14	0	0	79.9933	2.59925	356.2	2.59362	-.170954
15	0	0	86.1467	1.4141	355.9	1.41043	-.101867
END	0	0	92.3	0	0	0	0
GND	-20.8378	-118.177	0	**3.69492**	**135.3**	-2.62595	2.59939
17	-20.8378	-118.177	6.15333	3.73536	136.9	-2.72692	2.5528
18	-20.8378	-118.177	12.3067	3.71872	137.9	-2.76018	2.49205
19	-20.8378	-118.177	18.46	3.6567	138.8	-2.74962	2.41061
20	-20.8378	-118.177	24.6133	3.55145	139.5	-2.69916	2.3081
21	-20.8378	-118.177	30.7667	3.4046	140.1	-2.61102	2.18492
22	-20.8378	-118.177	36.92	3.21783	140.6	-2.487	2.04187
23	-20.8378	-118.177	43.0733	2.99305	141.1	-2.32897	1.87997
24	-20.8378	-118.177	49.2267	2.73238	141.5	-2.13881	1.7004
25	-20.8378	-118.177	55.38	2.43813	141.9	-1.91859	1.50448
26	-20.8378	-118.177	61.5333	2.11265	142.2	-1.67036	1.29352
27	-20.8378	-118.177	67.6867	1.75818	142.6	-1.39606	1.06875
28	-20.8378	-118.177	73.84	1.37637	142.9	-1.09716	.83104
29	-20.8378	-118.177	79.9933	.967232	143.1	-.773802	.580317
30	-20.8378	-118.177	86.1467	.525868	143.4	-.422125	.313604
END	-20.8378	-118.177	92.3	0	0	0	0
GND	-118.44	-118.44	0	**7.82298**	**43.5**	5.67879	5.38056
32	-118.44	-118.44	6.50909	7.37798	43.1	5.38949	5.03865
33	-118.44	-118.44	13.0182	6.94575	42.8	5.09599	4.71957
34	-118.44	-118.44	19.5273	6.45121	42.6	4.75079	4.36442
35	-118.44	-118.44	26.0364	5.88694	42.4	4.34951	3.9671
36	-118.44	-118.44	32.5455	5.25307	42.2	3.89267	3.5273
37	-118.44	-118.44	39.0546	4.55243	42.	3.3826	3.04674
38	-118.44	-118.44	45.5636	3.78881	41.9	2.82223	2.52786
39	-118.44	-118.44	52.0727	2.96548	41.7	2.21407	1.97281
40	-118.44	-118.44	58.5818	2.08271	41.6	1.55837	1.38173
41	-118.44	-118.44	65.0909	1.1306	41.4	.847727	.748079
END	-118.44	-118.44	71.6	0	0	0	0

Nighttime WCAP Calculations

Tower 1



WCAP OUTPUT AT FREQUENCY: 0.600 MHz

NODE VOLTAGES
Node: 1 837.1801 ∠ 57.3122° V
Node: 2 837.1801 ∠ 57.3122° V
Node: 3 604.1182 ∠ 36.8970° V

	WCAP PART	CURRENT IN	CURRENT OUT
TL	1→2 50.00000000	**9.76 ∠ 5.180° A**	9.76 ∠ 5.180° A

	WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
L	2→3 9.33000000	343.29 ∠ 95.180° V	9.76 ∠ 5.180° A
C	3→0 0.00002500	604.12 ∠ 36.897° V	0.06 ∠ 126.897° A
R	3→0 52.33000000	604.12 ∠ 36.897° V	**9.79 ∠ 4.897° A**

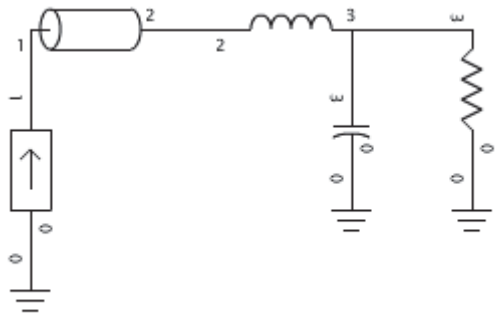
	WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
TL	1→2 50.00000000	52.65 + j 67.714	52.65 + j 67.714
L	2→3 9.33000000	52.65 + j 67.714	52.65 + j 32.541
C	3→0 0.00002500	0.01 - j 10610.330	0.00 + j 0.000
R	3→0 52.33000000	52.33 + j 32.700	0.00 + j 0.000

	WCAP PART	VSWR
TL	1→2 50.00000000	3.4549

WCAP INPUT DATA:
0.6000 0.00000000 0
I * 9.76010000 0 1 5.18000000
TL 50.00000000 1 2 100.00000000 0.00001000 0.00000000
L 9.33000000 2 3 0.00000000
C 0.00002500 3 0
R 52.33000000 3 0 32.70000000

***current required to produce the current predicted by MoM model at base of radiator**
Note: A mathematically insignificant length of transmission line was inserted into the circuit model at the sampling point to allow the program to calculate the impedance.

Tower 2



WCAP OUTPUT AT FREQUENCY: 0.600 MHz

NODE VOLTAGES
Node: 1 305.2155 ∠ -97.1275° V
Node: 2 305.2155 ∠ -97.1275° V
Node: 3 216.6028 ∠ -73.6942° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	1→2	50.00000000	**3.65 ∠ 133.900° A**	3.65 ∠ 133.900° A

WCAP PART			BRANCH VOLTAGE	BRANCH CURRENT
L	2→3	9.96000000	136.96 ∠ -136.100° V	3.65 ∠ 133.900° A
C	3→0	0.00012500	216.60 ∠ -73.694° V	0.10 ∠ 16.306° A
R	3→0	-51.26000000	216.60 ∠ -73.694° V	**3.70 ∠ 135.303° A**

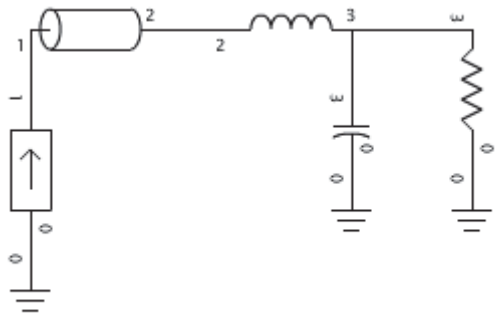
WCAP PART			FROM IMPEDANCE	TO IMPEDANCE
TL	1→2	50.00000000	-52.63 + j 65.055	-52.63 + j 65.055
L	2→3	9.96000000	-52.63 + j 65.055	-52.63 + j 27.507
C	3→0	0.00012500	0.00 - j 2122.066	0.00 + j 0.000
R	3→0	-51.26000000	-51.26 + j 28.410	0.00 + j 0.000

WCAP PART			VSWR
TL	1→2	50.00000000	3.3087

WCAP INPUT DATA:
0.6000 0.00000000 0
I* 3.64750000 0 1 133.90000000
TL 50.00000000 1 2 100.00000000 0.00001000 0.00000000
L 9.96000000 2 3 0.00000000
C 0.00012500 3 0
R -51.26000000 3 0 28.41000000

***current required to produce the current predicted by MoM model at base of radiator**
Note: A mathematically insignificant length of transmission line was inserted into the circuit model at the sampling point to allow the program to calculate the impedance.

Tower 3



WCAP OUTPUT AT FREQUENCY: 0.600 MHz

NODE VOLTAGES
Node: 1 608.8477 ∠ -38.2423° V
Node: 2 608.8477 ∠ -38.2423° V
Node: 3 675.4187 ∠ -39.0550° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	1→2	50.00000000	**7.89 ∠ 43.560° A**	7.89 ∠ 43.560° A

WCAP PART			BRANCH VOLTAGE	BRANCH CURRENT
L	2→3	2.26000000	67.19 ∠ 133.560° V	7.89 ∠ 43.560° A
C	3→0	0.00002500	675.42 ∠ -39.055° V	0.06 ∠ 50.945° A
R	3→0	11.18700000	675.42 ∠ -39.055° V	**7.82 ∠ 43.500° A**

WCAP PART			FROM IMPEDANCE	TO IMPEDANCE
TL	1→2	50.00000000	11.01 - j 76.416	11.01 - j 76.416
L	2→3	2.26000000	11.01 - j 76.416	11.01 - j 84.936
C	3→0	0.00002500	0.00 - j 10610.330	0.00 + j 0.000
R	3→0	11.18700000	11.19 - j 85.610	0.00 + j 0.000

WCAP PART			VSWR
TL	1→2	50.00000000	15.3056

WCAP INPUT DATA:
0.6000 0.00000000 0
I* 7.88610000 0 1 43.56000000
TL 50.00000000 1 2 100.00000000 0.00001000 0.00000000
L 2.26000000 2 3 0.00000000
C 0.00002500 3 0
R 11.18700000 3 0 -85.61000000

***current required to produce the current predicted by MoM model at base of radiator**
Note: A mathematically insignificant length of transmission line was inserted into the circuit model at the sampling point to allow the program to calculate the impedance.

Measured and Calculated Sampling Line Characteristics

Measured open circuit resonant frequency at odd multiple of ¼ wavelength nearest the carrier frequency:

Tower 1	803.8 kHz	3/4 λ(270°)
Tower 2	805.0 kHz	3/4 λ(270°)
Tower 3	804.5 kHz	3/4 λ(270°)

Measured impedance 1/8 wavelength above and below open circuit resonant frequency:

Tower 1	937.77 kHz	8.91 +j49.06 Ω	+1/8 λ
	669.83 kHz	6.04 –j49.18 Ω	-1/8 λ
Tower 2	939.17 kHz	8.89 +j49.06 Ω	+1/8 λ
	670.83 kHz	6.06 –j49.30 Ω	-1/8 λ
Tower 3	938.58 kHz	8.98 +j48.92 Ω	+1/8 λ
	670.42 kHz	6.10 –j49.06 Ω	-1/8 λ

Calculated characteristic impedance using formula $Z_o = ((R_1^2 + X_1^2)^{1/2} * (R_2^2 + X_2^2)^{1/2})^{1/2}$:

Tower 1	49.71 Ω
Tower 2	49.76 Ω
Tower 3	49.59 Ω

Calculated electrical length at f carrier :

Tower 1	L = (f carrier / f resonant) * 270° = (600 kHz / 803.8 kHz) * 270° = 201.54°
Tower 2	L = (f carrier / f resonant) * 270° = (600 kHz / 805.0 kHz) * 270° = 201.24°
Tower 3	L = (f carrier / f resonant) * 270° = (600 kHz / 804.5 kHz) * 270° = 201.37°

Measured impedance at f carrier at the input of the sampling line with the sampling device connected:

Tower 1	50.67 +j1.41Ω
Tower 2	50.76 +j1.06Ω
Tower 3	50.91 +j0.78Ω

All measurements were made with a Keysight Technologies Model P5020A vector network analyzer with a Tunwall Radio directional coupler in a calibrated measurement system.

Sampling Transformer Calibration

Calibration of the Delta Electronics model TCT-1 toroidal current transformers was confirmed using an Keysight Model P5020A vector network analyzer.

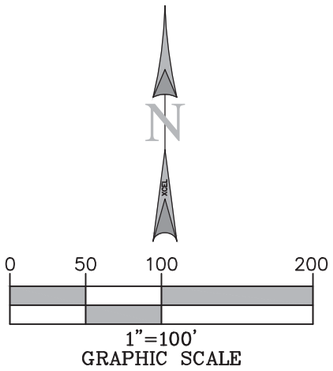
The signal from the generator output of the vector network analyzer was connected to a conductor running through the transformers which was then terminated with a 50Ω load. The network analyzer was set to measure in "transmission" mode and the output of the Tower 1 reference toroidal current transformer was connected to the network analyzer "B" receiver input. A "response" calibration was performed, calibrating the network analyzer for the amplitude and phase characteristics of the reference transformer. The outputs of the remaining toroidal current transformers were then connected in turn to the input of the "B" receiver of the analyzer and the amplitude and phase characteristics were recorded.

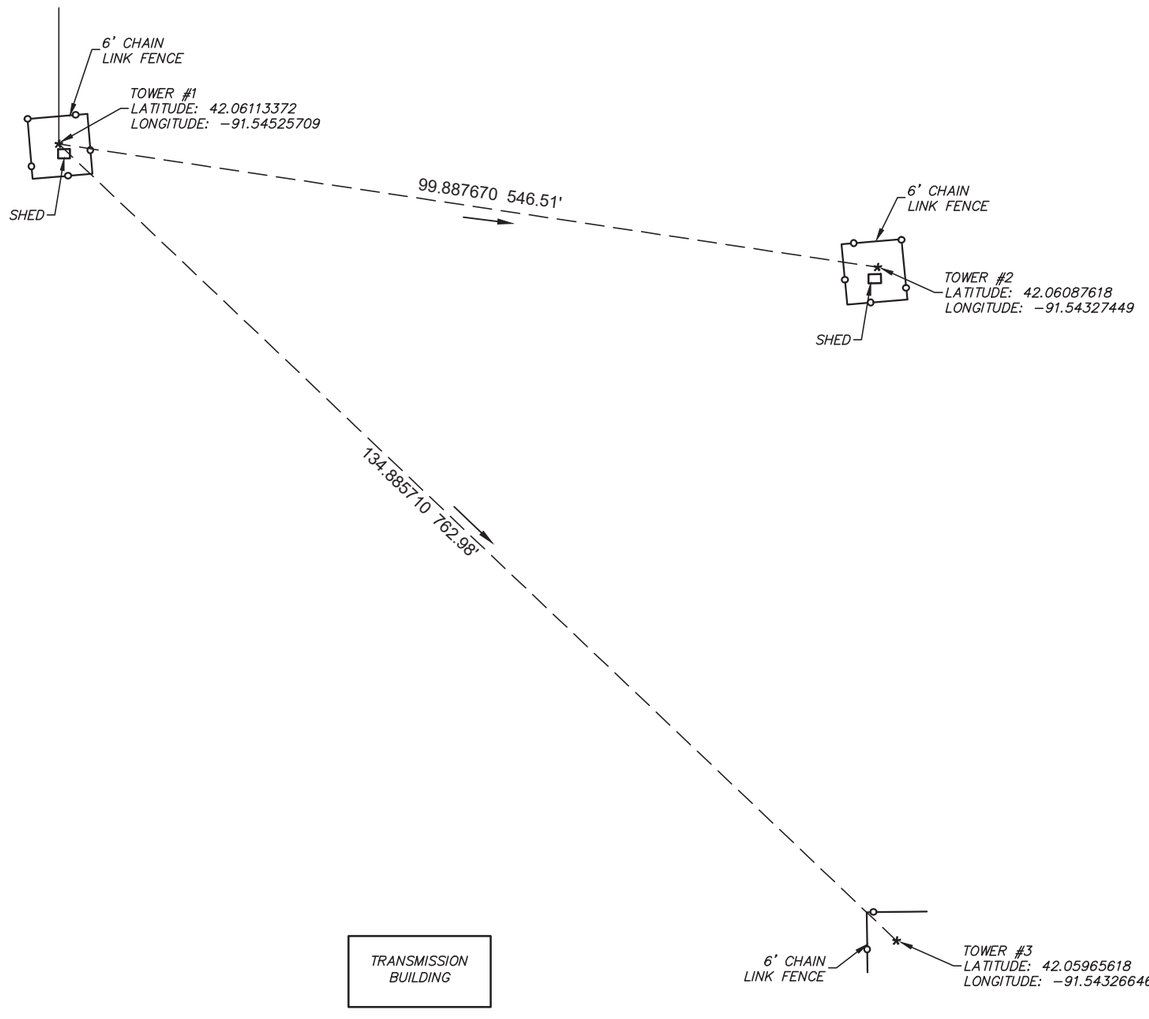
	Indicated Phase	Indicated Ratio
T1	0°	1.000
T2	-0.0158°	1.000
T3	-0.0641°	1.010

The manufacturer specifies these devices to be accurate to within +/- 2% absolute magnitude and +/- 2° absolute phase.

Environmental Statement

The WMT radiators are surrounded by secured fences restricting access by unauthorized personnel and signs are posted in the vicinity of the radiators, warning of potential radio frequency hazards at the site. Based on the charts and graphs supplied in Supplement A, Edition 97-01 to OET bulletin 65, Edition 97-01 the applicant certifies that the distance to the fences from the radiators complies with FCC OET65 regarding human exposure to non-ionizing electromagnetic radiation.





GENERAL NOTES

AZIMUTHS BASED ON TRUE NORTH

TOWER LOCATIONS VERIFIED ON 7/22/2021.

PROFESSIONAL LAND SURVEYOR
DAN J. KUEHL
19959
IOWA

I HEREBY CERTIFY TO: VERTICAL BRIDGE REIT, LLC, A DELAWARE LIMITED LIABILITY COMPANY, ITS SUBSIDIARIES, AND THEIR RESPECTIVE SUCCESSORS AND/OR ASSIGNS;

I, DAN J. KUEHL, AN IOWA PROFESSIONAL LAND SURVEYOR, CERTIFY THAT THE INFORMATION SHOWN HEREON WAS COMPILED USING DATA FROM AN ACTUAL FIELD SURVEY MADE UNDER MY DIRECT SUPERVISION AND THAT THE FIELD SURVEY AND THE COMPILATION OF INFORMATION SHOWN HEREIN WERE CONDUCTED IN ACCORDANCE WITH THE IOWA MINIMUM STANDARDS OF PRACTICE.

DAN J. KUEHL
LICENSE NUMBER 19959
MY LICENSE RENEWAL DATE IS DECEMBER 31, 2021
SHEETS COVERED BY THIS SEAL B-1

PREPARED FOR:

WESTCHESTER SERVICES LLC
604 FOX GLEN
BARRINGTON, IL 60010
TELEPHONE: 847.277.0070
FAX : 847.277.0080
ae@westchesterservices.com

PREPARED FOR:

verticalbridge
750 PARK OF COMMERCE DRIVE #200
BOCA RATON, FL 33487
(P) 561-948-6367
(W) VERTICALBRIDGE.COM

SURVEYED BY:

XCEL Consultants
8300 42ND STREET WEST
ROCK ISLAND, IL 61201
(O) 309-787-9988
(F) 309-756-5540
(E) XCEL@XCELCONSULTANTSINC.COM

XCEL PROJECT NUMBER: 202900

AS-BUILT SURVEY

REV.	DATE	DESCRIPTION
A	7/27/21	PRELIMINARY ISSUE

SITE INFORMATION:
US-IA-5116

1837 RADIO ROAD
MARION, IA 52302
LINN COUNTY

TAX PARCEL NUMBER:
102817600100000

PROPERTY OWNER:
JRD INCORPORATED
1213 NORTHFIELD DR NE
CEDAR RAPIDS, IA 52402

SITE NUMBER:
US-IA-5116

DRAWN BY: KJM
CHECKED BY: BCH
SURVEY DATE: 7/27/2021
PLAT DATE:

SHEET TITLE:
AS BUILT SURVEY
THIS DOES NOT REPRESENT A BOUNDARY SURVEY OF THE TITLE PROPERTY

SHEET NUMBER:
B-1

Station Tower Geometry Analysis

- Enter Requested Data in Yellow Blocks

Callsign:	WMT	*Reference Tower:*	1
Freq. (kHz):	600 kHz	*Feet per wavelength:*	1639.285094

Tower Pair Studied	*Licensed Spacing (Electrical degrees)*	*Licensed Azimuth (Degrees True)*	*Measured Distance (feet)*	*Measured Azimuth (Degrees True)*	*Tower Location Error from Licensed (Result in Feet)*	*Tower Location Error from Licensed (Electrical Degrees)*	*Tower No. & (Loc)*	FCC ASR Numbers
1 (ref)	0.0	0.0	0.0	0.0	0.00	0.00 °	#1(W)	1024391
1 to 2	120.0	100.0	546.510	99.8877	1.07	0.24 °	#2(E)	1024392
1 to 3	167.5	135.0	762.980	134.8857	1.54	0.34 °	#3(S)	1320134
1 to 4					--	--		
1 to 5					--	--		
1 to 6					--	--		
1 to 7					--	--		
					--	--		
					--	--		

Law of Cosines Analysis

Tower Pair Studied	Licensed Specification (Side "a") of Triangle (Feet)	Licensed Azimuth Versus Measured Azimuth Difference	Included Angle A Converted to Radians	Tower Location Error from licensed position (Result in Feet)	Error in Feet Converted to Electrical Degrees	*Error Greater Greater Than 1.5° ? (6.83 ft)*
1 (ref)	--	--	--	0.00	0.00 °	N/A
1 to 2	546.43	0.1123 °	0.001960528	1.07	0.24 °	No - Therefore Okay
1 to 3	762.72	0.1143 °	0.001994737	1.54	0.34 °	No - Therefore Okay
1 to 4	--	--	--	--	--	--
1 to 5	--	--	--	--	--	--
1 to 6	--	--	--	--	--	--
1 to 7	--	--	--	--	--	--
0	--	--	--	--	--	--
0	--	--	--	--	--	--