S

DEC 14 2017

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ORIGINAL

READ INSTRUCTIONS CAREFULLY BEFORE PROCEEDING

FCC/US BANK
2017 DEC 19 PM 3 12

FEDERAL COMMUNICATIONS COMMISSION
REMITTANCE ADVICE
FORM 159

Approved by OMB
3060-0589
Page No 1 of 2

(1) LOCKBOX #	SPECIAL USE ONLY
979089	FCC USE ONLY

SECTION A – PAYER INFORMATION

(2) PAYER NAME (if paying by credit card enter name exactly as it appears on the card)	(3) TOTAL AMOUNT PAID (U.S. Dollars and cents)
Lerman Senter PLLC	$1,505.00

(4) STREET ADDRESS LINE NO.1
2001 L STreet, NW

(5) STREET ADDRESS LINE NO. 2
Suite 400

(6) CITY	(7) STATE	(8) ZIP CODE
Washington	DC	20036

(9) DAYTIME TELEPHONE NUMBER (include area code)	(10) COUNTRY CODE (if not in U.S.A.)
202-429-8970	

FCC REGISTRATION NUMBER (FRN) REQUIRED

(11) PAYER (FRN)	(12) FCC USE ONLY
0004054797	

IF MORE THAN ONE APPLICANT, USE CONTINUATION SHEETS (FORM 159-C)
COMPLETE SECTION BELOW FOR EACH SERVICE, IF MORE BOXES ARE NEEDED, USE CONTINUATION SHEET

(13) APPLICANT NAME
Entercom License, LLC

(14) STREET ADDRESS LINE NO.1
401 E. City Avenue

(15) STREET ADDRESS LINE NO. 2
Suite 809

(16) CITY	(17) STATE	(18) ZIP CODE
Bala Cynwyd	PA	19004

(19) DAYTIME TELEPHONE NUMBER (include area code)	(20) COUNTRY CODE (if not in U.S.A.)
610-660-5610	

FCC REGISTRATION NUMBER (FRN) REQUIRED

(21) APPLICANT (FRN)	(22) FCC USE ONLY
0004434866	

COMPLETE SECTION C FOR EACH SERVICE, IF MORE BOXES ARE NEEDED, USE CONTINUATION SHEET

(23A) CALL SIGN/OTHER ID	(24A) PAYMENT TYPE CODE	(25A) QUANTITY
KMBZ	MMR	1
(26A) FEE DUE FOR (PTC)	**(27A) TOTAL FEE**	**FCC USE ONLY**
$700.00	$700.00	
(28A) FCC CODE 1	(29A) FCC CODE 2	
6382		

(23B) CALL SIGN/OTHER ID	(24B) PAYMENT TYPE CODE	(25B) QUANTITY
KMBZ	MOR	1
(26B) FEE DUE FOR (PTC)	**(27B) TOTAL FEE**	**FCC USE ONLY**
$805.00	$805.00	
(28B) FCC CODE 1	(29B) FCC CODE 2	
6382		

SECTION D – CERTIFICATION

CERTIFICATION STATEMENT

I, _____, certify under penalty of perjury that the foregoing and supporting information is true and correct to the best of my knowledge, information and belief.

SIGNATURE _____ DATE _____

PAID BY CREDIT CARD

SEE PUBLIC BURDEN ON REVERSE

FCC FORM 159

FEBRUARY 2003

Plastic Card Sale Transaction

Thank you.
Your transaction has been successfully completed.

Plastic Card Sale Confirmation

Transaction Information

Agency Application Name: U.S. Bank Lockbox for Federal Communications Commission (FCC)
Pay.gov Tracking ID: 266IENU9
Agency Tracking ID: 75382611909
Account Holder Name: UNKNOWN
Transaction Type: Plastic Card Sale
Billing Address: 1005 C
Billing Address 2:
City:
State/Province:
ZIP/Postal Code:
Country: USA
Email:
Phone:
Card Type: AmericanExpress
Plastic Card Number: **********1004
Payment Amount: $1,505.00
Current Date and Time: 12/14/2017 08:19 EST
Order ID:
Order Tax Amount:
Level 3 Data:
Agency Memo:

Note: Please avoid navigating the site using your browser's Back Button - this may lead to incomplete data being transmitted and pages being loaded incorrectly. Please use the links provided whenever possible.

Federal Communications Commission
Washington, D. C. 20554

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

FOR FCC USE ONLY

BMML-20171214ABK

FCC 302-AM
APPLICATION FOR AM BROADCAST STATION LICENSE

(Please read instructions before filling out form.

FOR COMMISSION USE ONLY
FILE NO. BMML-20171214ABK

SECTION I - APPLICANT FEE INFORMATION

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

Entercom License, LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)
401 E. City Avenue, Suite 809

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Bala Cynwyd	PA	19004

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
610-660-5610	KMBZ	6382

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	$ 700.00	

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	$ 805.00	

	TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
ADD ALL AMOUNTS SHOWN IN COLUMN C, AND ENTER THE TOTAL HERE. THIS AMOUNT SHOULD EQUAL YOUR ENCLOSED REMITTANCE.	$ 1505.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT Entercom License, LLC		
MAILING ADDRESS 401 E. City Avenue, Suite 809		
CITY Bala Cynwyd	STATE PA	ZIP CODE 19004

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
KMBZ	Kansas City, MO	BP-20140729ACZ		01/14/2018

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. 1

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

☐ Yes ☐ No

If No, state exceptions in an Exhibit.

Exhibit No.

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

☐ Yes ☑ No

If Yes, explain in an Exhibit.

Exhibit No.

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

☑ Yes ☐ No

☐ Does not apply

If No, explain in an Exhibit.

Exhibit No.

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

☐ Yes ☑ No

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

Exhibit No.

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

☐ Yes ☑ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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

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

CERTIFICATION

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

☑ Yes ☐ No

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

Name	Signature	
Andrew P. Sutor, IV		
Title	Date	Telephone Number
Executive Vice President	12/8/17	610-660-5610

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: Entercom License, 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
KMBZ	BP-20140729ACZ	980	Unlimited	5.0	9.0

2. Station location

State	City or Town
Missouri	Kansas City

3. Transmitter location

State	County	City or Town	Street address (or other identification)
MO	Jackson	Kansas City	6775 E. Coal Mine Road

4. Main studio location

State	County	City or Town	Street address (or other identification)
KS	Johnson	Mission	7000 Squibb Road

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

State	County	City or Town	Street address (or other identification)
KS	Johnson	Mission	7000 Squibb Road

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.

See Engineering Report

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
10.2	7.25

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
52	171	-j8.5	+j320

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 (1034741)	0		1.0			
2 (1034739)	+26.0		0.376			
3 (1242370)	+44.1		0.520			

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.
(5)Uniform cross-section guyed towers	98.6	As shown in ASR	As shown in ASR	Exhibit No. N/A

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	39 °	2 '	25 "	West Longitude	94 °	30 '	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. Eng Rpt

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

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.

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	
Address (include ZIP Code) Hatfield & Dawson Consulting Engineers 9500 Greenwood Ave N Seattle WA 98103-3012	Date October 24, 2017
	Telephone No. (Include Area Code) 206-783-9151

[ ] Technical Director

[X] Registered Professional Engineer

[ ] Chief Operator

[ ] Technical Consultant

[ ] Other (specify)

Exhibit 1
FCC Form 302-AM
November 2017

In response to Section II, Question 3, Applicant answered "No" as to whether the station is currently operating pursuant to automatic test authority in accordance with 47 C.F.R. § 73.1620. This application seeks to cover construction permit BP-20140729ACZ. The station is currently operating in accordance with § 73.1615. Program test authority is hereby requested.

ORIGINAL

LERMAN SENTER PLLC

WASHINGTON, DC

LAURA M. BERMAN
202.416.6792
LBERMAN@LERMANSENTER.COM

December 12, 2017

VIA OVERNIGHT DELIVERY

Federal Communications Commission
c/o U.S. Bank
SL-MO-C2-GL
1005 Convention Plaza
St. Louis, MO 63101
Attn: FCC Government Lockbox #979089

Re: Application for License (FCC Form 302-AM);
KMBZ(AM), Kansas City, MO (Facility ID No. 6382)

Dear Sir or Madam:

Enclosed are an original and two copies of an application on FCC Form 302-AM for Station KMBZ(AM), Kansas City, Missouri (Facility ID No. 6382). Also enclosed is a completed FCC Form 159 providing for the payment of the applicable license application filing fee of $1,505.00.

Please date-stamp the enclosed "Return Copy" of this filing and return it in the self-addressed, stamped envelope enclosed for that purpose.

If you have any questions, please contact me.

Respectfully submitted,

Laura M. Berman
Counsel to Entercom License, LLC

Enclosures

----------Please fold or cut in half----------

SENDER'S RECEIPT

Airbill#: 1Z0931F8NT97003430

To(Company):
Federal Communications Commission
Attn: FCC Gov't Lockbox #979089
SL-MO-C2-GL, 1005 Convention Plaza
SAINT LOUIS,MO 63101
United States
Attention To: c/o U.S. Bank

Phone#: (202) 416-6792

Sent By: Laura M. Berman

Phone#: 2024298970

Date Printed: 2017-12-12

Ship Date: 2017-12-12

Rate Estimate: 40.91
Protection: Amount: $
Protection: Value: $ 0.00 (inclusive of all pkgs)
Description:
Weight: 1
Dimensions: 0 x0 x 0
Ship Ref1: LMB/2245.0001
Ship Ref2:
Service Level: Next Day Air
Special Service:
COD Amount:
Payment Options:
Bill Shipment To: Sender
Bill To Account: 0931F8

UPS Signature (optional)_____ Route_____ Date_____ Time_____

WORLDWIDE EXPRESS For Tracking, please go to www.ups.com or call 1-800-PICK-UPS
Thank you for shipping with UPS Worldwide Express

HATFIELD & DAWSON
CONSULTING ELECTRICAL ENGINEERS
9500 GREENWOOD AVE. N.
SEATTLE, WASHINGTON 98103

THOMAS M. ECKELS, PE
STEPHEN S. LOCKWOOD, PE
DAVID J. PINION, PE
ERIK C. SWANSON, PE

THOMAS S. GORTON, PE
MICHAEL H. MEHIGAN, PE

JAMES B. HATFIELD, PE
BENJAMIN F. DAWSON III, PE
CONSULTANTS

TELEPHONE (206) 783-9151
FACSIMILE (206) 789-9834
E-MAIL hatdaw@hatdaw.com

MAURY L. HATFIELD, PE
(1942-2009)
PAUL W. LEONARD, PE
(1925-2011)

Application for License to Cover Construction Permit
and
Method of Moments Proof of Performance

KMBZ(AM)
Kansas City, Missouri
Facility ID 6382

980 kHz
9 kW Day, 5 kW Night DA-N

Entercom License, LLC

October 2017

APPLICATION FOR LICENSE
RADIO STATION KMBZ(AM) Kansas City, MO
980 kHz 9 kW Day, 5 kW Night DA-N

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

Appendix A	KMBZ Construction Permit
Appendix B	FCC Form 302-AM

Purpose of Application

This engineering exhibit supports an application by Entercom License, LLC for a license to cover Construction Permit BP-20140729ACZ for radio station KMBZ(AM) Kansas City, MO. (Facility ID 6382). KMBZ currently operates unlimited time on 980 kHz with a power of 5 kW using a directional antenna for nighttime operation. The construction permit authorizes relocation of KMBZ to the five tower antenna array of KCCV(AM), 760 kHz, Overland Park, KS. KMBZ will operate at a power of 9 kW daytime using a non-directional antenna, and 5 kW nighttime using three of the five KCCV towers for directional night operation (DA-N).

Information is provided herein demonstrating that the directional antenna parameters for the pattern authorized by the construction permit 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, with the exception of the Reference Point field strength measurements which were taken by KMBZ engineer Ken Wolf.

Item 1

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

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 open circuited at the same point where impedance measurements were made (the "reference points") for each of the measurements. The reference point measurements are listed in the table below.

KMBZ Measured "Reference Point" Impedances

Tower	Measured R	Measured X
1	216.4	309.6
2	261.6	294.7
3	199.4	292.3
4	243.4	313.7
5	156.8	296.0

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.* The series/parallel equivalent impedance of X_{IC}, X_{LC}, X_S and X_C was used in the moment method model as a load at ground level (lumped load) for the open circuited towers.

Item 2

Method of Moments Model Details for Towers Driven Individually - KMBZ

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 19 wire segments. As the tallest tower in the KMBZ model is 128.5 electrical degrees in height, the maximum segment length is 6.8 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 five uniform cross section towers having face widths of 18 inches. Towers 3 and 4 both have an STL antenna and associated isolation circuits.

KMBZ Tower Dimensions - Physical and Modeled

Tower	Physical Height (Degrees)	Modeled Height (degrees)	Modeled Height (percent)	Modeled Radius (meters)	Modeled Radius (percent)
1	116.1	126.8	109.2	.22	100
2	116.1	128.5	110.7	.26	118.2
3	116.1	123.2	106.1	.22	100
4	116.1	124.2	107.0	.22	100
5	116.1	121.4	104.6	.19	86.4

KMBZ MININEC Model Node and Wire Numbering

Tower	Wire Number	Base Node Number
1	1	1
2	2	20
3	3	39
4	4	58
5	5	77

Towers 3 and 4 each have an STL receive antenna mounted near the top of the tower (one for KMBZ, the other for KCCV), with an isocoupler across the base insulator, although the two stations use different isocoupler types. The impedance values used for these isocouplers in the model were obtained from the manufacturer. The tower numbering scheme used is the same as that used by KCCV. KMBZ will operate daytime from tower 4, with tower 3 also equipped for non-directional operation. The nighttime directional antenna will consist of towers 2, 3, and 4. Towers 1 and 5 are not used by KMBZ, and are detuned by an inductor to ground at the tower base.

There have been no changes made to the ground system, the data on file remains accurate.

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

KMBZ Tower 1 Driven, Other Towers Open Circuit at Current Transformer Location

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	174.1	298.	0	.22	19
		174.1	298.	126.8		
2	none	0	0	0	.26	19
		0	0	128.5		
3	none	174.1	118.	0	.22	19
		174.1	118.	123.2		
4	none	175.1	73.4	0	.22	19
		175.1	73.4	124.2		
5	none	338.9	73.4	0	.19	19
		338.9	73.4	121.4		

Number of wires = 5
current nodes = 95

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	6.38947	2	6.76316
radius	5	.19	2	.26

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	980.	0	1	.0177485	.0187866

Sources

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

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	20	0	-34,950.	0	0	0
2	39	0	-3,580.	0	0	0
3	58	0	-2,330.	0	0	0
4	77	0	-32,700.	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							
980.	**215.94**	**285.52**	357.98	52.9	12.018	-1.4489	-5.4718

KMBZ Tower 2 Driven, Other Towers Open Circuit at Current Transformer Location

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	174.1	298.	0	.22	19
		174.1	298.	126.8		
2	none	0	0	0	.26	19
		0	0	128.5		
3	none	174.1	118.	0	.22	19
		174.1	118.	123.2		
4	none	175.1	73.4	0	.22	19
		175.1	73.4	124.2		
5	none	338.9	73.4	0	.19	19
		338.9	73.4	121.4		

Number of wires = 5
current nodes = 95

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	6.38947	2	6.76316
radius	5	.19	2	.26

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	980.	0	1	.0177485	.0187866

Sources

source	node	sector	magnitude	phase	type
1	20	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-34,400.	0	0	0
2	39	0	-3,580.	0	0	0
3	58	0	-2,330.	0	0	0
4	77	0	-32,700.	0	0	0

C:\AM\KMBZ\KMBZ-rev3 07-19-2017 11:51:47

IMPEDANCE
normalization = 50.

freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 20, sector 1							
980.	**259.77**	**279.43**	381.52	47.1	11.311	-1.5398	-5.2503

KMBZ Tower 3 Driven, Other Towers Open Circuit at Current Transformer Location

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	174.1	298.	0	.22	19
		174.1	298.	126.8		
2	none	0	0	0	.26	19
		0	0	128.5		
3	none	174.1	118.	0	.22	19
		174.1	118.	123.2		
4	none	175.1	73.4	0	.22	19
		175.1	73.4	124.2		
5	none	338.9	73.4	0	.19	19
		338.9	73.4	121.4		

Number of wires = 5
current nodes = 95

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	6.38947	2	6.76316
radius	5	.19	2	.26

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	980.	0	1	.0177485	.0187866

Sources

source	node	sector	magnitude	phase	type
1	39	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-34,400.	0	0	0
2	20	0	-34,950.	0	0	0
3	58	0	-2,330.	0	0	0
4	77	0	-32,700.	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 39, sector 1							
980.	**174.24**	**260.3**	313.23	56.2	11.462	-1.5195	-5

KMBZ Tower 4 Driven, Other Towers Open Circuit at Current Transformer Location

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	174.1	298.	0	.22	19
		174.1	298.	126.8		
2	none	0	0	0	.26	19
		0	0	128.5		
3	none	174.1	118.	0	.22	19
		174.1	118.	123.2		
4	none	175.1	73.4	0	.22	19
		175.1	73.4	124.2		
5	none	338.9	73.4	0	.19	19
		338.9	73.4	121.4		

Number of wires = 5
current nodes = 95

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	6.38947	2	6.76316
radius	5	.19	2	.26

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	980.	0	1	.0177485	.0187866

Sources

source	node	sector	magnitude	phase	type
1	58	1	1,	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-34,400.	0	0	0
2	20	0	-34,950.	0	0	0
3	39	0	-3,580.	0	0	0
4	77	0	-32,700.	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 58, sector 1							
980.	**192.72**	**278.56**	338.73	55.3	12.084	-1.4409	-5.492

KMBZ Tower 5 Driven, Other Towers Open Circuit at Current Transformer Location

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	174.1	298.	0	.22	19
		174.1	298.	126.8		
2	none	0	0	0	.26	19
		0	0	128.5		
3	none	174.1	118.	0	.22	19
		174.1	118.	123.2		
4	none	175.1	73.4	0	.22	19
		175.1	73.4	124.2		
5	none	338.9	73.4	0	.19	19
		338.9	73.4	121.4		

Number of wires = 5
current nodes = 95

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	6.38947	2	6.76316
radius	5	.19	2	.26

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	980.	0	1	.0177485	.0187866

Sources

source	node	sector	magnitude	phase	type
1	77	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-34,400.	0	0	0
2	20	0	-34,950.	0	0	0
3	39	0	-3,580.	0	0	0
4	58	0	-2,330.	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 77, sector 1							
980.	**158.26**	**244.15**	290.96	57.	10.923	-1.5949	-5.1236

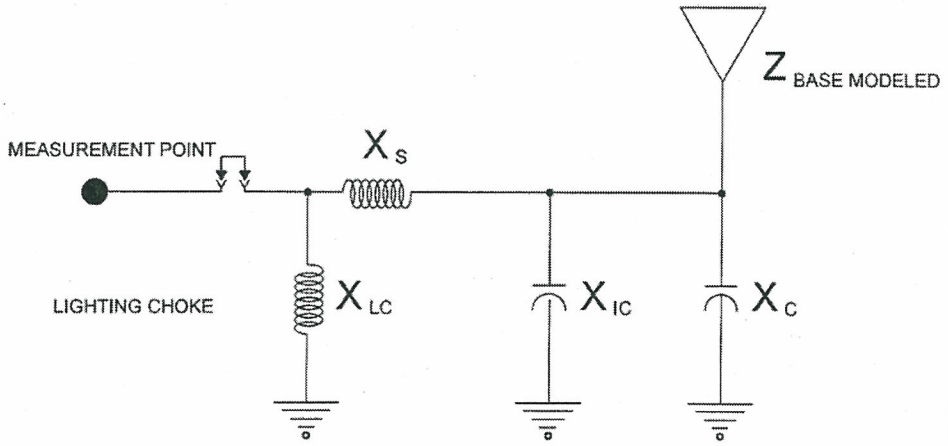
Item 3

Method of Moments Model Details for Directional Antenna- KMBZ

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 the reactance of the tower lighting choke
X_{IC} represents the reactance of the STL isocoupler

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



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	+j4500	+j26	------	-j4000	215.9 + j285.5	217.0 +j309.1	216.4+j309.6
#2	+j4500	+j17	------	-j4000	259.8 +j279.4	262.0 +j294.5	261.6 +j294.7
#3	+j4500	+j25	-j4000	-j4000	174.2 +j260.3	199.8 +j292.0	199.4 +j292.3
#4	+j4500	+j23	-j2500	-j4000	192.7 +j278.6	243.9 +j313.2	243.4 +j313.7
#5	+j4500	+j58	-------	-j4000	158.3+j244.2	156.6 +j296.3	156.8 +j296.0

Dwayne Straume, H&D 10/24/2017 KMBZ MOM TABLE.dwg

HATFIELD & DAWSON
CONSULTING ENGINEERS

ANALYSIS OF TOWER IMPEDANCE MEASUREMENTS TO VERIFY METHOD OF MOMENTS MODEL

RADIO STATION KMBZ 980 KHZ KANSAS CITY, MO 10/24/2017

KMBZ Driven Array

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	174.1	298.	0	.22	19
		174.1	298.	126.8		
2	none	0	0	0	.26	19
		0	0	128.5		
3	none	174.1	118.	0	.22	19
		174.1	118.	123.2		
4	none	175.1	73.4	0	.22	19
		175.1	73.4	124.2		
5	none	338.9	73.4	0	.19	19
		338.9	73.4	121.4		

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	980.	0	1	.0177485	.0187866

Sources

source	node	sector	magnitude	phase	type
1	20	1	2,022.07	65.1	voltage
2	39	1	246.223	129.3	voltage
3	58	1	908.024	146.7	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	395.	0	0	0
2	77	0	423.	0	0	0

IMPEDANCE
normalization = 50.

freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 20, sector 1							
980.	**211.9**	**214.94**	301.83	45.4	8.7196	-2.0011	-4.3274
source = 2; node 39, sector 1							
980.	**11.069**	**95.159**	95.801	83.4	21.053	-.82576	-7.6157
source = 3; node 58, sector 1							
980.	**27.664**	**234.51**	236.14	83.3	42.096	-.41275	-10.426

CURRENT rms
Frequency = 980 KHz
Input power = 5,000. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	81.735	153.721	0	.609315	313.6	.419984	-.44145
2	81.735	153.721	6.67368	.454669	313.6	.313609	-.329201
3	81.735	153.721	13.3474	.34578	313.8	.239198	-.249697
4	81.735	153.721	20.0211	.250836	314.2	.174793	-.179906
5	81.735	153.721	26.6947	.166046	315.2	.11772	-.117103
6	81.735	153.721	33.3684	.0903726	318.	.0671273	-.0605072
7	81.735	153.721	40.0421	.0248599	336.3	.022761	-1.E-02
8	81.735	153.721	46.7158	.0375946	114.2	-.0154134	.0342896
9	81.735	153.721	53.3895	.0862796	123.3	-.0473597	.0721196
10	81.735	153.721	60.0632	.126457	125.3	-.0730377	.103231
11	81.735	153.721	66.7368	.157384	126.	-.0924364	.127379
12	81.735	153.721	73.4105	.178848	126.2	-.105593	.144349
13	81.735	153.721	80.0842	.190755	126.2	-.112599	.153977
14	81.735	153.721	86.7579	.193099	126.	-.113601	.156148
15	81.735	153.721	93.4316	.185942	125.8	-.108796	.150791
16	81.735	153.721	100.105	.169383	125.5	-.0984157	.137858
17	81.735	153.721	106.779	.143506	125.2	-.0826925	.117285
18	81.735	153.721	113.453	.108224	124.8	-.0617762	.0888607
19	81.735	153.721	120.126	.0628288	124.4	-.0354836	.0518496
END	81.735	153.721	126.8	0	0	0	0
GND	0	0	0	**4.73894**	**19.7**	4.46179	1.59689
21	0	0	6.76316	5.45243	12.5	5.32242	1.18356
22	0	0	13.5263	5.91783	8.7	5.84936	.897633
23	0	0	20.2895	6.2711	5.9	6.23742	.649122
24	0	0	27.0526	6.5245	3.8	6.51046	.427712
25	0	0	33.8158	6.68163	2.	6.67766	.230192
26	0	0	40.579	6.74378	.5	6.74355	.0557751
27	0	0	47.3421	6.71198	359.2	6.7113	-.0954292
28	0	0	54.1053	6.58763	358.1	6.58385	-.222994
29	0	0	60.8684	6.37289	357.1	6.36452	-.32644
30	0	0	67.6316	6.07072	356.2	6.05717	-.405376
31	0	0	74.3947	5.68487	355.4	5.66626	-.459571
32	0	0	81.1579	5.21986	354.6	5.1969	-.488988
33	0	0	87.9211	4.68078	353.9	4.65466	-.493791
34	0	0	94.6842	4.07309	353.3	4.04538	-.474322
35	0	0	101.447	3.40216	352.7	3.37474	-.431039
36	0	0	108.211	2.67237	352.2	2.64742	-.36436
37	0	0	114.974	1.88497	351.6	1.86491	-.274286
38	0	0	121.737	1.03159	351.1	1.01922	-.159252
END	0	0	128.5	0	0	0	0
GND	-81.735	-153.721	0	**1.81803**	**45.9**	1.2644	1.30634
40	-81.735	-153.721	6.48421	1.91881	45.6	1.34332	1.37016
41	-81.735	-153.721	12.9684	1.97061	45.3	1.38494	1.40187
42	-81.735	-153.721	19.4526	1.9964	45.2	1.40716	1.41616
43	-81.735	-153.721	25.9368	1.99932	45.1	1.41243	1.41504
44	-81.735	-153.721	32.4211	1.98081	44.9	1.40187	1.39941
45	-81.735	-153.721	38.9053	1.94181	44.9	1.37621	1.36992
46	-81.735	-153.721	45.3895	1.88317	44.8	1.33609	1.32709
47	-81.735	-153.721	51.8737	1.80574	44.8	1.28218	1.2715
48	-81.735	-153.721	58.3579	1.71051	44.7	1.21521	1.20379
49	-81.735	-153.721	64.8421	1.59854	44.7	1.13601	1.12464

50	-81.735	-153.721	71.3263	1.47102	44.7	1.04547	1.03484
51	-81.735	-153.721	77.8105	1.32922	44.7	.944566	.935208
52	-81.735	-153.721	84.2947	1.17447	44.7	.834324	.826607
53	-81.735	-153.721	90.7789	1.00809	44.8	.715756	.709892
54	-81.735	-153.721	97.2631	.831348	44.8	.589833	.585865
55	-81.735	-153.721	103.747	.645173	44.9	.457315	.455094
56	-81.735	-153.721	110.232	.449752	44.9	.318429	.317615
57	-81.735	-153.721	116.716	.243005	45.	.171811	.17185
END	-81.735	-153.721	123.2	0	0	0	0
GND	50.024	-167.802	0	**2.72005**	**63.4**	1.21674	2.43273
59	50.024	-167.802	6.53684	3.10845	62.6	1.43226	2.75882
60	50.024	-167.802	13.0737	3.34468	62.1	1.5655	2.95569
61	50.024	-167.802	19.6105	3.51305	61.7	1.66313	3.09443
62	50.024	-167.802	26.1474	3.62446	61.5	1.73119	3.18429
63	50.024	-167.802	32.6842	3.68317	61.2	1.77197	3.22891
64	50.024	-167.802	39.2211	3.69138	61.1	1.78664	3.2302
65	50.024	-167.802	45.7579	3.6507	60.9	1.77603	3.18956
66	50.024	-167.802	52.2947	3.56266	60.7	1.74088	3.10835
67	50.024	-167.802	58.8316	3.42893	60.6	1.68202	2.98804
68	50.024	-167.802	65.3684	3.25147	60.5	1.6004	2.83033
69	50.024	-167.802	71.9053	3.03245	60.4	1.4971	2.63713
70	50.024	-167.802	78.4421	2.77438	60.3	1.37338	2.4106
71	50.024	-167.802	84.9789	2.47991	60.2	1.23058	2.15306
72	50.024	-167.802	91.5158	2.15183	60.2	1.07009	1.86689
73	50.024	-167.802	98.0526	1.79277	60.1	.893283	1.55437
74	50.024	-167.802	104.59	1.40481	60.1	.701207	1.21729
75	50.024	-167.802	111.126	.988343	60.	.494116	.855962
76	50.024	-167.802	117.663	.538728	60.	.269725	.466343
END	50.024	-167.802	124.2	0	0	0	0
GND	96.8198	-324.776	0	.131235	112.5	-.0502896	.121217
78	96.8198	-324.776	6.38947	.0982384	112.5	-.0375937	.0907607
79	96.8198	-324.776	12.779	.0748016	112.4	-.0284596	.0691761
80	96.8198	-324.776	19.1684	.0543506	112.	-.0203739	.0503874
81	96.8198	-324.776	25.5579	.0360664	111.2	-.0130311	.0336299
82	96.8198	-324.776	31.9474	.0197137	108.8	-6.35E-03	.0186638
83	96.8198	-324.776	38.3368	5.43E-03	93.4	-3.18E-04	5.42E-03
84	96.8198	-324.776	44.7263	7.9E-03	309.6	5.03E-03	-6.09E-03
85	96.8198	-324.776	51.1158	.0185565	301.4	9.67E-03	-.0158391
86	96.8198	-324.776	57.5053	.0273821	299.6	.0135393	-.0238005
87	96.8198	-324.776	63.8947	.0342343	299.	.016602	-.0299392
88	96.8198	-324.776	70.2842	.0390608	298.8	.0188118	-.0342324
89	96.8198	-324.776	76.6737	.0418287	298.8	.0201272	-.0366679
90	96.8198	-324.776	83.0632	.0425189	298.8	.0205107	-.0372448
91	96.8198	-324.776	89.4526	.0411222	299.	.0199278	-.035971
92	96.8198	-324.776	95.8421	.0376332	299.2	.0183452	-.032859
93	96.8198	-324.776	102.232	.032038	299.4	.0157244	-.0279137
94	96.8198	-324.776	108.621	.0242793	299.6	.0120055	-.0211034
95	96.8198	-324.776	115.011	.0141535	299.9	7.05E-03	-.0122701
END	96.8198	-324.776	121.4	0	0	0	0

CURRENT MOMENTS(amp-degrees) rms

Frequency = 980 KHz
Input power = 5,000. watts

wire	magnitude	phase (deg)	vertical current moment magnitude	phase (deg)
1	2.09822	40.8	2.09822	40.8
2	762.037	0.0	762.037	0.0
3	209.356	45.	209.356	45.
4	403.604	61.	403.604	61.
5	.371466	17.7	.371466	17.7

Medium wave array vertical current moment (amps-degrees) rms
(Calculation assumes tower wires are grouped together.
The first wire of each group must contain the source.)

tower	magnitude	phase (deg)
1	2.09822	40.8
2	762.037	0.0
3	209.356	45.
4	403.604	61.
5	.371466	17.7

Comparison of Current Moments with Theoretical Antenna Field Parameters

Tower	Current Moment Magnitude	Current Moment Phase	Normalized Magnitude	Normalized Phase	Standard Pattern Ratio	Standard Pattern Phase
2	762.037	0.0	1.0	0.0	1.0	0.0
3	209.356	45.0	0.275	+45.0	0.275	+45.0
4	403.604	61.0	0.530	+61.0	0.530	+61.0

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 (+/- 0.1°) of the theoretical antenna parameters specified in the KMBZ construction permit.

Item 4

Derivation of Operating Parameters for Directional Antennas - KMBZ

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.

```
## KMBZ TOWER 2 NIGHT BASE MODEL

 ****     CIRCUIT DESCRIPTION

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


.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 980kHz 980kHz

IIN             0                       1       AC 4.728 20.05
LXs             1                       2               2.761uH
LXlc            1                       3               731uH
Rlc             3                       0               .001ohms
CXc             2                       0               40.6pF
LL              2                       4               34.907uH
RL              4                       0               211.9ohms

.PRINT AC IM(RL) IP(RL)

##.PROBE
.END



 ****     AC ANALYSIS                    TEMPERATURE =   27.000 DEG C


  FREQ         IM(RL)       IP(RL)

   9.800E+05   4.739E+00    1.970E+01
```

```
## KMBZ TOWER 3 NIGHT BASE MODEL

 ****     CIRCUIT DESCRIPTION

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


.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 980kHz 980kHz

IIN             0                       1       AC 1.78 46.08
LXs             1                       2               4.06uH
LXlc            1                       3               731uH
Rlc             3                       0               .001ohms
CXic            2                       0               40.6pF
CXc             2                       0               40.6pF
LL              2                       4               15.454uH
RL              4                       0               11.07ohms

.PRINT AC IM(RL) IP(RL)

##.PROBE
.END



 ****     AC ANALYSIS                    TEMPERATURE =   27.000 DEG C


  FREQ         IM(RL)       IP(RL)

   9.800E+05   1.818E+00    4.590E+01
```

```
## KMBZ TOWER 4 NIGHT BASE MODEL

 ****     CIRCUIT DESCRIPTION

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


.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 980kHz 980kHz

IIN             0                       1       AC 2.459 64.16
LXs             1                       2               3.735uH
LXlc            1                       3               731uH
Rlc             3                       0               .001ohms
CXic            2                       0               65pF
CXc             2                       0               40.6pF
LL              2                       4               38.085uH
RL              4                       0               27.66ohms

.PRINT AC IM(RL) IP(RL)

##.PROBE
.END



****     AC ANALYSIS                    TEMPERATURE =   27.000 DEG C


 FREQ         IM(RL)       IP(RL)

  9.800E+05   2.720E+00   6.340E+01
```

Antenna Monitor Parameters - Night Pattern - KMBZ

Tower	Ref Point Current Magnitude	Ref Point Current Phase	Normalized Magnitude	Normalized Phase
2	4.728	20.05	1.0	0
3	1.780	46.08	0.376	+26.0
4	2.459	64.16	0.520	+44.1

Summary of Post Construction Certified Array Geometry - KMBZ

According to the survey on the following pages, the distance and bearing from the reference tower (Tower #2) to Tower #3 is 484.96 feet at a bearing of 117.97°. The difference between this point and the location specified in the construction permit is 0.482 feet (0.17°).

The surveyed distance from the reference tower to Tower #4 is 488.46 feet at a bearing of 73.34°, while the construction permit specifies 488.16 feet at a bearing of 73.4° The difference between this point and the location specified in the construction permit is 0.593 feet (0.21°).

AYLETT SURVEY& ENGINEERING COMPANY, INC.

LAND SURVEYING ~ LAND PLANNING ~ CIVIL ENGINEERING
201 NW 72nd STREET ~ GLADSTONE, MO 64118-1821
Phone: (816) 436-0732 ~ Fax: (816) 436-0767
www.sams-survey.com
Sam A. Aylett P.L.S.

Tower Location and Height Determination Survey
4725 E Coal Mine Road, Kansas City, MO

Field Work Completed on: 8-22-16, Sunny with average temperature of 78°

Datum:
The horizontal and vertical positions of each of the 5 towers are based on NAD83 State Plane Coordinates as generated using the Missouri Geographical Reference System. GPS Observations were made from 9:10AM to 10:10AM on 8-22-16 with a minimum of 6 minute sessions for each of the four primary control points. A second set of observations were made from 3:08PM to 3:55PM with a minimum of 6 minute sessions for each of the control points. These positions were then averaged for use in computing the tower positions.

Horizontal Position:
The centers of the towers were determined using horizontal angle measurements from two of the primary control points. The State Plane coordinates were then converted to Geodetic coordinate values.

Vertical Position:
The height of each of the key elements on each tower was computed using vertical angle measurement from two of the primary control points. The data points collected from each of the instrument setups was then averaged to determine the height of the structure. The Vertical Datum is NAVD88 and based on multiple GPS observations.

Tower 1:
NAD83, State Plane Coordinate, West Zone "True North"
N: 319009.28m
E: 849024.34m
EL: 762.14 (ground elevation)

NAD83, Geodetic Coordinates (Latitude and Longitude)
Lat: N 39° 02'27.87"
Long: W 94° 30'40.57"

Height:
337.3' (102.8m) Top of Beacon Light Ring

Tower 2:
NAD83, State Plane Coordinate, West Zone "True North"
N: 318939.84m
E: 849155.37m
EL: 766.27 (ground elevation)

NAD83, Geodetic Coordinates (Latitude and Longitude)
Lat: N 39° 02'25.62"
Long: W 94° 30'35.12"

Height:
334.0' (101.8m) Top of Beacon Light Ring

Tower 3:
NAD83, State Plane Coordinate, West Zone "True North"
N: 318870.51m
E: 849285.91m
EL: 769.60 (ground elevation)

NAD83, Geodetic Coordinates (Latitude and Longitude)
Lat: N 39° 02'23.37"
Long: W 94° 30'29.69"

Height:
329.5' (100.4m) Top of Beacon Light Ring

Tower 4:
NAD83, State Plane Coordinate, West Zone "True North"
N: 318982.50m
E: 849298.01m
EL: 769.12 (ground elevation)

NAD83, Geodetic Coordinates (Latitude and Longitude)
Lat: N 39° 02'27.01"
Long: W 94° 30'29.12"

Height:
333.1' (101.5m) Top of Beacon Light Ring

Tower 5:
NAD83, State Plane Coordinate, West Zone "True North"
N: 319022.49m
E: 849431.39m
EL: 771.16 (ground elevation)

NAD83, Geodetic Coordinates (Latitude and Longitude)
Lat: N 39° 02'28.30"
Long: W 94° 30'23.65"

Height:
331.1' (100.9m) Top of Beacon Light Ring

Azimuth: Tower 1 to Tower 2
Grid Azimuth: 152° 04'49" (S62°04'49"E), 486.50'
Average Convergence Angle for each of the tower locations: 0° 0'25"
Geodetic Azimuth: 152° 05'14" (S62°05'14"E), 486.53'

Azimuth: Tower 2 to Tower 3
Grid Azimuth: 152° 01'41" (S62°01'41"E), 484.96'
Average Convergence Angle for each of the tower locations: 0° 0'22"
Geodetic Azimuth: 152° 02'03" (S62°02'03"E), 484.99'

Azimuth: Tower 3 to Tower 4
Grid Azimuth: 06° 09'46" (N06°09'46"E), 369.55'
Average Convergence Angle for each of the tower locations: 0° 0'18"
Geodetic Azimuth: 06° 09'28" (N06°09'28"E), 369.57'

Azimuth: Tower 4 to Tower 5
Grid Azimuth: 73° 18'46" (N73°18'46"E), 456.85'
Average Convergence Angle for each of the tower locations: 0° 0'18"
Geodetic Azimuth: 73° 18'28" (N73°18'128E), 456.88'

Azimuth: Tower 2 to Tower 4
Grid Azimuth: 73° 21'02" (N73°21'02"E), 488.46'
Average Convergence Angle for each of the tower locations: 0° 0'22"
Geodetic Azimuth: 73° 20'40" (N73°20'40"E), 488.49'

Certification:
I, Sam A. Aylett, a Professional Land Surveyor in the State of Missouri do hereby certify that the Height Measurement Survey was completed for the above-described property on August 22, 2016 under my direct supervision and that the information provided in this letter is true and correct to the best of my knowledge.

Dated this 5th day of October, 2016

STATE OF MISSOURI
SAM ANTHONY AYLETT
NUMBER LS-2074
REGISTERED LAND SURVEYOR

Sam A. Aylett, P.L.S. #2074

Item 6

Sampling System Measurements - KMBZ

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 ½" Andrew LDF4-50A Heliax 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 above carrier frequency – which is the closest one to the carrier frequency – was found to be 450 electrical degrees. The electrical length at carrier frequency appearing in the table below was calculated by multiplying 450 degrees by the ratio of the carrier frequency (980 kHz) to the resonant frequency.

Sample Line Measurements - KMBZ

Tower	Sample Line Open Circuited Resonant Frequency (kHz)	Sample Line Electrical Length at 980 kHz	Measured Impedance at 980 kHz with Sample Transformer Connected
2	1087.4	243.33	53.0 -j1.7
3	1087.6	243.29	52.5 -j1.7
4	1087.9	243.22	52.7 -j1.8

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:

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

KMBZ Sample Line Characteristic Impedance Calculations

Tower	-45° Offset Frequency (kHz)	-45° Offset Measured Impedance	+45° Offset Frequency (kHz)	+45° Measured Impedance	Calculated Characteristic Impedance
2	906.167	3.0 -j50.4	1268.633	3.1 +j50.5	50.5
3	906.333	3.2 -j50.0	1268.867	4.9 +j49.9	50.1
4	906.583	3.2 -j50.1	1269.217	4.9 +j50.0	50.2

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 with the reference tower transformer to within 0.2° of phase and 0.1% of ratio.

The antenna monitor calibration certificate is included on the next page of this report.

Potomac Instruments, inc.
7309 Grove Rd Unit D Frederick, MD 21704 Phone 301-696-5550 Fax 301-696-5553

Certificate of Calibration

For

Medium Wave Directional Antenna Monitor

Model: 1901-3

Serial Number: 941

Performed for: KMBZ

Address: 7000 Squibb Road
Mission, KS 66202

Calibration Frequency: 980 kHz

Termination Impedance: 50 Ω

Temperature: 72° F

Relative Humidity: 42%

Equipment Modifications from Standard: None

This document certifies that the above instrument has been tested and calibrated in accordance with factory calibration procedures under the conditions noted using standards that are traceable to the National Institute of Standards and Technology (NIST).

Approved By: _____
Zachary Babendreier

Calibration Date: 11/10/2016

Next Recommended Calibration: November 2019

Item 7

Reference Field Strength Measurements - KMBZ

Reference field strength measurements were made along radials of minimum and maximum radiation for the directional pattern. The transmitter power was adjusted to 5.4 kW for the nighttime pattern measurements.

Measurements were made using a Potomac Instruments field strength meter, model PI4100, serial # 351. This meter was calibrated by the manufacturer in November 2015. All measurements were taken by KMBZ engineer Ken Wolf.

The measured field strengths and descriptions including GPS (NAD83) coordinates for the reference measurement points are shown on the following pages.

Reference Point Measurements - KMBZ - Night

54.5° 4.31km 41.8 mV/m
Manhole cover in front of 3300 S. Denton
39 3 45.3 94 28 4.3

54.5° 4.68 km 35.1 mV/m
Fire hydrant across from 9812 E. Linwood Blvd
39 3 55.8 94 27 46.1

54.5° 5.24 km 32.6 mV/m
Manhole cover in front of 10305 E 30th St
39 4 5.3 94 27 25.9

126.5° 1.03 km 88.1 mV/m
Fire hydrant at 7602 50th
39 2 0.1 94 29 47.4

126.5° 3.28 km 46 mV/m
Manhole cover in yard of 5520 Hunter
39 1 21.3 94 28 42.1

126.5° 4.76 km 13.4 mV/m
Fire hydrant in front of 9804 59th Terrace
39 0 53.6 94 27 51.8

199° 5.02 km 51.1 mV/m
North end of parking lot of off-leash dog park, at gate (in Swope Park)
38 59 51.2 94 31 37.2

199° 6.16 km 32.6 mV/m
Loading dock at 4530 E 75th Street
38 59 19.0 94 32 2.3

199° 6.87 km 36.1 mV/m
Turn out on west side of Blue River Road north of 87th by large power company box
38 58 56.2 94 32 9.8

268° 3.88 km 152 mV/m
SE corner of convenience store parking lot at SE corner of Swope Parkway & Prospect Ave
39 2 18.3 94 33 12.3

268° 4.47 km 89.1 mV/m
Fire hydrant in front of 2021 E. 48th Street
39 2 21.1 94 33 37.1

268° 4.97 km 93.4 mV/m
North edge of parking lot of Paseo Performing Arts Center parking lot at base of stairs
39 2 18.4 94 33 57.7

Spurious Emissions Measurements

A computer program was used to generate a list of all first through third order intermodulation products generated by the combination of 760 kHz and 980 kHz, from 500-5000kHz. While both KCCV and KMBZ were operating in their respective daytime modes, each of these frequencies was measured with a Potomac Instruments FIM 4100 field strength meter, and the level of each of these was compared to the level of 760 kHz (which was the lower of the two stations at the measurement point). In most cases, those frequencies which were less than 80 dB below the level of KCCV were observed to have audio not related to KCCV or KMBZ, and were therefore deemed to be from another source. The signals which did not contain identifiable audio were checked by briefly interrupting the carrier of KMBZ. As all of these signals remained unchanged during the interruption of KMBZ, it was determined that they were not the result of intermodulation between KCCV and KMBZ.

Direct Measurement of Power - KMBZ

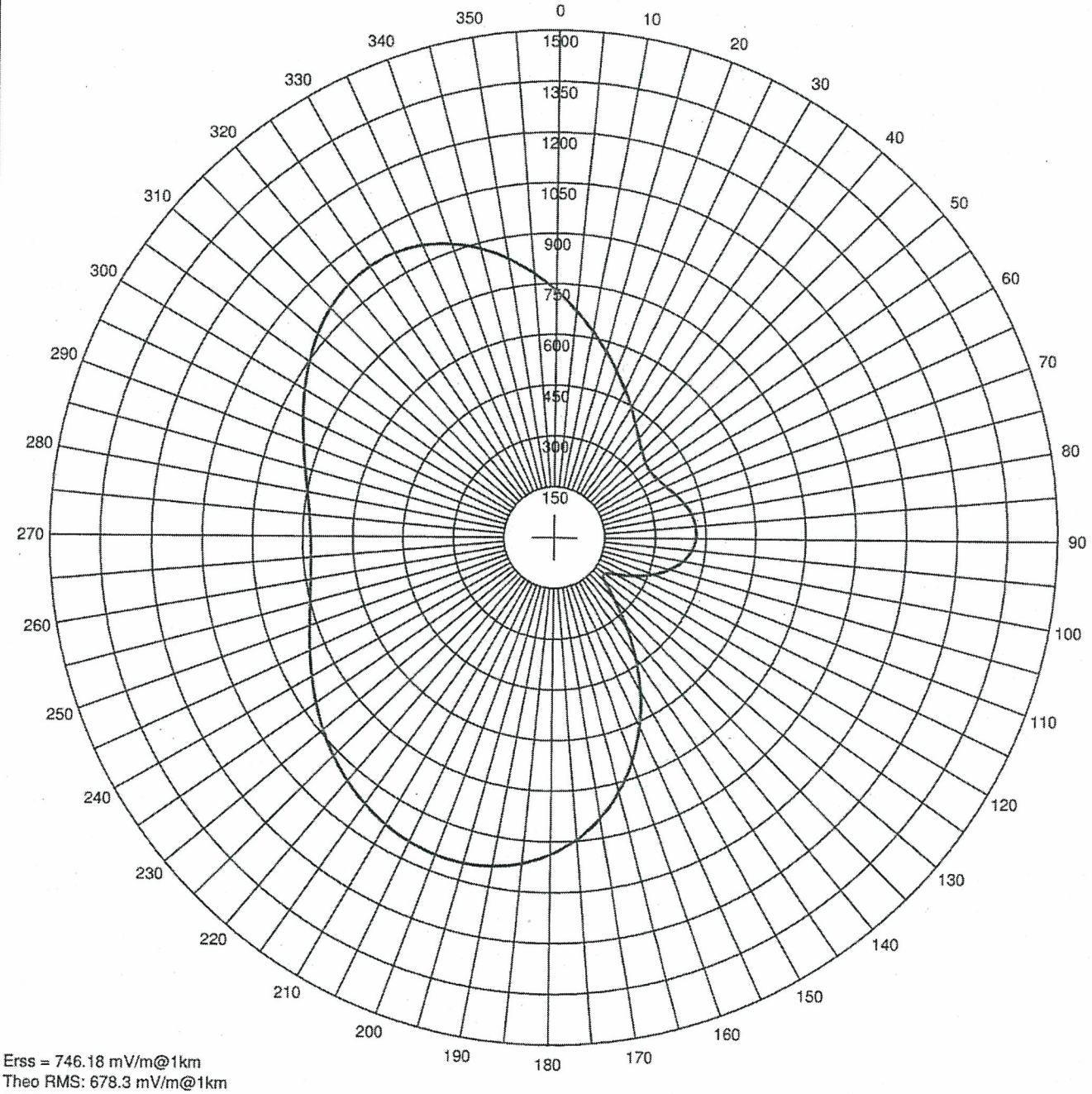
Common point impedance measurements were made using a Hewlett Packard 8751A network analyzer in a calibrated measurement system. The measurements were made at the phasor cabinet input jack adjacent to the common point current meter that is used to determine operating power. The common point impedance was adjusted such that the impedance at the transmitter output, as indicated on the Smith chart on the transmitters digital interface, was 50 j0. This resulted in an impedance at the location of the common point meter of 52 -j8.5.

The copy of Form 302 included in this application specifies non-directional daytime operation using tower #4 (ASR 1242370). Entercom requests that the new station license authorize use of tower #3 (ASR 1034739) as an alternate non-directional daytime antenna. The measured impedance of this tower is 184 +j292, therefore the base current for this tower for daytime operation is 7.0 amps.

Entercom also respectfully requests that the theoretical field parameters for the nighttime directional antenna contained in the CDBS be adjusted by reversing the order of the non-reference towers. This will result in the towers being listed in the CDBS in the same order as on the antenna monitor. The requested parameters are shown on the following page.

Entercom additionally requests authorization to determine operating power by use of the transmitter power output meter. The transmitter is a Nautel NX10.

AM Directional Pattern



Erss = 746.18 mV/m@1km
Theo RMS: 678.3 mV/m@1km
Std RMS: 712.602 mV/m@1km
Q: 22.361 mV/m@1km

Standard Horizontal Plane Pattern

Pattern (mV/m @ 1km)
Pattern X10

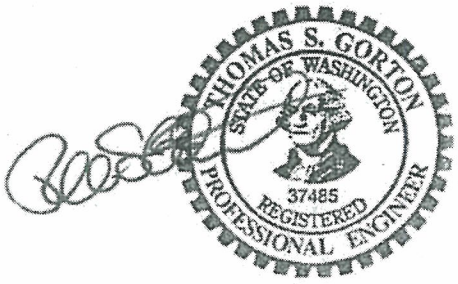
#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	0.0	0.0	0.0	116.1	0	0	0.0	0.0	0.0	0.0
2	0.275	45.0	174.1	118.0	116.1	0	0	0.0	0.0	0.0	0.0
3	0.530	61.0	175.1	73.4	116.1	0	0	0.0	0.0	0.0	0.0

Call: KMBZ
Freq: 980 kHz
KANSAS CITY, MO, US
Hours: N
Lat: 39-02-25 N
Lng: 094-30-30 W
Power: 5.0 kW
Theo RMS: 678.30 mV/m@1km
@ 5.0 kW

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.

October 24, 2017



Thomas S. Gorton P.E.

Hatfield & Dawson Consulting Engineers

APPENDIX A: Construction Permit BP-20140729ACZ

United States of America

FEDERAL COMMUNICATIONS COMMISSION

AM BROADCAST STATION CONSTRUCTION PERMIT

Authorizing Official:

Official Mailing Address:

ENTERCOM LICENSE, LLC
401 E. CITY AVENUE
SUITE 809
BALA CYNWYD PA 19004

Son Nguyen
Supervisory Engineer
Audio Division
Media Bureau

Grant Date: January 14, 2015

This permit expires 3:00 a.m. local time, 36 months after the grant date specified above.

Facility Id: 6382

Call Sign: KMBZ

Permit File Number: BP-20140729ACZ

This supersedes authorization of same date to remove special condition for KDMR. (JBS 3/4/15)

Subject to the provisions of the Communications Act of 1934, as amended, subsequent acts and treaties, and all regulations heretofore or hereafter made by this Commission, and further subject to the conditions set forth in this permit, the permittee is hereby authorized to construct the radio transmitting apparatus herein described. Installation and adjustment of equipment not specifically set forth herein shall be in accordance with representations contained in the permittee's application for construction permit except for such modifications as are presently permitted, without application, by the Commission's Rules.

Commission rules which became effective on February 16, 1999, have a bearing on this construction permit. See Report & Order, Streamlining of Mass Media Applications, MM Docket No. 98-43, 13 FCC RCD 23056, Para. 77-90 (November 25, 1998); 63 Fed. Reg. 70039 (December 18, 1998). Pursuant to these rules, this construction permit will be subject to automatic forfeiture unless construction is complete and an application for license to cover is filed prior to expiration. See Section 73.3598.

Equipment and program tests shall be conducted only pursuant to Sections 73.1610 and 73.1620 of the Commission's Rules.

Hours of Operation: Unlimited

Average hours of sunrise and sunset:
Local Standard Time (Non-Advanced)

Jan.	7:30 AM	5:15 PM	Jul.	5:00 AM	7:45 PM
Feb.	7:15 AM	6:00 PM	Aug.	5:30 AM	7:15 PM
Mar.	6:30 AM	6:30 PM	Sep.	6:00 AM	6:30 PM
Apr.	5:45 AM	7:00 PM	Oct.	6:30 AM	5:45 PM
May	5:00 AM	7:30 PM	Nov.	7:00 AM	5:00 PM
Jun.	4:45 AM	7:45 PM	Dec.	7:30 AM	5:00 PM

Callsign: KMBZ Permit No.: BP-20140729ACZ

Name of Permittee: ENTERCOM LICENSE, LLC

Station Location: KANSAS CITY, MO

Frequency (kHz): 980

Station Class: B

Antenna Coordinates:

		Day			
Latitude:	N	39 Deg	02 Min	25 Sec	
Longitude:	W	94 Deg	30 Min	30 Sec	

		Night			
Latitude:	N	39 Deg	02 Min	25 Sec	
Longitude:	W	94 Deg	30 Min	30 Sec	

Transmitter(s): Type Accepted. See Sections 73.1660, 73.1665 and 73.1670 of the Commission's Rules.

Nominal Power (kW): Day: 9.0 Night: 5.0

Antenna Mode: Day: ND Night: DA

(DA=Directional Antenna, ND=Non-directional Antenna; CH=Critical Hours)

Antenna Registration Number(s):

Day:

Tower No.	ASRN	Overall Height (m)
1	1034740	

Night:

Tower No.	ASRN	Overall Height (m)
1	1034741	
2	1242370	
3	1034739	

Callsign: KMBZ Permit No.: BP-20140729ACZ

DESCRIPTION OF DIRECTIONAL ANTENNA SYSTEM

Theoretical RMS (mV/m/km): Night: 678.3

Standard RMS (mV/m/km): Night: 712.6

Augmented RMS (mV/m/km):

Q Factor: Night:

Theoretical Parameters:

Night Directional Antenna:

Tower No.	Field Ratio	Phasing (Deg.)	Spacing (Deg.)	Orientation (Deg.)	Tower Ref Switch *	Height (Deg.)
1	1.0000	0.000	0.0000	0.000	0	116.1
2	0.5300	61.000	175.1000	73.400	0	116.1
3	0.2750	45.000	174.1000	118.000	0	116.1

* Tower Reference Switch
0 = Spacing and orientation from reference tower
1 = Spacing and orientation from previous tower

Non-Directional Antenna: Day

Radiator Height: 98.6 meters; 116.1 deg

Theoretical Efficiency: 322.51 mV/m/kw at 1km

Inverse Distance Field Strength:

The inverse distance field strength at a distance of one kilometer from the above antenna in the directions specified shall not exceed the following values:

Night:

Azimuth:	Radiation:	
54.5	344.9	mV/m
126.5	182.6	mV/m
268	725.8	mV/m

Special operating conditions or restrictions:

1 The permittee must submit a proof of performance as set forth in either Section 73.151(a) or 73.151(c) of the rules before program tests are authorized.
A proof of performance based on field strength measurements, per Section 73.151(a), shall include a complete nondirectional proof of performance, in addition to a complete proof on the (night) directional antenna system. The nondirectional and directional field strength measurements must be made under similar environmental conditions. The proof(s) of performance submitted to the Commission must contain all of the data specified in Section 73.186 of the rules.
Permittees who elect to submit a moment method proof of performance, as set forth in Section 73.151(c), must use series-fed radiators. In addition, the sampling system must be constructed as described in Section 73.151(c) (2) (i).

2 Permittee shall install a type accepted transmitter, or submit application (FCC Form 301) along with data prescribed in Section 73.1660(b) should non-type accepted transmitter be proposed.

3 Before program tests are authorized, sufficient data shall be submitted to show that adequate filters, traps and other equipment has been installed and adjusted to prevent interaction, intermodulation and/or generation of spurious radiation products which may be caused by common usage of the same antenna system by Stations KMBZ and KCCV ID# 6491 and there shall be filed with the license application copies of a firm agreement entered into by the two stations involved clearly fixing the responsibility of each with regard to the installation and maintenance of such equipment. In addition, field observations shall be made to determine whether spurious emissions exist and any objectionable problems resulting therefrom shall be eliminated. Following construction, and prior to authorization of program test under this grant, both stations shall each measure antenna or common point resistance and submit FCC Form 302 as application notifying the return to direct measurement of power.

4 A license application (FCC Form 302) to cover this construction permit must be filed with the Commission pursuant to Section 73.3536 of the Rules before the permit expires.

5 Licensee shall be responsible for satisfying all reasonable complaints of blanketing interference within the 1 V/m contour as required by Section 73.88 of the Commission's rules.

6 Ground system consists of 120 equally spaced, buried, copper radials about the base of each tower, each 98.6 meters in length except where intersecting radials are shortened and bonded to a transverse copper strap between adjacent towers,

*** END OF AUTHORIZATION ***