Kathleen A. Kirby
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kkirby@wiley.law

Wiley Rein LLP
1776 K Street NW
Washington, DC 20006
Tel: 202.719.7000

wiley.law

June 12, 2020

VIA e-mail submission to James Bradshaw and Nazifa Sawez

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

Re: **Estrella Radio License of Dallas LLC – FRN 0016264533**
Station KZMP(AM), University Park, TX (Fac. ID 63551)
Application for Station License

Dear Ms. Dortch:

On behalf of Estrella Radio License of Dallas LLC, licensee of AM station KZMP, University Park, TX, we are submitting herewith an application on FCC Form 302-AM for a modified license.

The fee due for this application, $1,560.00, has been paid, using the FCC Fee Filer system. A copy of Form 159 confirming the payment is included herewith.

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

Respectfully submitted,

Kathleen A. Kirby

Agency Tracking ID:PGC3404688
Authorization Number:285848
Successful Authorization -- Date Paid: 6/12/20
FILE COPY ONLY!!

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

SECTION A - Payer Information

(2) PAYER NAME (if paying by credit card, enter name exactly as it appears on your card)	(3) TOTAL AMOUNT PAID (dollars and cents)
Wiley Rein LLP	**$1560.00**

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

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

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

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

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

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

(13) APPLICANT NAME
Estrella Radio License of Dallas LLC
(14) STREET ADDRESS LINE NO. 1
1845 Empire Avenue
(15) STREET ADDRESS LINE NO. 2

(16) CITY	(17) STATE	(18) ZIP CODE
Burbank	**CA**	**91504**

(19) DAYTIME TELEPHONE NUMBER (INCLUDING AREA CODE)	(20) COUNTRY CODE (IF NOT IN U.S.A.)
818-7295300	**US**

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

(21) APPLICANT (FRN)	(22) FCC USE ONLY
0016264533	

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
KZMP	**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
63551	**Form302-AM**

(23B) FCC Call Sign/Other ID	(24B) Payment Type Code(PTC)	(25B) Quantity
KZMP	**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

63551	**Form302-AM**

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)

Estrella Radio License of Dallas LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)
1845 Empire Avenue

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Burbank	CA	91504

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
818-729-5300	KZMP	63551

2. A. Is a fee submitted with this application? [✔] Yes [ ] No

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

[ ] Governmental Entity [ ] Noncommercial educational licensee [ ] Other (Please explain):

C. If Yes, provide the following information:

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

(A) FEE TYPE CODE	(B) FEE MULTIPLE	(C) FEE DUE FOR FEE TYPE CODE IN COLUMN (A)	FOR FCC USE ONLY
MMR	0001	$ 725.00	

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

(A)	(B)	(C)	FOR FCC USE ONLY
MOR	0001	$ 835.00	

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
$ 1560.00	

CLEAR ALL PAGES

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT Estrella Radio License of Dallas LLC		
MAILING ADDRESS 1845 Empire Avenue		
CITY Burbank	STATE CA	ZIP CODE 91504

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
KZMP(AM)	University Park, TX	N/A	N/A	N/A

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

☐ Yes ☐ No

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

Exhibit No.

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

☐ Yes ☐ No

If No, state exceptions in an Exhibit. **N/A See engineering statement.**

Exhibit No.

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

☐ Yes ☐ No

If Yes, explain in an Exhibit. **N/A See engineering statement.**

Exhibit No.

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

☐ Yes ☐ No

☑ Does not apply

If No, explain in an Exhibit.

Exhibit No.

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

☐ Yes ☑ No

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

Exhibit No.

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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	
Brian Kei		
Title	Date	Telephone Number
Chief Financial Officer	6/12/2020	(818)729-5300

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.

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SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant

Estrella Radio License of Dallas LLC

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

[X] 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
KZMP		1540	Unlimited	0.75	32

2. Station location

State	City or Town
Texas	University Park

3. Transmitter location

State	County	City or Town	Street address (or other identification)
TX	Dallas	Grand Prairie	120 Josephine Lane

4. Main studio location

State	County	City or Town	Street address (or other identification)
TX	Dallas	Irving	2410 Gateway Dr

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

State	County	City or Town	Street address (or other identification)
TX	Dallas	Irving	2410 Gateway Dr

6. Has type-approved stereo generating equipment been installed? [ ] **Yes** [X] **No**

7. Does the sampling system meet the requirements of 47 C.F.R. Section 73.68? [X] **Yes** [ ] **No** [ ] Not Applicable

Attach as an Exhibit a detailed description of the sampling system as installed. Exhibit No. Eng Rpt

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
4.02	25.96

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	-j8	-j8

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 (E)	-104.0	0	0.521	1.0		
2 (S)	-54.3	+27.8	0.588	0.593		
3 (N)	+40.1	---	0.624			
4 (W)	0	---	1.0			

Manufacturer and type of antenna monitor: Potomac Instruments AM 1901

SECTION III - Page 2

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

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded.	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit. Exhibit No.
ENG RPT				

Excitation [X] 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	32 °	48 '	46 "	West Longitude	97 °	0 '	30 "

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. N/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.

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)
Thomas S. Gorton P.E.	
Address (include ZIP Code) Hatfield & Dawson Consulting Engineers 9500 Greenwood Ave N Seattle, WA 98103-3012	Date June 8, 2020
	Telephone No. (Include Area Code) (206) 783-9151

[ ] Technical Director

[X] Registered Professional Engineer

[ ] Chief Operator

[ ] Technical Consultant

[ ] Other (specify)

HATFIELD & DAWSON
CONSULTING ELECTRICAL ENGINEERS
9500 GREENWOOD AVE. N.
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MAURY L. HATFIELD, PE
(1942-2009)
PAUL W. LEONARD, PE
(1925-2011)

Application for Modified License
and
Method of Moments Proof of Performance

KZMP(AM)
University Park, Texas
Facility ID 63551

1540 kHz
32 kW Day, 0.75 kW Night DA-2

ESTRELLA RADIO LICENSE OF DALLAS LLC

June 2020

APPLICATION FOR LICENSE

RADIO STATION KZMP(AM) University Park, TX

1540 kHz 32 kW Day, 0.75 kW Night DA-2

Purpose of Application

Item 1	Analysis of Tower Impedance Measurements to Verify Method of Moments Model
Item 2	Method of Moments Model Details for Towers Driven Individually
Item 3	Method of Moments Model Details for Directional Antenna Patterns
Item 4	Derivation of Operating Parameters for Directional Antenna
Item 5	Post Construction Array Geometry Statement
Item 6	Sampling System Measurements
Item 7	Reference Field Strength Measurements
Item 8	Direct Measurement of Power

Purpose of Application

This engineering exhibit supports an application by Estrella Radio License of Dallas LLC ("Estrella") for a modified station license for radio station KZMP(AM) Dallas, TX (Facility ID 63551) following the replacement of the station's phasor and antenna tuning units, as well as replacement of tower lighting. Estrella has elected to perform a Method of Moments proof of performance rather than a traditional measurement based partial proof of performance.

Information is provided herein demonstrating that the directional antenna parameters for the pattern authorized by the station license have been determined in accordance with the requirements of section §73.151(c) of the FCC Rules. The system has been adjusted to produce antenna monitor parameters within +/- 5 percent in ratio and +/- 3 degrees in phase of the modeled values, as required by the Rules.

All measurements contained in this report were made by the undersigned engineer.

Item 1

Analysis of Tower Impedance Measurements to Verify Method of Moments Model - KZMP

Tower base impedance measurements were made at the locations of the sample system current transformers using a Hewlett Packard 8751A network analyzer in a calibrated measurement system. The other towers were floated by removing the j-plug at the matching network output.

The reference point impedance measurements are listed in the table below.

KZMP Measured "Reference Point" Impedances

Tower	Measured R	Measured X
1 (E)	72.4	+j105.6
2 (S)	162.8	+j219.3
3 (N)	59.6	+j78.3
4 (W)	55.4	+j67.4

Circuit calculations were performed to relate the method of moments modeled impedances at the tower base feed points to those at the measurement locations as shown in the diagram titled *Analysis of Tower Impedance Measurements to Verify Method of Moments Model*.

Item 2

Method of Moments Model Details for Towers Driven Individually - KZMP

The array of towers was modeled using Expert MININEC Broadcast Professional Version 14.0. One wire was used to represent each tower. The top and bottom wire end points were specified using electrical degrees in the geographic coordinate system, using the theoretical directional antenna specifications for tower spacing and orientation. Each tower was modeled using 20 wire segments. As the tallest tower in the KZMP array is 115.9 electrical degrees in height, the maximum segment length is 5.8 electrical degrees.

Each tower's modeled height relative to its physical height falls within the required range of 75 to 125 percent of the actual tower height. The array consists of four uniform cross section triangular towers each having face widths of 18 inches.

KZMP Tower Dimensions - Physical and Modeled

Tower	Physical Height (Degrees)	Modeled Height (degrees)	Modeled Height (percent)	Modeled Radius (meters)	Modeled Radius (percent)
1	95.4	103.5	108.5	.22	100
2	115.9	122.0	105.3	.22	100
3	90.2	97.5	108.1	.22	100
4	90.2	97.0	107.5	.22	100

KZMP MININEC Model Node and Wire Numbering

Tower	Wire Number	Base Node Number
1	1	1
2	2	21
3	3	41
4	4	61

The following pages show the details of the method of moments model.

KZMP Tower 1 Driven, Other Towers Floated

```
KZMP Tower 1

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

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0            0            .22          20
           0            0            103.5
 2    none 212.         188.2        0            .22          20
           212.         188.2        122.
 3    none 215.         324.3        0            .22          20
           215.         324.3        97.5
 4    none 63.1         262.6        0            .22          20
           63.1         262.6        97.

Number of wires          =  4
          current nodes  =  80

                         minimum                  maximum
Individual wires      wire    value             wire  value
segment length         4      4.85               2    6.1
radius                 1      .22                1    .22


ELECTRICAL DESCRIPTION
Frequencies (KHz)
     frequency                no. of  segment length (wavelengths)
 no. lowest       step         steps   minimum        maximum
 1   1,540.       0             1      .0134722       .0169444

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     61    0             -18,333.      0           0            0
 2     21    0             15,000.       0           0            0
 3     41    0             -18,333.      0           0            0

C:\AM\KZMP\KZMP  02-24-2020   13:12:00

IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(KHz)    (ohms)   (ohms)   (ohms)   (deg)            dB       dB
source =  1; node 1, sector 1
1,540.   71.667   88.166   113.62   50.9     4.0536  -4.3758  -1.973
```

KZMP Tower 2 Driven, Other Towers Floated

KZMP Tower 2

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.22	20
		0	0	103.5		
2	none	212.	188.2	0	.22	20
		212.	188.2	122.		
3	none	215.	324.3	0	.22	20
		215.	324.3	97.5		
4	none	63.1	262.6	0	.22	20
		63.1	262.6	97.		

Number of wires = 4
current nodes = 80

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	4.85	2	6.1
radius	1	.22	1	.22

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1,540.	0	1	.0134722	.0169444

Sources

source	node	sector	magnitude	phase	type
1	21	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	61	0	-18,333.	0	0	0
2	41	0	-18,333.	0	0	0
3	1	0	-18,333.	0	0	0

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IMPEDANCE
normalization = 50.

freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 21, sector 1							
1,540.	**167.48**	**212.81**	270.81	51.8	8.9447	-1.9503	-4.4156

Tower 3 Driven, Other Towers Floated

KZMP Tower 3

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.22	20
		0	0	103.5		
2	none	212.	188.2	0	.22	20
		212.	188.2	122.		
3	none	215.	324.3	0	.22	20
		215.	324.3	97.5		
4	none	63.1	262.6	0	.22	20
		63.1	262.6	97.		

Number of wires = 4
current nodes = 80

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	4.85	2	6.1
radius	1	.22	1	.22

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1,540.	0	1	.0134722	.0169444

Sources

source	node	sector	magnitude	phase	type
1	41	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	61	0	-18,333.	0	0	0
2	21	0	15,000.	0	0	0
3	1	0	-18,333.	0	0	0

C:\AM\KZMP\KZMP 02-24-2020 13:13:52

IMPEDANCE
normalization = 50.

freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 41, sector 1							
1,540.	**59.538**	**59.316**	84.043	44.9	2.8632	-6.3337	-1.1498

KZMP Tower 4 Driven, Other Towers Floated

KZMP Tower 4

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.22	20
		0	0	103.5		
2	none	212.	188.2	0	.22	20
		212.	188.2	122.		
3	none	215.	324.3	0	.22	20
		215.	324.3	97.5		
4	none	63.1	262.6	0	.22	20
		63.1	262.6	97.		

Number of wires = 4
current nodes = 80

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	4.85	2	6.1
radius	1	.22	1	.22

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1,540.	0	1	.0134722	.0169444

Sources

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

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-18,333.	0	0	0
2	21	0	15,000.	0	0	0
3	41	0	-18,333.	0	0	0

C:\AM\KZMP\KZMP 02-24-2020 13:09:40

IMPEDANCE
normalization = 50.

freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 61, sector 1							
1,540.	**55.649**	**53.008**	76.855	43.6	2.643	-6.9166	-.98758

Item 3

Method of Moments Model Details for Directional Antenna- KZMP

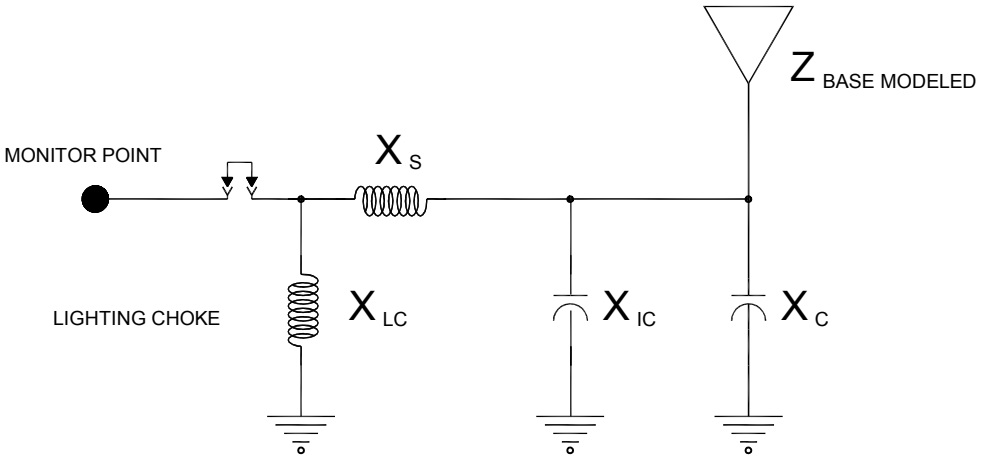
The array of towers was modeled using MININEC with the individual tower characteristics that were verified by the individual tower impedance measurements. Calculations were made to determine the complex voltage values for sources located at ground level under each tower of the array to produce current moment sums for the towers that, when normalized, equated to the theoretical field parameters of the authorized directional antenna patterns. In the schematic diagram on the following page,

X_C represents the capacitance between the tower and ground, including the base insulator
X_S represents the series inductance of the feed line connecting the ATU to the tower
X_{LC} represents reactance of the tower lighting or Static Drain chokes[1]

The values used for X_{LC} were obtained from the manufacturer.

In all cases, the modeled impedance at the reference point is within one ohm of the measured reference point impedance.

[1]Tower #2 has a lighting choke in addition to a static drain choke, the other three towers have a static drain choke only.



TOWER	X_{LC} (Ω)	X_S (Ω)	X_{IC} (Ω)	X_C (Ω)	$Z_{BASE\ MODELED}$ (Ω)	$Z_{MP\ MODELED}$ (Ω)	$Z_{MP\ MEASURED}$ (Ω)
#1	+j22K	+j17	----	-j10K	71.7 +j88.2	72.3 + j105.2	72.4 +j105.6
#2	+j6K	+j9	----	-j10K	167.5 +j212.8	162.4 +j220.0	162.8 +j219.3
#3	+j22K	+j19	----	-j10K	59.5 +j59.3	59.8 +j78.2	59.6 +j78.3
#4	+j22K	+j15	----	-j10K	55.6 +j53.0	55.8 +j67.9	55.4 +j67.4

Dwayne Straume, H&D 03/05/2020 KZMP MOM TABLE.dwg

HATFIELD & DAWSON
CONSULTING ENGINEERS

ANALYSIS OF TOWER IMPEDANCE MEASUREMENTS TO VERIFY METHOD OF MOMENTS MODEL

RADIO STATION KZMP 1540 KHZ UNIVERSITY PARK, TX 3/05/2020

KZMP Driven Array - Day Pattern

KZMP

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.22	20
		0	0	103.5		
2	none	212.	188.2	0	.22	20
		212.	188.2	122.		
3	none	215.	324.3	0	.22	20
		215.	324.3	97.5		
4	none	63.1	262.6	0	.22	20
		63.1	262.6	97.		

Number of wires = 4
current nodes = 80

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	4.85	2	6.1
radius	1	.22	1	.22

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1,540.	0	1	.0134722	.0169444

Sources

source	node	sector	magnitude	phase	type
1	1	1	2,565.86	60.2	voltage
2	21	1	3,995.82	102.8	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	41	0	449.	0	0	0
2	61	0	462.5	0	0	0

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IMPEDANCE
normalization = 50.

freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1,540.	**56.019**	**76.949**	95.18	53.9	3.8684	-4.5949	-1.8518
source = 2; node 21, sector 1							
1,540.	**95.086**	**236.8**	255.18	68.1	14.152	-1.2296	-6.0805

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CURRENT rms
Frequency   = 1540 KHz
Input power = 32,000. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	**19.0583**	**6.3**	18.9449	2.07631
2	0	0	5.175	19.9563	4.3	19.9006	1.49065
3	0	0	10.35	20.3703	3.2	20.3393	1.1247
4	0	0	15.525	20.5645	2.3	20.5484	.814552
5	0	0	20.7	20.5659	1.5	20.5587	.543754
6	0	0	25.875	20.3875	.9	20.3852	.305388
7	0	0	31.05	20.037	.3	20.0368	.0964422
8	0	0	36.225	19.5205	359.8	19.5203	-.0845319
9	0	0	41.4	18.8439	359.3	18.8424	-.238265
10	0	0	46.575	18.0131	358.8	18.0094	-.365144
11	0	0	51.75	17.0346	358.4	17.0282	-.465413
12	0	0	56.925	15.9152	358.1	15.906	-.539269
13	0	0	62.1	14.6623	357.7	14.6505	-.586913
14	0	0	67.275	13.2834	357.4	13.2694	-.608579
15	0	0	72.45	11.7858	357.1	11.7703	-.604525
16	0	0	77.625	10.1764	356.8	10.1601	-.575004
17	0	0	82.8	8.45994	356.5	8.44393	-.520178
18	0	0	87.975	6.63751	356.2	6.62291	-.439927
19	0	0	93.15	4.69999	355.9	4.68815	-.333325
20	0	0	98.325	2.61395	355.7	2.60648	-.197369
END	0	0	103.5	0	0	0	0
GND	-209.833	30.2373	0	**11.0703**	**34.7**	9.10381	6.29852
22	-209.833	30.2373	6.1	12.912	31.4	11.0247	6.7212
23	-209.833	30.2373	12.2	13.9932	29.7	12.153	6.93645
24	-209.833	30.2373	18.3	14.7912	28.5	12.9974	7.06027
25	-209.833	30.2373	24.4	15.3561	27.6	13.6132	7.10571
26	-209.833	30.2373	30.5	15.7082	26.8	14.0227	7.07885
27	-209.833	30.2373	36.6	15.8574	26.1	14.2371	6.98305
28	-209.833	30.2373	42.7	15.8102	25.6	14.263	6.82124
29	-209.833	30.2373	48.8	15.5721	25.1	14.1061	6.59611
30	-209.833	30.2373	54.9	15.1487	24.6	13.7717	6.31051
31	-209.833	30.2373	61.	14.5463	24.2	13.2659	5.96756
32	-209.833	30.2373	67.1	13.7722	23.9	12.5952	5.57071
33	-209.833	30.2373	73.2	12.8345	23.5	11.7675	5.12363
34	-209.833	30.2373	79.3	11.7422	23.2	10.7908	4.63023
35	-209.833	30.2373	85.4	10.5047	22.9	9.67384	4.09451
36	-209.833	30.2373	91.5	9.13128	22.7	8.42541	3.52034
37	-209.833	30.2373	97.6	7.63046	22.4	7.05331	2.91114
38	-209.833	30.2373	103.7	6.00755	22.2	5.56253	2.26914
39	-209.833	30.2373	109.8	4.25955	22.	3.9503	1.5934
40	-209.833	30.2373	115.9	2.36113	21.7	2.19307	.874877
END	-209.833	30.2373	122.	0	0	0	0
GND	174.598	125.461	0	.537414	275.3	.0500106	-.535082
42	174.598	125.461	4.875	.385741	275.4	.0360899	-.384049
43	174.598	125.461	9.75	.292089	275.5	.0279493	-.290748
44	174.598	125.461	14.625	.212763	275.8	.0215041	-.211673
45	174.598	125.461	19.5	.143513	276.5	.0163263	-.142581
46	174.598	125.461	24.375	.0825593	278.5	.012203	-.0816524
47	174.598	125.461	29.25	.0295046	287.8	9.01E-03	-.0280966

48	174.598	125.461	34.125	.0196169	70.2	6.63E-03	.0184615
49	174.598	125.461	39.	.0584142	85.1	4.99E-03	.0582005
50	174.598	125.461	43.875	.0912901	87.5	3.99E-03	.0912029
51	174.598	125.461	48.75	.117558	88.3	3.53E-03	.117505
52	174.598	125.461	53.625	.137169	88.5	3.5E-03	.137125
53	174.598	125.461	58.5	.150124	88.6	3.79E-03	.150076
54	174.598	125.461	63.375	.156434	88.4	4.27E-03	.156376
55	174.598	125.461	68.25	.156116	88.2	4.83E-03	.156041
56	174.598	125.461	73.125	.149175	88.	5.31E-03	.14908
57	174.598	125.461	78.	.135588	87.6	5.57E-03	.135474
58	174.598	125.461	82.875	.115246	87.3	5.45E-03	.115117
59	174.598	125.461	87.75	.0878101	86.9	4.75E-03	.0876815
60	174.598	125.461	92.625	.0523812	86.5	3.23E-03	.0522816
END	174.598	125.461	97.5	0	0	0	0
GND	-8.12699	62.5745	0	1.78711	52.8	1.07969	1.42409
62	-8.12699	62.5745	4.85	1.26976	52.8	.76715	1.01182
63	-8.12699	62.5745	9.7	.952362	52.8	.575456	.758843
64	-8.12699	62.5745	14.55	.685232	52.8	.414215	.545865
65	-8.12699	62.5745	19.4	.453706	52.8	.274622	.361154
66	-8.12699	62.5745	24.25	.251401	52.5	.152884	.199572
67	-8.12699	62.5745	29.1	.0754321	51.2	.0473013	.0587588
68	-8.12699	62.5745	33.95	.0758812	235.5	-.0429905	-.0625282
69	-8.12699	62.5745	38.8	.203146	234.3	-.118499	-.165004
70	-8.12699	62.5745	43.65	.307109	234.2	-.179586	-.249128
71	-8.12699	62.5745	48.5	.388212	234.3	-.226578	-.315232
72	-8.12699	62.5745	53.35	.446889	234.4	-.259831	-.36359
73	-8.12699	62.5745	58.2	.483587	234.7	-.279753	-.394455
74	-8.12699	62.5745	63.05	.498789	234.9	-.286815	-.408078
75	-8.12699	62.5745	67.9	.493002	235.2	-.281553	-.404696
76	-8.12699	62.5745	72.75	.466724	235.5	-.264533	-.384517
77	-8.12699	62.5745	77.6	.420372	235.8	-.23631	-.347663
78	-8.12699	62.5745	82.45	.354108	236.1	-.197321	-.294035
79	-8.12699	62.5745	87.3	.267415	236.5	-.147643	-.222963
80	-8.12699	62.5745	92.15	.158108	236.9	-.0864478	-.132382
END	-8.12699	62.5745	97.	0	0	0	0

CURRENT MOMENTS(amp-degrees) rms

Frequency = 1540 KHz
Input power = 32,000. watts

			vertical current moment	
wire	magnitude	phase (deg)	magnitude	phase (deg)
1	1,158.63	360.	1,158.63	360.
2	1,087.79	25.8	1,087.79	25.8
3	.778164	5.	.778164	5.
4	.704013	329.5	.704013	329.5

KZMP Driven Array - Night Pattern

```
KZMP

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

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0           0            .22          20
           0            0           103.5
 2    none 212.         188.2       0            .22          20
           212.         188.2       122.
 3    none 215.         324.3       0            .22          20
           215.         324.3       97.5
 4    none 63.1         262.6       0            .22          20
           63.1         262.6       97.

Number of wires          =  4
          current nodes  =  80

                         minimum                  maximum
Individual wires      wire    value              wire  value
segment length         4      4.85                2    6.1
radius                 1      .22                 1    .22


ELECTRICAL DESCRIPTION
Frequencies (KHz)
     frequency                no. of  segment length (wavelengths)
 no. lowest       step         steps   minimum        maximum
 1   1,540.       0             1      .0134722       .0169444

Sources
source node    sector  magnitude      phase          type
 1      1       1      341.164        15.8           voltage
 2      21      1      534.279        72.7           voltage
 3      41      1      172.478        158.4          voltage
 4      61      1      144.404        126.           voltage

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IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(KHz)    (ohms)   (ohms)   (ohms)   (deg)            dB       dB
source =  1; node 1, sector 1
1,540.   93.535   135.83   164.92   55.4     6.1886  -2.8319  -3.1964

source =  2; node 21, sector 1
1,540.   110.07   206.08   233.63   61.9     10.275  -1.6961  -4.9039

source =  3; node 41, sector 1
1,540.   41.242   56.437   69.901   53.8     3.2766  -5.4762  -1.4471

source =  4; node 61, sector 1
1,540.   17.5     32.101   36.561   61.4     4.1435  -4.2769  -2.0309
```

Parallel combination of all sources.
1.54E+06 10.0181   16.4573   19.2667   58.7   5.5519 -3.1635 -2.8624

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CURRENT rms
Frequency   = 1540 KHz
Input power = 750. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	**1.46277**	**320.4**	1.12682	-.93273
2	0	0	5.175	1.58853	317.2	1.16581	-1.07903
3	0	0	10.35	1.65548	315.5	1.18125	-1.15985
4	0	0	15.525	1.69909	314.2	1.18518	-1.21748
5	0	0	20.7	1.72283	313.2	1.17893	-1.2563
6	0	0	25.875	1.72828	312.3	1.16316	-1.27829
7	0	0	31.05	1.71629	311.5	1.13829	-1.28451
8	0	0	36.225	1.68748	310.9	1.10468	-1.27565
9	0	0	41.4	1.6424	310.3	1.06267	-1.25229
10	0	0	46.575	1.58162	309.8	1.01261	-1.21497
11	0	0	51.75	1.5057	309.4	.954842	-1.16422
12	0	0	56.925	1.41531	309.	.889774	-1.10063
13	0	0	62.1	1.31112	308.6	.81779	-1.02482
14	0	0	67.275	1.19385	308.3	.739287	-.937412
15	0	0	72.45	1.06421	308.	.654657	-.839025
16	0	0	77.625	.92285	307.7	.564248	-.730258
17	0	0	82.8	.770275	307.4	.468308	-.611565
18	0	0	87.975	.606607	307.2	.366863	-.483098
19	0	0	93.15	.431052	307.	.259399	-.344264
20	0	0	98.325	.240547	306.8	.144062	-.192637
END	0	0	103.5	0	0	0	0
GND	-209.833	30.2373	0	**1.61707**	**10.8**	1.58855	.302374
22	-209.833	30.2373	6.1	1.85206	6.9	1.83873	.221749
23	-209.833	30.2373	12.2	1.98975	4.9	1.98254	.169217
24	-209.833	30.2373	18.3	2.09033	3.4	2.08665	.124041
25	-209.833	30.2373	24.4	2.15995	2.2	2.15831	.0840651
26	-209.833	30.2373	30.5	2.20109	1.3	2.20056	.04849
27	-209.833	30.2373	36.6	2.215	.4	2.21493	.017026
28	-209.833	30.2373	42.7	2.20248	359.7	2.20245	-.0104177
29	-209.833	30.2373	48.8	2.16425	359.1	2.16399	-.0338504
30	-209.833	30.2373	54.9	2.10107	358.5	2.1004	-.0532526
31	-209.833	30.2373	61.	2.01381	358.	2.01265	-.0686025
32	-209.833	30.2373	67.1	1.90348	357.6	1.9018	-.0798918
33	-209.833	30.2373	73.2	1.77118	357.2	1.76903	-.0871304
34	-209.833	30.2373	79.3	1.61816	356.8	1.61563	-.0903541
35	-209.833	30.2373	85.4	1.44572	356.4	1.44294	-.089618
36	-209.833	30.2373	91.5	1.25515	356.1	1.25227	-.0849964
37	-209.833	30.2373	97.6	1.04764	355.8	1.04484	-.0765669
38	-209.833	30.2373	103.7	.823895	355.5	.821375	-.0643843
39	-209.833	30.2373	109.8	.583542	355.2	.58153	-.0484071
40	-209.833	30.2373	115.9	.323122	355.	.32188	-.0283079
END	-209.833	30.2373	122.	0	0	0	0
GND	174.598	125.461	0	**1.74477**	**104.6**	-.439297	1.68856
42	174.598	125.461	4.875	1.80149	103.2	-.410111	1.75419
43	174.598	125.461	9.75	1.82342	102.3	-.389722	1.78129

44	174.598	125.461	14.625	1.82831	101.7	-.370026	1.79047
45	174.598	125.461	19.5	1.818	101.1	-.350263	1.78394
46	174.598	125.461	24.375	1.79342	100.6	-.330133	1.76277
47	174.598	125.461	29.25	1.75514	100.2	-.309543	1.72762
48	174.598	125.461	34.125	1.70366	99.7	-.288486	1.67906
49	174.598	125.461	39.	1.63944	99.4	-.267002	1.61756
50	174.598	125.461	43.875	1.56298	99.	-.245158	1.54363
51	174.598	125.461	48.75	1.47474	98.7	-.223036	1.45778
52	174.598	125.461	53.625	1.37529	98.4	-.200728	1.36057
53	174.598	125.461	58.5	1.26517	98.1	-.17833	1.25254
54	174.598	125.461	63.375	1.14495	97.8	-.15594	1.13428
55	174.598	125.461	68.25	1.01515	97.6	-.133647	1.00631
56	174.598	125.461	73.125	.87624	97.3	-.111536	.869112
57	174.598	125.461	78.	.728527	97.1	-.089664	.722988
58	174.598	125.461	82.875	.571928	96.8	-.0680527	.567865
59	174.598	125.461	87.75	.405505	96.6	-.04663	.402815
60	174.598	125.461	92.625	.226211	96.4	-.0251103	.224813
END	174.598	125.461	97.5	0	0	0	0
GND	-8.12699	62.5745	0	**2.79284**	**64.6**	1.1977	2.52299
62	-8.12699	62.5745	4.85	2.84054	64.	1.24548	2.55293
63	-8.12699	62.5745	9.7	2.84954	63.6	1.26547	2.55313
64	-8.12699	62.5745	14.55	2.83616	63.3	1.27268	2.53458
65	-8.12699	62.5745	19.4	2.80221	63.1	1.2687	2.49856
66	-8.12699	62.5745	24.25	2.74869	62.8	1.25431	2.44581
67	-8.12699	62.5745	29.1	2.6763	62.6	1.22998	2.37692
68	-8.12699	62.5745	33.95	2.58572	62.4	1.19611	2.29243
69	-8.12699	62.5745	38.8	2.47759	62.3	1.15302	2.19294
70	-8.12699	62.5745	43.65	2.35262	62.1	1.10106	2.07906
71	-8.12699	62.5745	48.5	2.21158	61.9	1.04059	1.95147
72	-8.12699	62.5745	53.35	2.05525	61.8	.971961	1.81089
73	-8.12699	62.5745	58.2	1.88447	61.6	.895551	1.65807
74	-8.12699	62.5745	63.05	1.70008	61.5	.811744	1.49376
75	-8.12699	62.5745	67.9	1.50288	61.3	.720888	1.3187
76	-8.12699	62.5745	72.75	1.29356	61.2	.623273	1.1335
77	-8.12699	62.5745	77.6	1.07257	61.1	.519077	.938599
78	-8.12699	62.5745	82.45	.839832	60.9	.408213	.733949
79	-8.12699	62.5745	87.3	.593971	60.8	.289957	.518388
80	-8.12699	62.5745	92.15	.330571	60.6	.16208	.288109
END	-8.12699	62.5745	97.	0	0	0	0

CURRENT MOMENTS(amp-degrees) rms

Frequency = 1540 KHz
Input power = 750. watts

			vertical current moment	
wire	magnitude	phase (deg)	magnitude	phase (deg)
1	99.6308	311.3	99.6308	311.3
2	151.645	360.	151.645	360.
3	95.6879	99.9	95.6879	99.9
4	144.821	62.5	144.821	62.5

Comparison of Current Moments with Theoretical Antenna Field Parameters

Day

Tower	Current Moment Magnitude	Current Moment Phase	Normalized Magnitude	Normalized Phase	Standard Pattern Ratio	Standard Pattern Phase
1	1,158.63	360°	1.0	0°	1.0	0°
2	1,087.79	25.8°	0.9389	25.8°	0.939	+25.8°
3	0.778164	---	0.0007	---	---	---
4	0.704013	---	0.0008	---	---	---

Night

Tower	Current Moment Magnitude	Current Moment Phase	Normalized Magnitude	Normalized Phase	Standard Pattern Ratio	Standard Pattern Phase
1	99.6308	311.3°	0.6570	-48.7°	0.657	-48.7°
2	151.645	360°	1.0	0	1.0	0°
3	95.6879	99.9°	0.6310	99.9°	0.631	99.9°
4	144.821	62.5°	0.9550	62.5°	0.955	62.5°

As shown in the tables above, the base voltages used in the Method of Moments computer model produce current moments in each of the towers that are identical to the field ratios and phases of the theoretical antenna parameters specified in the KZMP license.

Item 4

Derivation of Operating Parameters for Directional Antennas - KZMP

The currents at the tower reference points have been calculated by using the computer circuit simulation program pspice. A pspice model has been made for each tower using the antenna base currents and base impedances calculated by MININEC and shown in the driven array model above, and the reactances listed previously in the table *Analysis of Tower Impedance Measurements to Verify Method of Moments Model*. The magnitude and phase of the current source in the pspice model was adjusted so that the current calculated in the output branch of the pspice model (the current through resistor R_L) was the same as the base current for the tower calculated by MININEC. The current at the reference point is the current source in the pspice model. These calculated currents are then normalized to the reference tower to obtain the antenna monitor phase and ratio readings, as shown in the tables labeled Antenna Monitor Parameters, which follow the pspice data below.

```
 ## KZMP TOWER 1 DAY BASE MODEL

 ****     CIRCUIT DESCRIPTION

******************************************************************************


.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1540kHz 1540kHz

IIN             0                       1       AC 18.9966 6.475
Lxlc            0                       1               2273.6uH
Lxs             1                       2               1.7569uH
Cxc             2                       0               10.335pF
LL              2                       3               7.9524uH
RL              3                       0               56.019ohms


.PRINT AC IM(RL) IP(RL)

##.PROBE
.END




 ****     AC ANALYSIS                     TEMPERATURE =   27.000 DEG C


  FREQ        IM(RL)      IP(RL)

   1.540E+06   1.906E+01   6.299E+00
```

```
 ## KZMP TOWER 2 DAY BASE MODEL

 ****     CIRCUIT DESCRIPTION

********************************************************************************


.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1540kHz 1540kHz

IIN             0                       1       AC 11.2627 34.34
Lxlc            0                       1               620.25uH
Lxs             1                       2               0.9301uH
Cxc             2                       0               10.335pF
LL              2                       3               24.4725uH
RL              3                       0               95.086ohms


.PRINT AC IM(RL) IP(RL)

##.PROBE
.END




 ****     AC ANALYSIS                     TEMPERATURE =   27.000 DEG C


  FREQ        IM(RL)      IP(RL)

   1.540E+06   1.107E+01   3.470E+01
```

```
 ## KZMP TOWER 1 NIGHT BASE MODEL


 ****     CIRCUIT DESCRIPTION

********************************************************************************


.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1540kHz 1540kHz

IIN             0                       1       AC 1.4529 -39.31
Lxlc            0                       1               2273.6uH
Lxs             1                       2               1.7569uH
Cxc             2                       0               10.335pF
LL              2                       3               14.0376uH
RL              3                       0               93.535ohms


.PRINT AC IM(RL) IP(RL)

##.PROBE
.END




 ****     AC ANALYSIS                     TEMPERATURE =   27.000 DEG C


  FREQ        IM(RL)      IP(RL)

   1.540E+06   1.463E+00  -3.960E+01
```

```
 ## KZMP TOWER 2 NIGHT BASE MODEL

 ****     CIRCUIT DESCRIPTION

******************************************************************************


.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1540kHz 1540kHz

IIN             0                       1       AC 1.6415 10.4
Lxlc            0                       1               620.25uH
Lxs             1                       2               0.9301uH
Cxc             2                       0               10.335pF
LL              2                       3               21.2977uH
RL              3                       0               110.07ohms

.PRINT AC IM(RL) IP(RL)

##.PROBE
.END




 ****     AC ANALYSIS                        TEMPERATURE =   27.000 DEG C


  FREQ         IM(RL)       IP(RL)

   1.540E+06   1.617E+00    1.081E+01
```

KZMP TOWER 3 NIGHT BASE MODEL

**** CIRCUIT DESCRIPTION

****

.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1540kHz 1540kHz

IIN	0	1	**AC 1.7412 104.7**
Lxlc	0	1	2273.6uH
Lxs	1	2	1.9636uH
Cxc	2	0	10.335pF
LL	2	3	5.8326uH
RL	3	0	41.242ohms

.PRINT AC IM(RL) IP(RL)

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ	IM(RL)	IP(RL)
1.540E+06	**1.745E+00**	**1.046E+02**

```
 ## KZMP TOWER 4 NIGHT BASE MODEL


 ****     CIRCUIT DESCRIPTION

********************************************************************************


.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1540kHz 1540kHz

IIN             0                       1       AC 2.7896 64.65
Lxlc            0                       1               2273.6uH
Lxs             1                       2               1.5502uH
Cxc             2                       0               10.335pF
LL              2                       3               3.3175uH
RL              3                       0               17.5ohms


.PRINT AC IM(RL) IP(RL)

##.PROBE
.END




 ****     AC ANALYSIS                        TEMPERATURE =   27.000 DEG C


  FREQ        IM(RL)      IP(RL)

   1.540E+06   2.793E+00   6.460E+01
```

Antenna Monitor Parameters - Day Pattern - KZMP

Tower	Ref Point Current Magnitude	Ref Point Current Phase	Normalized Magnitude	Normalized Phase
1	18.997	6.475	**1.0**	**0°**
2	11.2627	34.34	**0.593**	**+27.8°**
3	---	---	---	---
4	---	---	---	---

Antenna Monitor Parameters - Night Pattern - KZMP

Tower	Ref Point Current Magnitude	Ref Point Current Phase	Normalized Magnitude	Normalized Phase
1	1.4529	-39.31	**0.521**	**-104.0°**
2	1.6415	10.4	**0.588**	**-54.3°**
3	1.7412	104.7	**0.624**	**+40.1°**
4	2.7896	64.65	**1.0**	**0°**

Summary of Post Construction Array Geometry - KZMP

As the KZMP antenna array has been previously licensed by means of a traditional measurement based proof of performance, a post-construction survey is not required. (BL-20020809ABT)

Ground System

The ground system is unchanged.

Item 6

Sampling System Measurements - KZMP

Impedance measurements were made of the antenna monitor sampling system using a Hewlett Packard 8751A network analyzer in a calibrated measurement system. The measurements were made looking into the antenna monitor ends of the sampling lines for two conditions – with and without the sampling lines connected to the sampling transformers at the antenna tuning units.

The sample lines are equal lengths of 3/8" Heliax type cable.

The following table shows the frequency closest to the carrier frequency where series resonance – zero reactance corresponding with low resistance – was found. As frequencies of resonance occur at odd multiples of 90 degrees electrical length, the sampling line length at the resonant frequency below carrier frequency – which is the closest one to the carrier frequency – was found to be 270 electrical degrees. The electrical length at carrier frequency appearing in the table below was calculated by multiplying 270 degrees by the ratio of the carrier frequency (1540 kHz) to the resonant frequency.

Sample Line Measurements - KZMP

Tower	Sample Line Open Circuited Resonant Frequency (kHz)	Sample Line Electrical Length at 1540 kHz	Measured Impedance at 1540 kHz with Sample Transformer Connected
1	1243.25	334.45	47.9 +j0.1
2	1242.83	334.56	48.5 -j0.4
3	1241.60	334.89	48.4 -j0.3
4	1242.28	334.71	48.3 -j0.5

The sample line lengths meet the requirement that they be equal in length to within 1 electrical degree.

In order to determine the characteristic impedance values of the sampling lines, open-circuited measurements were made with frequencies offset to produce +/- 45 degrees of electrical length from resonance. The characteristic impedance was calculated using the following formula, where R1 +j X1 and R2 +j X2 are the measured impedances at the +45 and –45 degree offset frequencies, respectively:

$$Zo = ((R_1^2 + X_1^2)^{½} \times (R_2^2 + X_2^2)^{1/2})^{½}$$

KZMP Sample Line Characteristic Impedance Calculations

Tower	-45° Offset Frequency (kHz)	-45° Offset Measured Impedance	+45° Offset Frequency (kHz)	+45° Measured Impedance	Calculated Characteristic Impedance
1	1036.042	5 -j48.7	1450.458	7.4 +j48.6	49.06
2	1035.694	5.2 -j49.6	1449.972	7.6 +j49.4	49.93
3	1034.664	5 -j49.3	1448.530	7.3 +j49.1	49.60
4	1035.233	5 -j49.2	1449.327	7.5 +j49.1	49.56

The sample line measured characteristic impedances meet the requirement that they be equal within 2 ohms.

The sample current transformers were tested by feeding their outputs to the “A” and “B” inputs of the network analyzer, while feeding the output of the network analyzer through the sample transformers and into a resistive load. The transformers were in agreement within 0.05° of phase and 0.005% of ratio.

Day

Toroid (Tower) Number	Serial Number	Ratio	Phase
1	18422	1.0	0°
2	18212	0.997	-0.02°

Night

Toroid (Tower) Number	Serial Number	Ratio	Phase
1	18422	0.995	-0.05°
2	18212	0.995	-0.04°
3	17157	0.996	-0.03°
4	17165	1.0	0°

The antenna monitor was checked by splitting the amplified output of the network analyzer through a "T" connector The two outputs of the "T" were fed into the antenna monitor reference inputs and each non-reference tower sequentially.

Day

Tower Input	Ratio	Phase
1	1.000	0.0°
2	1.001	-0.2°

Night

Tower Input	Ratio	Phase
1	1.000	-0.1°
2	1.001	-0.2°
3	1.000	-0.1°
4	1.000	0.0°

Item 7

Reference Field Strength Measurements - KZMP

All field strength measurements were taken by Mike VanHooser, a Dallas area broadcast engineer with over thirty years experience. All measurements were taken using a Potomac Instruments FIM-41 field intensity meter, serial number 2215. This meter was calibrated in September 2017. All listed GPS coordinates are NAD83.

17°

3.55 km	Driveway of 3521 Grande Blvd 32° 50' 36.3"N 96° 59' 52.0"W 60 mV/m Day 13 mV/m Night
4.46 km	Driveway of 3517 Finley 32° 51' 4.8N 96° 59' 40.7"W 70 mV/m Day 10.5 mV/m Night
6.09 km	Walnut Hill & Pleasant Drive 32° 51' 54.6"N 96° 59' 20.1"W 42 mV/m Day 6.8 mV/m Night

91°

2.7 km	Driveway of 2602 Himes 32° 48' 46.7"N 96° 58' 47.7"W 820 mV/m Day 195 mV/m Night
3.7 km	Driveway of 307 Collins 32° 48' 43.5"N 96° 58' 6.0"W 640 mV/m Day 155 mV/m Night
5.36 km	Southwest corner of plot next to river 32° 48' 45.2"N 96° 57' 5.1"W 440 mV/m Day 105 mV/m Night

145°

4.65 km	North side of Hunter Ferrell Rd at storm drain 100m SW of Pollock 32° 46' 42.8"N 96° 58' 48.3"W 55 mV/m Day 6.4 mV/m Night
7.65 km	NE Corner of parking lot, Graham and NE 28th St 32° 45' 20.5"N 96° 57' 48.6"W 7.9 mV/m Day 1.5 mV/m Night
8.33 km	Fire plug at Purcell and NE 32nd St. 32° 45' 6.7"N 96° 57' 26.0"W 9.8 mV/m Day 4.1 mV/m Night

205°

3.92 km	Rear of Gateway Church parking lot 32° 46' 50.4"N 97° 1' 34.5"W 15 mV/m Night
4.5 km	Driveway of 1901 Westfield 32° 46' 33.4N 97° 1' 44.4"W 10 mV/m Night
5.45 km	Driveway of 1901 Wildwood 32° 46' 6.0"N 97° 2' 0.0W 10 mV/m Night

270°

2.54 km	South end of Trinity Blvd at fireplug 32° 48' 48.2"N 97° 2' 8.5"W 31 mV/m Night
3.21 km	Rear driveway of Cummings Electrical 32° 46' 45.5"N 97° 2' 34.6"W 23 mV/m Night
4.43 km	50 meters south of bridge on SH 360 32° 48' 45.0" 97° 3' 21.4"W 7.6 mV/m Night

354°

3.22 km	Street sign at Kent Dr. & Annesley Lane 32° 50' 30.7"N 97° 0' 40.9"W 135 mV/m Day 21 mV/m Night
4.53 km	Manhole cover at west end of Crested Butte Dr 32° 51' 14.6"N 97° 0' 49.6"W 27 mV/m Day 10 mV/m Night
5.72 km	SE corner of Building 4019 Estelle Creek N Apts. 32° 50' 30.7"N 97° 0' 40.8"W 50 mV/m Day 4.4 mV/m Night

Direct Measurement of Power - KZMP

Common point impedance measurements were made using a Hewlett Packard 8751A network analyzer in a calibrated measurement system. The measurements were made at the phasor cabinet input jack adjacent to the common point current meter that is used to determine operating power. The common point impedance was adjusted to 50 j0 at the common point, then the reactance was adjusted for minimum reflected power at the transmitter output. The final measured common point impedance is 50 -j8 for both day and night operation.

Certification

This Engineering Report has been prepared personally by the undersigned or under my immediate supervision, and all representations are true and correct to the best of my knowledge. I am an experienced radio engineer whose qualifications are a matter of record with the Federal Communications Commission, I am an engineer in the firm of Hatfield & Dawson Consulting Engineers, LLC, and I am Registered as a Professional Engineer in the States of Washington and Oregon.

June 8, 2020

Thomas S. Gorton P.E.

APPENDIX B: FCC Form 302

Section III Item #9 - Description of Antenna System

Tower	Overall height of radiator (meters)	Overall height above ground W/O lighting	Overall height above ground with lighting
1	51.6	52.2	52.2
2	62.7	63.7	64.0
3	48.8	50	50
4	48.8	49.7	49.7

All four towers are uniform cross-section guyed towers. All are series fed, not sectionalized and not top loaded.

The current station license for KZMP (BL-20020809ABT) lists ASR numbers for all four towers, however a search of the FCC ASR database shows that the ASRs listed for towers 1,3 & 4. are terminated. Only tower #2 is tall enough to require registration.