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)

Audacy, Inc.

MAILING ADDRESS (Line 1) (Maximum 35 characters)
2400 Market Street, 4th Floor

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Philadelphia	PA	19103

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
610-660-5610	KIFM	67848

2. A. Is a fee submitted with this application? [X] 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
M M R	0 0 0 1	$ 720.00	

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
M O R	0 0 0 1	$ 1405.00	

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
$ 2125.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT Audacy License, LLC		
MAILING ADDRESS 2400 Market Street, 4th Floor		
CITY Philadelphia	STATE PA	ZIP CODE 19103

2. This application is for:

[X] Commercial [ ] Noncommercial

[X] 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
KIFM	West Sacramento, CA	BP-20210903AAF		12/23/24

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

[ ] Yes [X] No

If No, explain in an Exhibit.

Exhibit No. AM Directional Antenna

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

[X] 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 [X] 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

[X] 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 [X] 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	
Laura Berman		
Title	Date	Telephone Number
Vice President, Legal	July 6, 2023	202-571-6555

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

Audacy 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
KIFM	BP-20210903AAF	1320	Unlimited	0.62	5.0

2. Station location

State	City or Town
California	West Sacramento

3. Transmitter location

State	County	City or Town	Street address (or other identification)
CA	Sacramento	Sacramento	3802 Garden Highway

4. Main studio location

State	County	City or Town	Street address (or other identification)
CA	Placer	Roseville	3010 Lava Ridge Ct #220

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

State	County	City or Town	Street address (or other identification)
CA	Placer	Roseville	3010 Lava Ridge Ct #220

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
3.66	10.4

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	j0	j0

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	0	-157.5	1.0	0.476		
2	13.9	-83.3	0.647	0.227		
3	-40.1	0	0.833	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.
Uniform cross-section guyed towers	#1 114.3 #2 124.0 #3 57.3	#1 156.0 #2 126.5 #3 60.3	#1 156.0 #2 126.5 #3 60.3	Exhibit No.

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	West Longitude
38 ° 38 ' 11"	121 ° 33 ' 09"

If not fully described above, attach as an Exhibit further details and dimensions including any other antenna mounted on tower and associated isolation circuits. Exhibit No.

Also, if necessary for a complete description, attach as an Exhibit a sketch of the details and dimensions of ground system. As specified in BP-20210903AAF 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?

None

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

Relocation of nighttime operation to licensed daytime transmitter site.

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 June 22, 2023
	Telephone No. (Include Area Code) (206) 783-9151

[ ] Technical Director

[X] Registered Professional Engineer

[ ] Chief Operator

[ ] Technical Consultant

[ ] Other (specify)

STEPHEN S. LOCKWOOD, PE, PMP
———
THOMAS M. ECKELS, PE
ERIK C. SWANSON, PE, PMP
THOMAS S. GORTON, PE
———
JAMES B. HATFIELD, PE
BENJAMIN F. DAWSON III, PE
STEPHEN PUMPLE, M.Eng, MBA, PMP
CONSULTANTS

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

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
and
Method of Moments Proof of Performance

KIFM(AM)
West Sacramento, CA
Facility ID 67848

1320 kHz
5 kW Day, 0.62 kW Night, DA-2

Audacy License, LLC

June 2023

APPLICATION FOR LICENSE

RADIO STATION KIFM(AM) West Sacramento, CA

1320 kHz 5 kW D, 0.62 kW N, 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 Geometry Statement
Item 6	Ground System
Item 7	Sampling System Measurements
Item 8	Reference Field Strength Measurements

Purpose of Application

This engineering exhibit supports an application by Audacy License, LLC. for a modified station license for radio station KIFM(AM) West Sacramento (Facility ID 67848). Construction Permit BP-20210903AAF provides for continued operation on 1320 kHz with separate day and night directional antenna configurations. A new method of moments proof of performance is now being submitted following the installation of the new nighttime directional antenna equipment from this site, the site of the licensed daytime operation.

Information is provided herein demonstrating that the directional antenna parameters for the patterns authorized by the KIFM license and construction permit, BL-20110118ADU and BP-20210903AAF have been determined in accordance with the requirements of section §73.151 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 Kurt Gorman. Analysis and preparation of this report were performed by Benjamin F. Dawson, P.E.

Item 1

Analysis of Tower Impedance Measurements to Verify Method of Moments Model

Tower base impedance measurements were made at the locations of the sample system current transformers using a Hewlett-Packard 8753 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.

KIFM Measured "Reference Point" Impedances

Tower	Resistance	Reactance
1 (SW)	68.9	-J 215.3
2 (N)	42.8	-J 182.2
3 (S)	65.9	+j 83.1

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_S and X_C was used in the moment method model as a load at ground level (lumped load) for the open circuited towers. Static drain inductor values are greater than +/- 50K ohms and were therefore not included in the model.

Item 2

Method of Moments Model Details for Towers Driven Individually - KIFM

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 or 30 wire segments, as appropriate. As the tallest tower in the KIFM model is 196.6 electrical degrees in height, and using 30 segments the maximum segment length is 6.55 electrical degrees. The isolated upper section of tower 1 was modeled with 40 segments to obtain an accurate location for its current minimum when properly detuned.

Each tower's modeled electrical height relative to its physical height falls within the required range of 75 to 125 percent of the actual physical tower height. The towers are triangular with various face widths., and each was modeled at its physical equivalent radius.

KIFM Tower Dimensions - Physical and Electrical

Tower	Physical Height (degrees)	Electrical Height (degrees)	Modeled Height (percent)	Modeled Radius (meters)	Modeled Radius (percent)
1 (SW)	181.2	195.2	107.73	0.363	100
2 (N)	196.6	209.32	106.47	0.291	100
3 (S)	90.8	95.81	105.52	0.218	100

The tower employed as element 1 in the daytime and nighttime directional antenna systems for KIFM is insulated at 114.3 meters above the base insulator, and the upper portion supports an FM antenna. The FM antenna and the top aviation lighting are fed by an isocoupler and an “Austin” transformer respectively at the sectionalized location. In previous license applications for operation of KIFM the series capacitance of the three items at the sectionalization location (insulators, isocoupler, lighting transformer, in parallel) were not properly compensated for minimum current to the upper section. Moment method calculations of this situation showed clearly that there was substantial current and far field contribution from the uncompensated upper section.

Consequently an analysis of the necessary reactance to actually isolate the upper section was performed, and this study determined that a reactance of +J 2600 ohms would produce current moment contribution from the upper tower section to the far field of both daytime and nighttime directional patterns of less than 1%. A suitable inductor was installed to produce this resulting total reactance, and its value was set by magnetic field measurement of the minimum value at the height of the current minimum shown in the moment method analysis. The base impedance measurements used in this proof of performance were made subsequent to the installation and adjustment of this inductance.

The moment method analysis to match the base impedance measurements show that the lower, radiating, portion of the tower is 195.2 electrical degrees in height. The portion of 73.151(c)(2)(I) regarding sample devices states: *"Samples may be obtained from current transformers at the output of the antenna coupling and matching equipment for base-fedtowers whose actual electrical height is 120 degrees or less, or greater than 190 electrical degrees."*The use of the explicit "actual electrical height" and "electrical degrees" terms comes about from the studies performed for the rulemaking comments on sample device suitability prepared by Ronald Rackley and Matthew Folkert (and reviewed by the undersigned before its filing) which based the sampling device recommendations on moment method analysis using the electrical height of the cases studied.

KIFM MININEC Model Node and Wire Numbering

Tower	Wire Number	Base Node Number
1 (SW)	1	1
2 (N)	3	71
3 (S)	4	101

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

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

C:\KIFM 3k 12-04-2022   14:50:34

kIFM Basic Model

GEOMETRY
Dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.363	30
		0	0	123.15		
2	none	0	0	123.15	.363	40
		0	0	168.09		
3	none	135.3	27.5	0	.291	30
		135.3	27.5	132.06		
4	none	79.175	61.8	0	.218	20
		79.175	61.8	60.45		

Number of wires   = 4
          current nodes = 120

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	2	1.1235	3	4.402
segment/radius ratio	2	3.09504	3	15.1272
radius	4	.218	1	.363

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.32	0	1	4.95E-03	.0193817

Sources

source	node	sector	magnitude	phase	type
1	1	1	962.497	74.7	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	31	0	2,600.	0	0	0
2	101	0	-6,030.	0	0	0
3	71	0	-726.	0	0	0

C:\KIFM 3k 12-04-2022   14:50:34

IMPEDANCE
   normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.32	180.28	-406.2	444.41	293.9	22.142	-.78508	-7.8153

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

```
C:\KIFM 3l  12-04-2022   14:56:54

kIFM Basic Model

GEOMETRY
Dimensions in meters
Environment: perfect ground

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0            0            .363         30
           0            0            123.15
 2    none 0            0            123.15       .363         40
           0            0            168.09
 3    none 135.3        27.5         0            .291         30
           135.3        27.5         132.06
 4    none 79.175       61.8         0            .218         20
           79.175       61.8         60.45

Number of wires          =  4
          current nodes  =  120

                         minimum                  maximum
Individual wires      wire    value             wire  value
segment length         2      1.1235             3    4.402
segment/radius ratio   2      3.09504            3    15.1272
radius                 4      .218               1    .363


ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                no. of  segment length (wavelengths)
 no. lowest       step         steps   minimum        maximum
 1   1.32         0             1      4.95E-03       .0193817

Sources
source node    sector  magnitude      phase          type
 1      71      1      962.497        74.7           voltage

Lumped loads
             resistance    reactance     inductance  capacitance passive
load  node   (ohms)        (ohms)        (mH)        (uF)        circuit
 1     31    0             2,600.        0           0            0
 2     101   0             -6,030.       0           0            0
 3     1     0             -681.         0           0            0

C:\KIFM 3l  12-04-2022   14:56:54

IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(MHz)    (ohms)   (ohms)   (ohms)   (deg)            dB       dB
source =  1; node 71, sector 1
1.32     84.673   -298.58  310.36   285.8    23.299  -.74606  -8.0178
```

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

```
C:\KIFM 3j  12-04-2022   14:39:41

kIFM Basic Model

GEOMETRY
Dimensions in meters
Environment: perfect ground

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0            0            .363         30
           0            0            123.15
 2    none 0            0            123.15       .363         40
           0            0            168.09
 3    none 135.3        27.5         0            .291         30
           135.3        27.5         132.06
 4    none 79.175       61.8         0            .218         20
           79.175       61.8         60.45

Number of wires          =  4
          current nodes  =  120

                         minimum                  maximum
Individual wires      wire    value             wire  value
segment length         2      1.1235             3    4.402
segment/radius ratio   2      3.09504            3    15.1272
radius                 4      .218               1    .363


ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                no. of  segment length (wavelengths)
 no. lowest       step         steps   minimum        maximum
 1   1.32         0             1      4.95E-03       .0193817

Sources
source node    sector  magnitude      phase          type
 1      101     1      962.497        74.7           voltage

Lumped loads
             resistance    reactance     inductance  capacitance passive
load  node   (ohms)        (ohms)        (mH)        (uF)        circuit
 1     31    0             2,600.        0           0            0
 2     1     0             -681.         0           0            0
 3     71    0             -726.         0           0            0

C:\KIFM 3j  12-04-2022   14:39:41

IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(MHz)    (ohms)   (ohms)   (ohms)   (deg)             dB       dB
source =  1; node 101, sector 1
1.32     64.882   42.256   77.429   33.1     2.1545  -8.7306  -.62457
```

Item 3

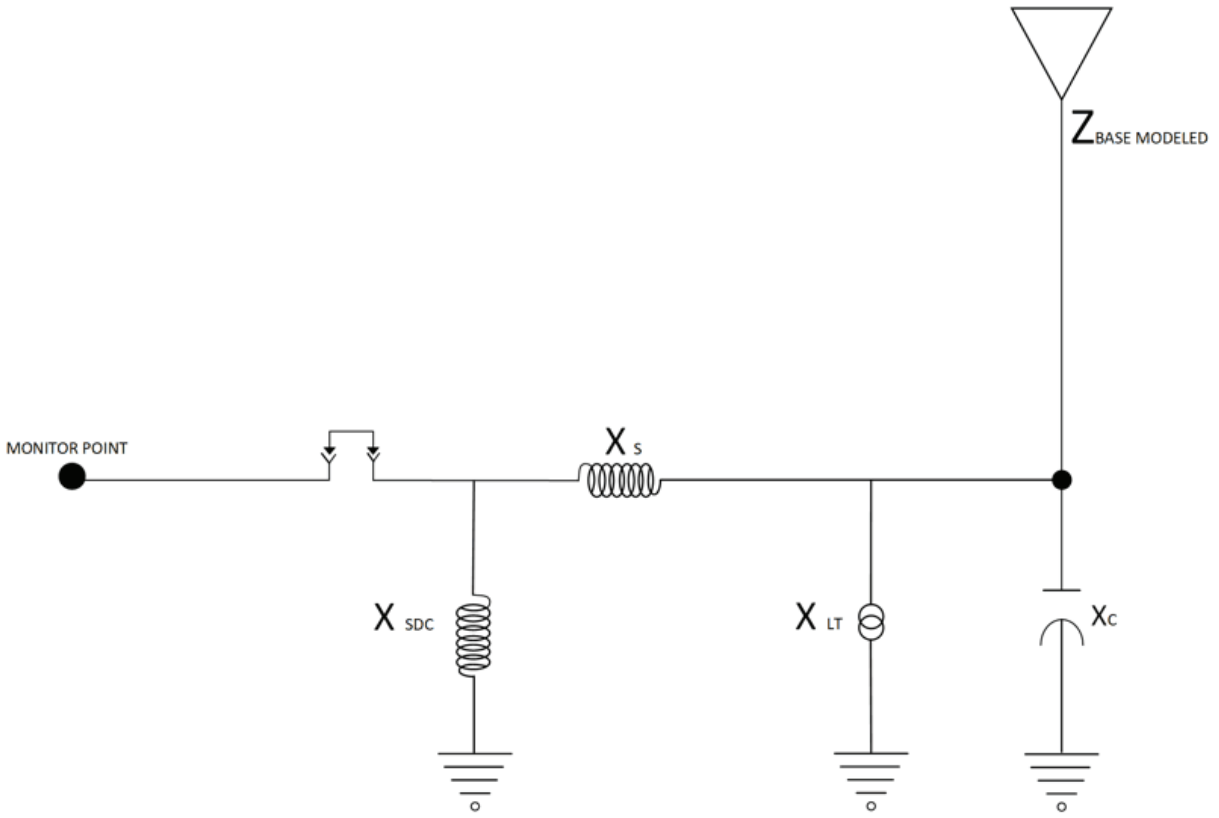
Method of Moments Model Details for Directional Antenna- KIFM

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

The value used for X_{SDC} is based on measurements of the actual devices in use.

In all cases, the modeled impedance at the measurement point is within two ohms of the measured impedance at that point.



Tower	X_{SDC} (Ohms)	X_S (Ohms)	X_{LT} (Ohms)	X_C (Ohms)	Z Base Modeled	Z MP Modeled	Z MP Measured
1 (SW)	>50K	+J 50.55	Included	-J 681	180.28 -J 406.2	68.8 -J 215.3	68.9 -J 215.3
2 (N)	>50K	+J 32.8	In Xc	-J 726	84.67 -J 298.58	42.2 -J 182.3	42.8 -J 182.2
3 (S)	>50K	+J 41.3	No Lighting	-J 6030	64.88 +J 42.26	65.79 +J 83.1	65.9 +J 83.1

#1 Zbase Xc 24 pF lighting transformer) from mfg data
35 pF insulator) " " "
118 pF FM isocoupler) measured

#2 Zbase Xc 24 pF lighting transformer) from mfg data
24 pF insulator) " " "
118 pF FM isocoupler) measured

#3 Zbase Xc 20 pF insulator) from mfg data

KIFM Driven Array - Day Pattern

```
C:\KIFM 3n  12-04-2022   15:13:35

kIFM Basic Model

GEOMETRY
Dimensions in meters
Environment: perfect ground

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0            0            .363         30
           0            0            123.15
 2    none 0            0            123.15       .363         40
           0            0            168.09
 3    none 135.3        27.5         0            .291         30
           135.3        27.5         132.06
 4    none 79.175       61.8         0            .218         20
           79.175       61.8         60.45

Number of wires          =  4
          current nodes  =  120

                         minimum                  maximum
Individual wires      wire    value             wire  value
segment length         2      1.1235             3    4.402
segment/radius ratio   2      3.09504            3    15.1272
radius                 4      .218               1    .363


ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                no. of  segment length (wavelengths)
 no. lowest       step         steps   minimum        maximum
 1   1.32         0             1      4.95E-03       .0193817

Sources
source node    sector  magnitude      phase          type
 1      1       1      1,677.9        80.5           voltage
 2      71      1      700.278        120.6          voltage
 3      101     1      926.293        335.4          voltage

Lumped loads
             resistance    reactance     inductance  capacitance passive
load  node   (ohms)        (ohms)        (mH)        (uF)        circuit
 1     31    0             2,600.        0           0            0

C:\KIFM 3n  12-04-2022   15:13:35

IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(MHz)    (ohms)   (ohms)   (ohms)   (deg)            dB       dB
source =  1; node 1, sector 1
1.32     371.92   -574.6   684.46   302.9    25.288  -.68733  -8.3454

source =  2; node 71, sector 1
1.32     -179.5   -332.19  377.59   241.6    ****    ****     ****

source =  3; node 101, sector 1
```

1.32 84.544 38.811 93.027 24.7 2.1799 -8.6115 -.64328

C:\KIFM 3n 12-04-2022 15:13:35

CURRENT rms
Frequency = 1.32 MHz
Input power = 5,000. watts
Efficiency = 100. %
coordinates in meters

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.73342	137.6	-1.28066	1.16819
2	0	0	4.105	1.02783	104.5	-.257085	.995154
3	0	0	8.21	.965394	65.4	.401775	.877817
4	0	0	12.315	1.25277	37.8	.990346	.767225
5	0	0	16.42	1.66892	23.3	1.53311	.659451
6	0	0	20.525	2.11248	15.2	2.03875	.55326
7	0	0	24.63	2.54886	10.1	2.50907	.448614
8	0	0	28.735	2.9634	6.7	2.94314	.345984
9	0	0	32.84	3.3478	4.2	3.33874	.246097
10	0	0	36.945	3.6962	2.3	3.69316	.149807
11	0	0	41.05	4.00396	.8	4.00354	.0580237
12	0	0	45.155	4.26722	359.6	4.26712	-.0283331
13	0	0	49.26	4.48269	358.6	4.48138	-.108366
14	0	0	53.365	4.64773	357.8	4.6442	-.181228
15	0	0	57.47	4.76021	357.	4.75385	-.24614
16	0	0	61.575	4.81861	356.4	4.80911	-.302409
17	0	0	65.68	4.82201	355.8	4.80933	-.349443
18	0	0	69.785	4.77008	355.3	4.75438	-.386759
19	0	0	73.89	4.66308	354.9	4.64467	-.41399
20	0	0	77.995	4.50186	354.5	4.48119	-.430891
21	0	0	82.1	4.28784	354.1	4.26548	-.437336
22	0	0	86.205	4.02294	353.8	3.99953	-.43332
23	0	0	90.31	3.70952	353.5	3.68579	-.418943
24	0	0	94.415	3.35033	353.2	3.32704	-.394407
25	0	0	98.52	2.94833	353.	2.92627	-.359985
26	0	0	102.625	2.50645	352.8	2.48645	-.315981
27	0	0	106.73	2.0272	352.6	2.01011	-.262669
28	0	0	110.835	1.5118	352.4	1.49849	-.20013
29	0	0	114.94	.957806	352.3	.949235	-.127848
30	0	0	119.045	.35446	352.9	.351731	-.0439022
END	0	0	123.15	.479395	170.	-.472149	.0830349
2J1	0	0	123.15	.479395	170.	-.472149	.0830349
32	0	0	124.274	.261827	170.9	-.258534	.041397
33	0	0	125.397	.206363	172.2	-.204471	.0278799
34	0	0	126.521	.159712	174.2	-.1589	.0160902
35	0	0	127.644	.125223	177.	-.12505	6.59E-03
36	0	0	128.768	.0979056	180.9	-.097894	-1.51E-03
37	0	0	129.891	.0760555	186.4	-.0755763	-8.52E-03
38	0	0	131.015	.0587547	194.5	-.0568935	-.0146714
39	0	0	132.138	.0457187	206.1	-.0410689	-.0200884
40	0	0	133.262	.0371244	222.1	-.0275616	-.0248712
41	0	0	134.385	.03319	241.2	-.0159784	-.0290907
42	0	0	135.509	.0333489	259.6	-6.02E-03	-.0328007
43	0	0	136.632	.0361327	274.	2.54E-03	-.0360435
44	0	0	137.756	.0400913	284.3	9.88E-03	-.0388537
45	0	0	138.879	.0443133	291.4	.0161657	-.0412594
46	0	0	140.003	.048332	296.4	.0215045	-.0432844
47	0	0	141.126	.0519283	300.	.0260025	-.044949

48	0	0	142.25	.0550076	302.7	.029746	-.0462711
49	0	0	143.373	.057537	304.8	.0328089	-.0472661
50	0	0	144.497	.0595139	306.3	.0352548	-.0479479
51	0	0	145.62	.0609508	307.5	.037139	-.048329
52	0	0	146.744	.0618675	308.5	.03851	-.0484207
53	0	0	147.867	.0622866	309.3	.0394106	-.048233
54	0	0	148.991	.0622319	309.9	.0398786	-.0477756
55	0	0	150.114	.0617264	310.3	.0399475	-.0470568
56	0	0	151.238	.0607925	310.7	.0396476	-.0460847
57	0	0	152.361	.059451	311.	.0390057	-.0448662
58	0	0	153.485	.0577212	311.2	.0380457	-.043408
59	0	0	154.608	.0556205	311.4	.0367892	-.0417157
60	0	0	155.732	.0531649	311.5	.0352551	-.0397942
61	0	0	156.855	.0503676	311.6	.0334601	-.0376473
62	0	0	157.979	.0472403	311.7	.0314185	-.0352778
63	0	0	159.102	.0437913	311.7	.029142	-.0326867
64	0	0	160.226	.0400258	311.7	.0266395	-.0298731
65	0	0	161.349	.035944	311.7	.0239161	-.0268326
66	0	0	162.473	.0315392	311.7	.0209721	-.0235562
67	0	0	163.596	.0267932	311.6	.0177994	-.0200264
68	0	0	164.72	.0216698	311.6	.0143781	-.0162126
69	0	0	165.843	.0160548	311.5	.0106367	-.0120257
70	0	0	166.967	.0100234	311.4	6.63E-03	-7.52E-03
END	0	0	168.09	0	0	0	0
GND	120.013	-62.4746	0	1.3114	238.9	-.676444	-1.12347
72	120.013	-62.4746	4.402	.966293	250.7	-.319424	-.91197
73	120.013	-62.4746	8.804	.763268	265.	-.0661665	-.760395
74	120.013	-62.4746	13.206	.640106	285.5	.17128	-.616765
75	120.013	-62.4746	17.608	.622573	310.1	.400843	-.476363
76	120.013	-62.4746	22.01	.710002	331.6	.624369	-.338033
77	120.013	-62.4746	26.412	.865231	346.5	.841316	-.202021
78	120.013	-62.4746	30.814	1.05238	356.2	1.0501	-.0691693
79	120.013	-62.4746	35.216	1.25011	2.7	1.2487	.0593971
80	120.013	-62.4746	39.618	1.44635	7.2	1.4348	.182422
81	120.013	-62.4746	44.02	1.6336	10.5	1.60607	.298605
82	120.013	-62.4746	48.422	1.80657	13.	1.76021	.406656
83	120.013	-62.4746	52.824	1.96125	14.9	1.89503	.505336
84	120.013	-62.4746	57.226	2.09434	16.5	2.00849	.593487
85	120.013	-62.4746	61.628	2.20317	17.7	2.09881	.670059
86	120.013	-62.4746	66.03	2.28556	18.7	2.16445	.734126
87	120.013	-62.4746	70.432	2.33975	19.6	2.20417	.784903
88	120.013	-62.4746	74.834	2.36443	20.3	2.21704	.821758
89	120.013	-62.4746	79.236	2.35871	21.	2.20246	.844222
90	120.013	-62.4746	83.638	2.32212	21.5	2.16016	.852008
91	120.013	-62.4746	88.04	2.25459	22.	2.09026	.844986
92	120.013	-62.4746	92.442	2.15645	22.4	1.99314	.8232
93	120.013	-62.4746	96.844	2.02839	22.8	1.86954	.786876
94	120.013	-62.4746	101.246	1.87143	23.2	1.72047	.736374
95	120.013	-62.4746	105.648	1.68688	23.5	1.54716	.6722
96	120.013	-62.4746	110.05	1.47616	23.8	1.35096	.594938
97	120.013	-62.4746	114.452	1.24073	24.	1.13322	.505198
98	120.013	-62.4746	118.854	.981701	24.3	.894964	.403456
99	120.013	-62.4746	123.256	.698903	24.5	.636041	.289684
100	120.013	-62.4746	127.658	.388608	24.7	.35307	.162351
END	120.013	-62.4746	132.06	0	0	0	0
GND	37.4142	-69.7772	0	7.04088	310.8	4.59964	-5.33079
102	37.4142	-69.7772	3.0225	7.18498	308.1	4.43021	-5.6566
103	37.4142	-69.7772	6.045	7.23154	306.4	4.29485	-5.81803
104	37.4142	-69.7772	9.0675	7.22105	305.1	4.15121	-5.90856
105	37.4142	-69.7772	12.09	7.15744	303.9	3.99513	-5.93867

106	37.4142	-69.7772	15.1125	7.04267	302.9	3.82524	-5.91327
107	37.4142	-69.7772	18.135	6.87809	302.	3.64135	-5.83512
108	37.4142	-69.7772	21.1575	6.66494	301.1	3.44386	-5.70625
109	37.4142	-69.7772	24.18	6.40459	300.3	3.23347	-5.52843
110	37.4142	-69.7772	27.2025	6.09853	299.6	3.01107	-5.30335
111	37.4142	-69.7772	30.225	5.74844	298.9	2.77773	-5.03277
112	37.4142	-69.7772	33.2475	5.35613	298.2	2.53458	-4.71848
113	37.4142	-69.7772	36.27	4.92352	297.6	2.2828	-4.36232
114	37.4142	-69.7772	39.2925	4.45257	297.	2.02358	-3.96617
115	37.4142	-69.7772	42.315	3.94518	296.5	1.75807	-3.53181
116	37.4142	-69.7772	45.3375	3.40297	295.9	1.48727	-3.06076
117	37.4142	-69.7772	48.36	2.82693	295.4	1.21193	-2.55397
118	37.4142	-69.7772	51.3825	2.2167	294.9	.932222	-2.01115
119	37.4142	-69.7772	54.405	1.56859	294.4	.647057	-1.42891
120	37.4142	-69.7772	57.4275	.870536	293.9	.352083	-.79616
END	37.4142	-69.7772	60.45	0	0	0	0

C:\KIFM 3n 12-04-2022 15:13:40

CURRENT MOMENTS(amp-meters) rms

Frequency = 1.32 MHz
Input power = 5,000. watts

			vertical current moment	
wire	magnitude	phase (deg)	magnitude	phase (deg)
1	507.759	.2	507.759	.2
2	1.85755	243.	1.85755	243.
3	248.386	12.5	248.386	12.5
4	429.354	301.4	429.354	301.4

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

tower	magnitude	phase (deg)
1	506.912	360.
2	248.386	12.5
3	429.354	301.4

KIFM Driven Array - Night Pattern

```
C:\KIFM 3m  12-04-2022   15:04:42

kIFM Basic Model

GEOMETRY
Dimensions in meters
Environment: perfect ground

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0            0            .363         30
           0            0            123.15
 2    none 0            0            123.15       .363         40
           0            0            168.09
 3    none 135.3        27.5         0            .291         30
           135.3        27.5         132.06
 4    none 79.175       61.8         0            .218         20
           79.175       61.8         60.45

Number of wires          =  4
          current nodes  =  120

                         minimum                  maximum
Individual wires      wire    value             wire  value
segment length         2      1.1235             3    4.402
segment/radius ratio   2      3.09504            3    15.1272
radius                 4      .218               1    .363


ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                no. of  segment length (wavelengths)
 no. lowest       step         steps   minimum        maximum
 1   1.32         0             1      4.95E-03       .0193817

Sources
source node    sector  magnitude      phase          type
 1      1       1      973.863        74.1           voltage
 2      71      1      533.971        82.7           voltage
 3      101     1      164.991        191.1          voltage

Lumped loads
             resistance    reactance     inductance  capacitance passive
load  node   (ohms)        (ohms)        (mH)        (uF)        circuit
 1     31    0             2,600.        0           0            0

C:\KIFM 3m  12-04-2022   15:04:42

IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(MHz)    (ohms)   (ohms)   (ohms)   (deg)            dB       dB
source =  1; node 1, sector 1
1.32     169.69   -374.82  411.44   294.4    20.197  -.86082  -7.452

source =  2; node 71, sector 1
1.32     78.194   -307.1   316.9    284.3    26.288  -.66114  -8.5013

source =  3; node 101, sector 1
```

1.32 6.895 52.36 52.812 82.5 15.276 -1.1388 -6.3703

C:\KIFM 3m 12-04-2022 15:04:42

CURRENT rms
Frequency = 1.32 MHz
Input power = 620. watts
Efficiency = 100. %
coordinates in meters

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.6737	139.7	-1.27677	1.08219
2	0	0	4.105	1.15031	127.3	-.697139	.914997
3	0	0	8.21	.865361	111.9	-.322893	.802864
4	0	0	12.315	.698416	89.	.0125727	.698303
5	0	0	16.42	.679224	61.6	.323137	.597434
6	0	0	20.525	.79099	39.1	.613758	.498965
7	0	0	24.63	.972795	24.5	.885511	.402742
8	0	0	28.735	1.17915	15.2	1.13792	.309087
9	0	0	32.84	1.38712	9.1	1.36979	.218549
10	0	0	36.945	1.58515	4.8	1.57966	.131792
11	0	0	41.05	1.76667	1.6	1.76597	.0495242
12	0	0	45.155	1.92741	359.2	1.92721	-.0275363
13	0	0	49.26	2.06439	357.3	2.06203	-.0986917
14	0	0	53.365	2.17539	355.7	2.16925	-.163282
15	0	0	57.47	2.25875	354.4	2.24794	-.220704
16	0	0	61.575	2.31329	353.3	2.29743	-.270416
17	0	0	65.68	2.33826	352.3	2.31736	-.311953
18	0	0	69.785	2.33327	351.5	2.30763	-.344934
19	0	0	73.89	2.29829	350.8	2.26846	-.369061
20	0	0	77.995	2.23365	350.1	2.20038	-.384125
21	0	0	82.1	2.14001	349.5	2.10418	-.390013
22	0	0	86.205	2.01831	349.	1.98092	-.386693
23	0	0	90.31	1.86974	348.5	1.83191	-.374219
24	0	0	94.415	1.69572	348.	1.65863	-.352717
25	0	0	98.52	1.4978	347.6	1.46269	-.322365
26	0	0	102.625	1.27753	347.2	1.2457	-.283363
27	0	0	106.73	1.03625	346.8	1.00905	-.235865
28	0	0	110.835	.774665	346.6	.753501	-.179842
29	0	0	114.94	.491561	346.5	.477991	-.114701
30	0	0	119.045	.181459	347.7	.177323	-.0385205
END	0	0	123.15	.250783	161.8	-.23823	.0783496
2J1	0	0	123.15	.250783	161.8	-.23823	.0783496
32	0	0	124.274	.136069	163.6	-.130551	.0383568
33	0	0	125.397	.106336	166.5	-.103381	.0248949
34	0	0	126.521	.0815835	170.8	-.0805275	.0130842
35	0	0	127.644	.0637088	176.9	-.0636151	3.45E-03
36	0	0	128.768	.0503375	185.5	-.0501058	-4.82E-03
37	0	0	129.891	.0408783	197.2	-.0390596	-.0120577
38	0	0	131.015	.0351023	211.7	-.0298667	-.0184433
39	0	0	132.138	.0327279	227.4	-.0221323	-.0241097
40	0	0	133.262	.0330494	241.9	-.0155807	-.0291463
41	0	0	134.385	.035077	253.4	-.0100102	-.0336184
42	0	0	135.509	.0379429	262.	-5.27E-03	-.0375754
43	0	0	136.632	.0410748	268.3	-1.23E-03	-.0410563
44	0	0	137.756	.044146	272.8	2.18E-03	-.044092
45	0	0	138.879	.0469822	276.2	5.07E-03	-.046708
46	0	0	140.003	.0494943	278.7	7.48E-03	-.0489258
47	0	0	141.126	.0516401	280.6	9.47E-03	-.0507635

48	0	0	142.25	.0534029	282.	.0110989	-.0522368
49	0	0	143.373	.0547797	283.1	.0123925	-.0533596
50	0	0	144.497	.0557754	283.9	.0133904	-.0541442
51	0	0	145.62	.0563984	284.5	.0141233	-.0546014
52	0	0	146.744	.0566596	285.	.0146184	-.0547413
53	0	0	147.867	.0565703	285.3	.0148999	-.0545728
54	0	0	148.991	.0561424	285.5	.0149897	-.0541043
55	0	0	150.114	.0553872	285.6	.0149075	-.0533433
56	0	0	151.238	.0543155	285.7	.0146709	-.0522967
57	0	0	152.361	.0529377	285.7	.0142965	-.0509707
58	0	0	153.485	.0512631	285.6	.0137989	-.049371
59	0	0	154.608	.0493002	285.5	.0131918	-.0475025
60	0	0	155.732	.0470563	285.4	.0124875	-.0453691
61	0	0	156.855	.0445376	285.2	.0116973	-.0429741
62	0	0	157.979	.0417486	285.	.0108315	-.040319
63	0	0	159.102	.038692	284.8	9.9E-03	-.0374041
64	0	0	160.226	.0353675	284.6	8.91E-03	-.0342269
65	0	0	161.349	.0317711	284.3	7.87E-03	-.0307815
66	0	0	162.473	.0278931	284.1	6.78E-03	-.0270565
67	0	0	163.596	.0237136	283.8	5.65E-03	-.0230306
68	0	0	164.72	.0191968	283.5	4.48E-03	-.0186677
69	0	0	165.843	.0142382	283.2	3.24E-03	-.0138639
70	0	0	166.967	8.9E-03	282.8	1.97E-03	-8.68E-03
END	0	0	168.09	0	0	0	0
GND	120.013	-62.4746	0	1.19146	158.4	-1.10792	.438256
72	120.013	-62.4746	4.402	.888756	153.4	-.794958	.397403
73	120.013	-62.4746	8.804	.681516	147.4	-.574368	.36683
74	120.013	-62.4746	13.206	.499352	137.6	-.368802	.336655
75	120.013	-62.4746	17.608	.350616	119.2	-.171153	.306004
76	120.013	-62.4746	22.01	.27545	85.8	.0204056	.274693
77	120.013	-62.4746	26.412	.318198	49.7	.205646	.242816
78	120.013	-62.4746	30.814	.437504	28.8	.383486	.210591
79	120.013	-62.4746	35.216	.580511	17.9	.552452	.178297
80	120.013	-62.4746	39.618	.725792	11.6	.710905	.14625
81	120.013	-62.4746	44.02	.864807	7.6	.857156	.114783
82	120.013	-62.4746	48.422	.993161	4.9	.989583	.0842342
83	120.013	-62.4746	52.824	1.10801	2.8	1.10665	.0549395
84	120.013	-62.4746	57.226	1.20728	1.3	1.20697	.0272277
85	120.013	-62.4746	61.628	1.28933	.1	1.28933	1.41E-03
86	120.013	-62.4746	66.03	1.35291	359.1	1.35273	-.0222126
87	120.013	-62.4746	70.432	1.39708	358.2	1.3964	-.0433761
88	120.013	-62.4746	74.834	1.42115	357.5	1.41981	-.061835
89	120.013	-62.4746	79.236	1.42477	356.9	1.42267	-.0773773
90	120.013	-62.4746	83.638	1.40781	356.3	1.40494	-.0898238
91	120.013	-62.4746	88.04	1.37045	355.9	1.36687	-.0990339
92	120.013	-62.4746	92.442	1.31309	355.4	1.30889	-.104902
93	120.013	-62.4746	96.844	1.23637	355.	1.2317	-.107364
94	120.013	-62.4746	101.246	1.14116	354.7	1.13619	-.106389
95	120.013	-62.4746	105.648	1.02849	354.3	1.02342	-.101985
96	120.013	-62.4746	110.05	.899478	354.	.894533	-.0941853
97	120.013	-62.4746	114.452	.755258	353.7	.750679	-.0830399
98	120.013	-62.4746	118.854	.596735	353.4	.592781	-.0685847
99	120.013	-62.4746	123.256	.424079	353.1	.421029	-.0507713
100	120.013	-62.4746	127.658	.235288	352.9	.23346	-.0292739
END	120.013	-62.4746	132.06	0	0	0	0
GND	37.4142	-69.7772	0	2.20909	108.6	-.703079	2.09422
102	37.4142	-69.7772	3.0225	2.269	108.3	-.713966	2.15374
103	37.4142	-69.7772	6.045	2.2903	108.2	-.715989	2.17551
104	37.4142	-69.7772	9.0675	2.29118	108.1	-.712672	2.17752
105	37.4142	-69.7772	12.09	2.27377	108.	-.704432	2.1619

106	37.4142	-69.7772	15.1125	2.23915	108.	-.691483	2.12971
107	37.4142	-69.7772	18.135	2.18801	107.9	-.673971	2.08163
108	37.4142	-69.7772	21.1575	2.12094	107.9	-.65202	2.01823
109	37.4142	-69.7772	24.18	2.03848	107.9	-.625755	1.94006
110	37.4142	-69.7772	27.2025	1.94125	107.9	-.595303	1.84771
111	37.4142	-69.7772	30.225	1.82982	107.8	-.560801	1.74176
112	37.4142	-69.7772	33.2475	1.70485	107.8	-.522393	1.62284
113	37.4142	-69.7772	36.27	1.56699	107.8	-.480226	1.49159
114	37.4142	-69.7772	39.2925	1.41691	107.9	-.434447	1.34867
115	37.4142	-69.7772	42.315	1.25525	107.9	-.385189	1.19469
116	37.4142	-69.7772	45.3375	1.08253	107.9	-.332558	1.03019
117	37.4142	-69.7772	48.36	.899104	107.9	-.276597	.855501
118	37.4142	-69.7772	51.3825	.704871	107.9	-.21721	.670569
119	37.4142	-69.7772	54.405	.498667	108.	-.153971	.474301
120	37.4142	-69.7772	57.4275	.276682	108.	-.0856258	.263099
END	37.4142	-69.7772	60.45	0	0	0	0

C:\KIFM 3m 12-04-2022 15:05:17

CURRENT MOMENTS(amp-meters) rms

Frequency = 1.32 MHz
Input power = 620. watts

			vertical current moment	
wire	magnitude	phase (deg)	magnitude	phase (deg)
1	222.994	.5	222.994	.5
2	2.04703	252.1	2.04703	252.1
3	130.079	5.	130.079	5.
4	136.749	108.	136.749	108.

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

tower	magnitude	phase (deg)
1	222.356	360.
2	130.079	5.
3	136.749	108.

Comparison of Current Moments with Theoretical Antenna Field Parameters - Day

Tower	Current Moment Magnitude	Current Moment Phase	Normalized Magnitude	Normalized Phase (Degrees)	Theoretical Ratio	Theoretical Phase (Degrees)
1 (SW)	506.912	360	1.0	0	1.0	0
2 (N)	248.386	12.5	0.49	12.5	0.49	12.5
3 (S)	429.354	301.4	0.847	-58.6	0.847	-58.6

Comparison of Current Moments with Theoretical Antenna Field Parameters - Night

Tower	Current Moment Magnitude	Current Moment Phase	Normalized Magnitude	Normalized Phase (Degrees)	Theoretical Ratio	Theoretical Phase (Degrees)
1 (SW)	222.356	360	1.0	0	1.0	0
2 (N)	130.079	5.0	0.585	5.0	0.585	5.0
3 (S)	136.748	108.0	0.615	108.0	0.615	108.0

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 KIFM station license.

Item 4

Derivation of Operating Parameters for Directional Antennas - KIFM

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.

```
**** 06/15/23 15:23:39 *********** Evaluation PSpice (Nov 1999) **************

 ## KIFM TOWER 1 DAY BASE MODEL


 ****     CIRCUIT DESCRIPTION

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



.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1320kHz 1320kHz

IIN             0               1       AC 3.3321 154.1
LXs             1               2               6.1uH
CXc             2               0               177pF
CL              2               3               209.836pf
Rbp             2               3               1000000ohms
RL              3               0               371.92ohms


 ****     AC ANALYSIS                        TEMPERATURE =   27.000 DEG C


  FREQ         IM(RL)       IP(RL)

   1.320E+06   1.733E+00   1.376E+02
```

**** 06/15/23 15:26:12 ********** Evaluation PSpice (Nov 1999) **************

 ## KIFM TOWER 2 DAY BASE MODEL

 ****   CIRCUIT DESCRIPTION

****

.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1320kHz 1320kHz

IIN	0	1	AC 1.938 -130.7
LXs	1	2	4uH
CXc	2	0	166pF
CL	2	3	362.96pf
Rbp	2	3	1000000ohms
RL	3	0	-179.5ohms

 ****   AC ANALYSIS   TEMPERATURE =   27.000 DEG C

  FREQ   IM(RL)   IP(RL)

   1.320E+06   1.311E+00 -1.211E+02

**** 06/15/23 15:19:14 ********** Evaluation PSpice (Nov 1999) **************

 ## KIFM TOWER 3 DAY BASE MODEL

 ****   CIRCUIT DESCRIPTION

****

.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1320kHz 1320kHz

IIN	0	1	AC 6.996 -48.4
LXs	1	2	5uH
CXc	2	0	20pF
LL	2	3	4.6795uH
Rbp	2	3	1000000ohms
RL	3	0	84.544ohms

 ****   AC ANALYSIS   TEMPERATURE =   27.000 DEG C

FREQ	IM(RL)	IP(RL)
1.320E+06	7.041E+00	-4.921E+01

KIFM TOWER 1 NIGHT BASE MODEL

**** CIRCUIT DESCRIPTION

****

.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1320kHz 1320kHz

IIN	0	1	AC 2.6287 148.8
LXs	1	2	6.1uH
CXc	2	0	177pF
CL	2	3	321.68pf
Rbp	2	3	1000000ohms
RL	3	0	169.69ohms

**** AC ANALYSIS TEMPERATURE = 27.000 DEG C

FREQ	IM(RL)	IP(RL)
1.320E+06	1.674E+00	1.397E+02

**** 06/15/23 15:38:29 ********** Evaluation PSpice (Nov 1999) **************

 ## KIFM TOWER 2 NIGHT BASE MODEL

 ****   CIRCUIT DESCRIPTION

****

.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1320kHz 1320kHz

IIN	0	1	AC 1.7 162.7
LXs	1	2	4uH
CXc	2	0	166pF
CL	2	3	392.615pf
Rbp	2	3	1000000ohms
RL	3	0	78.194ohms

 ****   AC ANALYSIS   TEMPERATURE =   27.000 DEG C

FREQ	IM(RL)	IP(RL)
1.320E+06	1.191E+00	1.584E+02

**** 06/15/23 15:41:59 ********** Evaluation PSpice (Nov 1999) **************

 ## KIFM TOWER 3 NIGHT BASE MODEL

 ****   CIRCUIT DESCRIPTION

****

.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 1320kHz 1320kHz

IIN	0	1	AC 2.1897 108.7
LXs	1	2	5uH
CXc	2	0	20pF
LL	2	3	6.3132uH
Rbp	2	3	1000000ohms
RL	3	0	6.895ohms

 ****   AC ANALYSIS   TEMPERATURE =   27.000 DEG C

FREQ	IM(RL)	IP(RL)
1.320E+06	2.209E+00	1.086E+02

Antenna Monitor Parameters - Day Pattern - KIFM

Tower	Ref Point Current Magnitude	Ref Point Current Phase (Degrees)	Normalized Magnitude	Normalized Phase (Degrees)
1 (SW)	3.3332	154.1	0.476	-157.5
2 (N)	1.938	-130.7	0.277	-82.3
3 (S)	6.996	-48.4	1.0	0.0

Antenna Monitor Parameters - Night Pattern - KIFM

Tower	Ref Point Current Magnitude	Ref Point Current Phase (Degrees)	Normalized Magnitude	Normalized Phase (Degrees)
1 (SW)	2.6287	148.8	1.0	0.0
2 (N)	1.70	162.7	0.647	13.9
3 (S)	2.1897	108.7	0.833	-40.1

Item 5
Summary of Post Construction Array Geometry - KIFM

The KIFM antenna daytime array which uses all three of the antenna towers has been previously licensed by means of a measurement based proof of performance. Therefore a survey of the array geometry is not required.

Item 6
Ground System

The ground system is as specified in BL-19850619AE.

Item 7

Sampling System Measurements - KIFM

Impedance measurements were made of the antenna monitor sampling system using a Hewlett-Packard 8753 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 1/2 inch solid outer conductor foam insulated cable: FLC-12-50J/LCF-12-50J

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 (1320 kHz) to the resonant frequency.

Sample Line Measurements - KIFM

Tower	Sample Line Open Circuited Resonant Frequency (MHz)	Sample Line Electrical Length at 1320 kHz Degrees	Measured Impedance at 1320 kHz with Sample Transformer Connected
1 (SW)	1.362853	435.9	51.84 -J 1.98
2 (N)	1.363284	435.7	51.01 -J 1.71
3 (S)	1.363987	435.5	50.09 -J 3.95

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:

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

KIFM Sample Line Characteristic Impedance Calculations

Tower	-45° Offset Frequency (MHz)	-45° Offset Measured Impedance	+45° Offset Frequency (MHz)	+45° Measured Impedance	Calculated Characteristic Impedance
1 (SW)	1.2266	6.55 -J 48.4	1.4991	8.83 +J 48.1	48.87
2 (N)	1.2270	6.51 -J 48.0	1.4966	8.67 +J 47.6	48.41
3 (S)	1.2276	6.17 -J 48.1	1.5004	8.46 +J 47.8	48.52

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

The PhaseTek P600-203 (1V/A) 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 0.5° of phase and 0.1% of ratio.

Tower	Serial **Number**	Ratio	**Phase**
1 (SW)	775	Ref	Ref
2 (N)	776	1.003	-0.1°
3 (S)	777	1.001	-0.1°

The Potomac Instruments AM-1901-3, sn. 321 Antenna Monitor was checked by using a common signal to the reference and measured inputs and found to be accurate to well within 1% and 1 degree.

Item 9

Reference Field Strength Measurements - KIFM

Reference field strength measurements were made along radials of minimum and maximum radiation for the directional pattern. The transmitter power was adjusted to 5.4kW for the day pattern and 670 watts for the night pattern..

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

KIFM REFERENCE FIELD INTENSITY MEASUREMENTS

KIFM DAY REFERENCE POINT MEASUREMENTS – MAY 25, 2023

Radial		Dist km	mV/m	Time	CO-ORD NAD27	Deg	Min	Sec	Description
5.5°	1	1.91	365	1329	N	38	39	12.7	Opposite, #4187 Hovnanian Dr.
					W	121	33	01.5	
	2	2.56	206	1348	N	38	39	33.7	#4060 Clarewood Way
					W	121	32	57.9	
	3	2.72	265	1351	N	38	39	39.1	End of Westlake Parkway
					W	121	32	57.7	
54.5°	1	1.48	335	1303	N	38	38	38.7	El Centro Rd. at sign
					W	121	32	18.8	
	2	2.24	251	1308	N	38	38	53.1	#4229 Windsong St.
					W	121	31	53.0	
	3	3.76	169	1317	N	38	39	20.7	#2400 Del Paso Rd.
					W	121	31	01.0	
121.5°	1	1.41	840	1401	N	38	37	47.2	El Centro Rd., North of Moscatel
					W	121	32	19.7	
	2	1.67	721	1405	N	38	37	42.8	#3430 Jabbour Way
					W	121	32	10.0	
	3	5.00	144	1420	N	38	36	44.9	Intersection El Camino Ave./
					W	121	30	13.1	Natomas Park Dr.

IFM REFERENCE FIELD INTENSITY MEASUREMENTS

CONTINUED

KIFM DAY REFERENCE POINT MEASUREMENTS – MAY 25, 2023

					CO-ORD NAD27				
Radial		**Dist km**	**mV/m**	**Time**		**Deg**	**Min**	**Sec**	**Description**
207°	1	1.09	63.4	1626	N	38	37	39.6	Dirt Road off San Juan
					W	121	33	29.6	
	2	1.27	22.0	1654	N	38	37	34.3	#3111 Garden Hwy.
					W	121	33	33.2	
	3	1.84	29.8	1524	N	38	37	18.3	Old River Rd. at CR128A
					W	121	33	44.7	
243.5°	1	0.67	118	1631	N	38	38	01.1	Dirt Road
					W	121	33	33.4	
	2	0.74	156	1649	N	38	38	00.2	Garden Hwy.
					W	121	33	36.4	
	3	1.07	98.5	1518	N	38	37	54.1	Old River Rd.
					W	121	33	47.9	
316°	1	1.38	188	1637	N	38	38	43.6	Stone Road off Garden Hwy.
					W	121	33	48.9	
	2	1.41	286	1640	N	38	38	43.7	#4061 Garden Hwy.
					W	121	33	49.6	
	3	9.72	35.1	1458	N	38	41	57.7	County Road 117
					W	121	37	49.2	

KIFM REFERENCE FIELD INTENSITY MEASUREMENTS

CONTINUED

KIFM NIGHT REFERENCE POINT MEASUREMENTS – MAY 25, 2023

						CO-ORD NAD27			
Radial		**Dist km**	**mV/m**	**Time**		**Deg**	**Min**	**Sec**	**Description**
78.5°	1	1.25	28.2	0930	N	38	38	19.2	#3850 El Centro Rd.
					W	121	32	18.6	
	2	1.65	17.6	0936	N	38	38	21.8	Opposite, #3842 Stemmler Dr.
					W	121	32	02.3	
	3	2.03	15.2	0945	N	38	38	23.7	#3873 Saintsbury Dr.
					W	121	31	46.0	
153.5°	1	2.02	61.1	1020	N	38	37	12.4	Dirt Road
					W	121	32	31.2	
	2	2.77	37.2	0957	N	38	36	50.5	El Centro Rd. South of #2640
					W	121	32	17.9	
	3	3.82	36.0	1006	N	38	36	20.1	#1841 Garden Hwy. at pull off
					W	121	31	59.0	
235°	1	0.33	926	1034	N	38	38	04.8	Radio Rd.
					W	121	33	20.1	
	2	0.79	310	1138	N	38	37	56.4	#3563 Garden Hwy.
					W	121	33	35.8	
	3	1.11	205	1109	N	38	37	50.9	Old River Rd.
					W	121	33	47.3	

KIFM REFERENCE FIELD INTENSITY MEASUREMENTS

CONTINUED

KIFM NIGHT REFERENCE POINT MEASUREMENTS – MAY 25, 2023

					CO-ORD NAD27				
Radial		**Dist km**	**mV/m**	**Time**		**Deg**	**Min**	**Sec**	**Description**
295°	1	0.78	566	1758	N	38	38	21.8	Dirt Road off Garden Hwy.
					W	121	33	38.7	
	2	0.83	485	1805	N	38	38	22.4	Garden Hwy. at drive
					W	121	33	39.9	
	3	1.18	424	1118	N	38	38	27.6	Old River Rd.
					W	121	33	52.8	
359.5°	1	2.14	37.7	1135	N	38	39	20.3	Del Paso Rd., South side
					W	121	33	09.8	
	2	3.83	18.5	1832	N	38	40	15.1	Bayou Way
					W	121	33	09.9	
	3	8.67	3.6	1156	N	38	42	52.1	W. Elverta Rd.
					W	121	33	10.9	

All Field Intensity Measurements were made with a Potomac Instruments Field Intensity Meter, model PI 4100, Serial Number 249, calibrated on January 21, 2016. The meter was calibrated by Potomac Instruments, Frederick, Maryland. The meter was compared to a Potomac Instruments FIM-41, Serial Number 2063, calibrated on March 3, 2023, and agreed. All measurements were taken by Kurt Gorman of Phasetek Inc.

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 California.

June 30, 2023

Benj. F. Dawson III, P.E.