7136 S Yale Ave
Suite 501
Tulsa, OK 74133

o 918.664.4581
f 918.664.3066

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

April 2, 2021

VIA EMAIL

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

RE: IHM LICENSES, LLC (FRN No. 0014042816)
Application for New License on FCC Form 302-AM
KJR (AM), 950 kHz, Seattle, WA; Facility ID No. 48386

Dear Ms. Dortch:

On behalf of IHM LICENSES, LLC, the licensee of the above-referenced station, enclosed is copy of an application for New License submitted on FCC Form 302-AM.

Also enclosed is Form 159, Remittance Advice, with credit card payment of the $1560.00 filing fee.

Please contact the undersigned with any communications concerning this application.

Respectfully submitted,
IHM LICENSES, LLC

By: _____
Troy Langham
VP, Technical Regulatory Affairs

cc: Public Inspection File

Online Payment Information

Total Amount	$1,560.00
Payer FRN	0014042816
Payer Name	iHM Licenses, LLC
Remittance ID	3552860
Treasury Tracking ID	26ROH8CD

Thank you for your payment!

Federal Communications Commission
Washington, D. C. 20554

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

FOR FCC USE ONLY

FCC 302-AM
APPLICATION FOR AM BROADCAST STATION LICENSE

(Please read instructions before filling out form.)

FOR COMMISSION USE ONLY

FILE NO.

SECTION I - APPLICANT FEE INFORMATION

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

IHM LICENSES, LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)

7136 S YALE

MAILING ADDRESS (Line 2) (Maximum 35 characters)

SUITE 501

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
TULSA	OK	74136

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
918-664-4611	KJR	48386

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

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

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

C. If Yes, provide the following information:

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

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

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

(A)	(B)	(C)	FOR FCC USE ONLY
MOR	0001	$ 835	

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

TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
$ 1560.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT IHM LICENSES, L.L.C.		
MAILING ADDRESS 7136 S YALE SUITE 501		
CITY TULSA	STATE OK	ZIP CODE 74136

2. This application is for:

☑ Commercial ☐ Noncommercial

☑ AM Directional ☐ AM Non-Directional

Call letters	Community of License	Construction Permit File No.	Modification of Construction Permit File No(s).	Expiration Date of Last Construction Permit
KJR	SEATTLE, WA			

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

☑ Yes ☐ No

If No, explain in an Exhibit.

Exhibit No.

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

☑ Yes ☐ No

If No, state exceptions in an Exhibit.

Exhibit No.

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

☐ Yes ☑ No

If Yes, explain in an Exhibit.

Exhibit No.

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

☑ Yes ☐ No

☐ Does not apply

If No, explain in an Exhibit.

Exhibit No.

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

☐ Yes ☑ No

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

Exhibit No.

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

☐ Yes ☑ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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

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

CERTIFICATION

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

☑ Yes ☐ No

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

Name	Signature	
Troy Langham	Troy Langham Digitally signed by Troy Langham DN: cn=Troy Langham, o, ou, email=Troylangham@iheartmedia.com, c=US Date: 2021.04.02 09:41:16 -05'00'	
Title VP, Technical Regulatory Affairs	Date 4/2/2021	Telephone Number 918-664-4581

WILLFUL FALSE STATEMENTS ON THIS FORM ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. CODE, TITLE 18, SECTION 1001), AND/OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION

FCC NOTICE TO INDIVIDUALS REQUIRED BY THE PRIVACY ACT AND THE PAPERWORK REDUCTION ACT

The solicitation of personal information requested in this application is authorized by the Communications Act of 1934, as amended. The Commission will use the information provided in this form to determine whether grant of the application is in the public interest. In reaching that determination, or for law enforcement purposes, it may become necessary to refer personal information contained in this form to another government agency. In addition, all information provided in this form will be available for public inspection. If information requested on the form is not provided, the application may be returned without action having been taken upon it or its processing may be delayed while a request is made to provide the missing information. Your response is required to obtain the requested authorization.

Public reporting burden for this collection of information is estimated to average 639 hours and 53 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, can be sent to the Federal Communications Commission, Records Management Branch, Paperwork Reduction Project (3060-0627), Washington, D. C. 20554. Do NOT send completed forms to this address.

THE FOREGOING NOTICE IS REQUIRED BY THE PRIVACY ACT OF 1974, P.L. 93-579, DECEMBER 31, 1974, 5 U.S.C. 552a(e)(3), AND THE PAPERWORK REDUCTION ACT OF 1980, P.L. 96-511, DECEMBER 11, 1980, 44 U.S.C. 3507.

SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant
IHM LICENSES, LLC

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

☐ Station License ☑ Direct Measurement of Power

1. Facilities authorized in construction permit

Call Sign	File No. of Construction Permit (if applicable)	Frequency (kHz)	Hours of Operation	Power in kilowatts	
				Night	Day
KJR		950			

2. Station location

State	City or Town
WASHINGTON	SEATTLE

3. Transmitter location

State	County	City or Town	Street address (or other identification)
WA	KING	VASHON	10426 CEMETARY ROAD

4. Main studio location

State	County	City or Town	Street address (or other identification)
WA	KING	SEATTLE	645 ELLIOTT AVE W SUITE 400

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

State	County	City or Town	Street address (or other identification)
WA	KING	SEATTLE	645 ELLIOTT AVE W SUITE 400

6. Has type-approved stereo generating equipment been installed? ☐ Yes ☑ No

7. Does the sampling system meet the requirements of 47 C.F.R. Section 73.68? ☑ Yes ☐ No ☐ Not Applicable

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

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system	RF common point or antenna current (in amperes) without modulation for day system
32.45	32.45

Measured antenna or common point resistance (in ohms) at operating frequency		Measured antenna or common point reactance (in ohms) at operating frequency	
Night	Day	Night	Day
50.0	50.0	12.5	12.5

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	-20.6	18.3	0.534	0.518		
2	0.0	0.0	1.0	1.0		
3	37.7	-37.2	0.439	0.496		

Manufacturer and type of antenna monitor: Potomac AM 1901-3

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, Steel	88.8	89.3	89.9	Exhibit No. n/a

Excitation ☑ Series ☐ Shunt

Geographic coordinates to nearest second. For directional antenna give coordinates of center of array. For single vertical radiator give tower location.

North Latitude	47	o	26	'	0.0	"	West Longitude	122	o	28	'	2.0	"

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. 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.

see technical narrative

I certify that I represent the applicant in the capacity indicated below and that I have examined the foregoing statement of technical information and that it is true to the best of my knowledge and belief.

Name (Please Print or Type)	Signature (check appropriate box below)
Jacob Wyatt	
Address (include ZIP Code) 113 West 4th St Ogallala, NE 69153	Date 5-08-2020 Telephone No. (Include Area Code) 308-289-1872

☑ Technical Director ☐ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☐ Other (specify)

ENGINEERING EXHIBIT
IN SUPPORT OF AN
APPLICATION FOR STATION LICENSE
STATION KJR(AM) – SEATTLE, WASHINGTON
950 kHz – 50 kW, U, DA-2
Facility ID: 48386

Applicant: IHM Licenses, LLC

March, 2021

Consulting Engineers
CTJC
CARL T. JONES CORPORATION

TABLE OF CONTENTS

Consulting Engineers
CTJC
CARL T. JONES CORPORATION

SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant
IHM Licenses, LLC

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

☑ Station License ☐ Direct Measurement of Power

1. Facilities authorized in construction permit					
Call Sign	File No. of Construction Permit (if applicable)	Frequency (kHz)	Hours of Operation	Power in kilowatts	
				Night	Day
KJR	N/A	950	Unlimited	50.0	50.0

2. Station location	
State	City or Town
Washington	Seattle

3. Transmitter location			
State	County	City or Town	Street address (or other identification)
WA	King	Vashon	10426 Cemetary Road

4. Main studio location			
State	County	City or Town	Street address (or other identification)
WA	King	Seattle	645 Elliott Avenue W, Suite 400

5. Remote control point location (specify only if authorized directional antenna)			
State	County	City or Town	Street address (or other identification)
WA	King	Seattle	645 Elliott Avenue W, Suite 400

6. Has type-approved stereo generating equipment been installed? ☐ Yes ☑ No

7. Does the sampling system meet the requirements of 47 C.F.R. Section 73.68? ☑ Yes ☐ No ☐ Not Applicable

Attach as an Exhibit a detailed description of the sampling system as installed. Exhibit No. See Engineering Sttmt.

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
32.45	32.45
Measured antenna or common point resistance (in ohms) at operating frequency Night: 50.0 Day: 50.0	Measured antenna or common point reactance (in ohms) at operating frequency Night: +j12.5 Day: +j12.5

Antenna indications for directional operation

Towers	Antenna monitor Phase reading(s) in degrees		Antenna monitor sample current ratio(s)		Antenna base currents	
	Night	Day	Night	Day	Night	Day
1(W)	-20.6	18.3	0.534	0.518		
2(C)	0.0	0.0	1.000	1.000		
3(E)	37.7	-37.2	0.439	0.496		

Manufacturer and type of antenna monitor: Potomac Instruments Model 1901-3, Serial Number 548

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, Steel	88.8	89.3	89.9	Exhibit No. N/A

Excitation ☑ Series ☐ Shunt

Geographic coordinates to nearest second. For directional antenna give coordinates of center of array. For single vertical radiator give tower location.

North Latitude	47 °	26 '	00 "	West Longitude	122 °	28 '	02 "

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. See Engineering Sttmt.

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

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.

N/A

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 ( )
Carl T. Jones, Jr.	
Address (include ZIP Code)	Date
Carl T. Jones Corporation 7901 Yarnwood Court Springfield, VA 22153	March 15, 2021
	Telephone No. (Include Area Code)
	(703) 569-7704

☐ Technical Director ☑ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☐ Other (specify)

Consulting Engineers
CTJC
CARL T. JONES CORPORATION

ENGINEERING STATEMENT OF CARL T. JONES, JR., P.E.
IN SUPPORT OF AN
APPLICATION FOR STATION LICENSE
STATION KJR(AM) – SEATTLE, WASHINGTON
950 kHz – 50 kW DAY, 50 kW Night, U, DA-2
Facility ID: 48386

Applicant: IHM Licenses, LLC

I am a Consulting Engineer and president of the Carl T. Jones Corporation, with offices located in Springfield, Virginia. My education and experience are a matter of record with the Federal Communications Commission. I am a Registered Professional Engineer in the Commonwealth of Virginia, Registration No. 013391.

1.0 GENERAL

This office has been authorized by IHM Licenses, LLC ("IHM"), licensee of AM Radio Station KJR, to prepare this engineering statement and the associated figures and appendices in support of an Application for License. Station KJR is licensed to operate on 950 kHz with a daytime and nighttime power of 50 kilowatts, using different directional patterns for its daytime and nighttime operations (DA-2). The station uses a three-tower inline array that is also shared with collocated and diplexed station KGNW. KJR has been operating at reduced power under an STA granted on July 17, 2020, and extended on January 26, 2021 due to distortion of its directional patterns resulting from

7901 Yarnwood Court
Springfield, VA 22153-2899
tel: (703) 569-7704
fax: (703) 569-6417
email: info@ctjc.com
www.ctjc.com

reradiation from a communications support tower constructed in the immediate vicinity of the KJR antenna array. A significant effort was made by the communications tower owner to detune the tower however the effort was only partially successful at eliminating the pattern distortion. The purpose of the instant application is to modify the license of KJR in order to bring the station into permanent compliance.

Computer modeling and sample system verification techniques as described in Section 47 CFR 73.151(c) of the FCC's Rules and Regulations were used to verify the performance of the KJR daytime and nighttime directional patterns. The specific measurement and modeling techniques used in performing the proof of performance on the KJR directional patterns are described in detail in this engineering statement. Impedance measurement data, sample system verification measurement data, model derived operating parameters, and reference point field strength measurement data for the KJR daytime and nighttime directional patterns are tabulated in the figures attached to this engineering statement. All pertinent computer model input and output files are contained in the attached Appendices A, B and C.

2.0 IMPEDANCE MEASUREMENTS, COMPUTER MODELING AND SAMPLE SYSTEM VERIFICATION

The KJR antenna array consists of three, equal height, triangular, uniform cross-section, base insulated, guyed towers. The face width of each tower is 18 inches. The sampling system employs toroidal current transformers located at the output of the series pass/reject diplex filter network at the base of each tower. A detailed description

of the impedance and sample system measurements and the computer models employed is contained below.

2.1 INDIVIDUAL TOWER IMPEDANCE MEASUREMENTS

Impedance measurements were performed at the base of each tower, by the undersigned, at the output J-Plug immediately adjacent to the sample system toroidal current transformer. The J-Plug and sample current transformer are located at the output of the series pass/reject diplex filter network at the base of each tower. The impedance measurements were performed using a Hewlett-Packard Model 4396A network analyzer; an ENI Model 240L power amplifier; and a Tunwall Radio directional coupler. The base impedance of each tower was measured with the other two towers short-circuited to ground at the corresponding J-Plug location. The measured impedances are tabulated in Figure 2.

A set of parallel capacitors are installed in series with the tower base between the measurement location and the tower base, so that the reactance of these capacitors is included in the impedance measurement for each tower. The capacitive reactance of the parallel capacitor set at the base of each tower was measured separately so that the reactance could be taken into account in the tower and circuit models. The equivalent measured series capacitance for each tower is included in Figure 2.

2.2 INDIVIDUAL TOWER COMPUTER MODELS

A Method of Moments ("MoM") computer model was developed to model each element in the antenna array using Expert MiniNEC Broadcast Professional (Version 23.0). A wire model was developed for each tower that is comprised of 42 segments. To replicate the individual measured base impedances to within the tolerance specified in the FCC's Rules, each tower's physical height and radius was adjusted in the MiniNEC model and shunt capacitance, series inductance and measured series capacitance was employed in a separate circuit model. Details of the modeled individual tower adjusted heights and radii are contained in Figure 1.

The values of the lumped shunt capacitance, series inductance and measured series capacitance used in the circuit model are contained in Figure 2. The measured individual tower impedances, the modeled individual tower impedances, and the adjusted modeled (circuit model) individual tower impedances are also contained in Figure 2. The percentage difference between the adjusted modeled tower heights and radii and the actual physical tower heights and radii are all within the tolerances set forth in the FCC's Rules. The magnitude of the lumped shunt capacitances and series inductances that were used in the circuit models are also within the tolerances set forth in the FCC's Rules.

As demonstrated by the data contained in Figure 2, the adjusted modeled individual tower resistance and reactance for each tower is well within ±2 ohms and ±4 percent tolerance of the corresponding measured individual tower resistance and

reactance. The text files containing all pertinent input and output data associated with the individual tower models are contained in Appendix A.

2.3 DAYTIME AND NIGHTTIME DIRECTIONAL ANTENNA COMPUTER MODELS AND ANTENNA MONITOR PARAMETERS

The KJR daytime and nighttime directional antenna theoretical field parameters and the licensed tower spacings and orientations were used in combination with the adjusted individual tower models to produce the daytime and nighttime directional antenna computer models. From the directional computer models, tower currents were derived for each wire segment of each antenna. Each segment current was multiplied by the segment length and numerically integrated and normalized to the appropriate reference tower to verify that the modeled current moments are essentially identical to the authorized relative daytime and nighttime directional field parameters.

The new daytime and nighttime operating parameters were determined from the modeled base currents and are tabulated in Figure 3. The text files containing all pertinent input and output data associated with the KJR daytime and nighttime directional antenna computer models are contained in Appendices B and C, respectively.

2.4 SAMPLE SYSTEM DESCRIPTION AND VERIFICATION MEASURMENTS

The KJR antenna sampling system is comprised of: 1) Delta Electronics, Model TCT-1 (Tower #1 and #3) and TCT-1HV (Tower #2) toroidal current transformers

mounted in an identical manner at the output of the series pass 950 kHz/reject 820 kHz filter network; 2) approximate equal lengths of Andrew, Type LDF4-50A, 1/2-inch, foam dielectric, coaxial cable between the toroidal current transformer and the antenna monitor equipment rack in the transmitter building and short jumper cables of flexible RG214U connecting the ends of the LDF4-50A coaxial cable to the antenna monitor; and 3) a Potomac Instruments model 1901-3 antenna monitor. Each sample line between the ATU filter enclosure and the transmitter building, including excess lengths, is buried; therefore, each sample line is subjected to the same environmental conditions.

The electrical lengths of the sample system coaxial cables were verified to be equal in length by measuring the open-circuit series resonant frequency closest to the carrier frequency. The characteristic impedances of the sample coaxial cables were verified by measuring the impedance at frequencies corresponding to odd multiples of 1/8 wavelength (45 degrees) immediately above and below the open circuit series resonant frequency closest to the carrier frequency, while the line was open-circuited at the sample element end of the line. The characteristic impedance was calculated using the following formula:

$$Z = \sqrt{\sqrt{R_1^2 + X_1^2} \times \sqrt{R_2^2 + X_2^2}}$$

where: Z = Characteristic impedance and

$R_1 + X_1$ and $R_2 + X_2$ are the measured impedances at 45 degree offset frequencies.

A tabulation of the measured sample line lengths and characteristic impedances is contained in Figure 4. All sample line verification measurements were performed by the undersigned using a Hewlett-Packard Model 4396A network analyzer; an ENI Model 240L power amplifier; and a Tunwall Radio directional coupler. As demonstrated by the measured values in Figure 4, the sample line lengths are well within 1 electrical degree with respect to each other and the measured characteristic impedances are well within 2 Ohms with respect to each other, as required by Section CFR73.151(c)(2)(i) of the FCC's Rules and Regulations.

An impedance measurement was performed at the input to each sample line, at the antenna monitor end of the line, with the toroidal current transformer connected. The measurement was performed at the KJR operating frequency of 950 kHz. The measured sample line impedances with the current transformers connected are tabulated in Figure 4 under the heading, "Reference Impedance Sample Transformer Connected".

The performance of the Delta Electronics Model TCT-1 and TCT-1HV toroidal current transformers was verified by driving a common reference current through all three transformers and comparing the outputs as observed on the Hewlett-Packard Model 4396A network analyzer. Based on the test results, the performance of the three current transformers is well within the manufacturer's stated accuracy. A tabulation of the toroidal current transformer measurement data along with the serial number of each current transformer is contained in Figure 5.

The KJR antenna monitor is a Potomac instruments Model 1901-3, Serial Number 548. The performance of the antenna monitor was verified, by the undersigned, to be within the manufacture's stated accuracy. The verification was performed by comparison of the measured relative nighttime directional operating parameters, as observed on the antenna monitor, with those measured using the network analyzer when the nighttime phasing and coupling system common point was driven with the network analyzer swept source through a power amplifier.

3.0 DAYTIME AND NIGHTTIME COMMON POINT IMPEDANCE AND CURRENT

The networks associated with the daytime and nighttime directional antenna systems were adjusted for proper impedance transformation and the daytime and nighttime common point impedance matching networks were set for Z = 50 + j12.5 Ohms. The transmitter output power level was adjusted for a daytime and nighttime common point current of 32.45 amperes to achieve an input power of approximately 52,650 Watts.

4.0 REFERENCE FIELD STRENGTH MEASUREMENTS

Reference field strength measurements were performed on five radials for both the KJR daytime directional pattern and the KJR nighttime directional pattern. For the KJR daytime directional pattern, measurements were performed on the 53º and 207º radial bearings, corresponding to the daytime pattern main radiation lobes; and on the 130º, 288º, and 332º radial bearings, corresponding to the daytime directional pattern

minima. For the KJR nighttime directional pattern, measurements were performed on the 29º and 231º radial bearings, corresponding to the nighttime pattern main radiation lobes; and on the 107º, 153º, and 310º radial bearings, corresponding to the nighttime directional pattern minima. Three reference field strength measurements were performed on each of the selected daytime and nighttime radial bearings.

The field strength measurements were performed by Mr. Monte Passmore, a contract engineer working for the Carl T. Jones Corporation. Mr. Passmore is experienced in performing field strength measurements on AM directional patterns. Two field intensity meters were used to perform the measurements: Potomac Instruments, Model PI-4100, Serial Number 0352, last calibrated by the manufacturer in July, 2020; and Potomac Instruments, Model FIM-41, Serial Number 2185, last calibrated by the manufacturer in January, 2021.

The measured field strength value for each established reference point location is tabulated in Figure 6, Sheets 1 through 5. The tabulations contained in Figure 6 also include for each reference location: GPS coordinates (NAD83), distance from the KJR antenna array center, and a description of the measurement location.

5.0 ANTENNAS MOUNTED ON TOWERS AND ISOLATION CIRCUITS

An STL parabolic dish antenna is side mounted near the top of Tower #2 (Center Tower). A parallel resonant isolation circuit is used to allow the STL antenna transmission line to cross the base insulator without impacting the AM station operation.

Austin ring type transformers are used at the base of each tower to allow AC cables to cross the base insulator to power the tower lights.

6.0 SUMMARY

It is submitted that the KJR daytime and nighttime directional pattern performance has been verified using computer modeling and sample system verification procedures in accordance with Section 47 CFR 73.151(c) of the FCC's Rules and Regulations. It is believed that the daytime and nighttime antenna systems, as adjusted, fully comply with the terms of the station's FCC Authorization and all applicable FCC Rules and Regulations. It is requested that a superseding license be issued to IHM reflecting the new model derived directional operating parameters as contained herein and on FCC Form 302-AM attached.

This engineering statement and the attached figures and appendices were prepared by the undersigned or under the direct supervision of the undersigned and the information contained therein is believed to be true and correct.

Dated: March 15, 2021

7901 Yarnwood Court
Springfield, VA 22153-2899
tel: (703) 569-7704
fax: (703) 569-6417
email: info@ctjc.com
www.ctjc.com

Figure 1

TOWER MODEL HEIGHT AND RADIUS

STATION KJR - SEATTLE, WASHINGTON
950 kHz - 50 kW DAY, 50 kW NIGHT, U, DA-2
MARCH, 2021

Tower	Physical Height (degrees)	Modeled Height (degrees)	Percent of Physical Height	Tower Face Width (inches)	Equivalent Radius (meters)	Modeled Radius (meters)	Percent of Equivalent Radius
1	100.8	109.47	108.6	18.000	0.2183	0.2911	133.4
2	100.8	110.98	110.1	18.000	0.2183	0.2911	133.4
3	100.8	108.76	107.9	18.000	0.2183	0.2911	133.4

MEASURED AND MODELED IMPEDANCES

STATION KJR - SEATTLE, WASHINGTON
950 kHz - 50 kW DAY, 50 kW NIGHT, U, DA-2
MARCH, 2021

Tower	Measured Tower Base Impedance[1]	Modeled Tower Base Impedance	Shunt Capacitance (pF)	Modeled plus Shunt Reactance	Measured Series Capacitance (pF)	Lumped Series Inductance (uH)	Total Adjusted Tower Base Impedance
1	100.8 +j 114.4	96.6 +j 128.6	15.0	98.8 +j 129.2	13359.8	0.0	98.8 +j 116.7
2	101.9 +j 107.7	99.5 +j 129.6	15.0	101.9 +j 130.2	4933.2	1.9	101.9 +j 107.5
3	135.9 +j 106.7	93.7 +j 124.1	245.0	136.0 +j 128.9	9139.7	0.0	136.0 +j 110.5

[1] Measured at output of series diplex filter (pass 950 kHz/reject 820 kHz) with other towers short-circuited to ground.

Figure 3

ANTENNA MONITOR PARAMETERS AND COMMON POINT DATA

STATION KJR - SEATTLE, WASHINGTON
950 kHz - 50 kW DAY, 50 kW NIGHT, U, DA-2
MARCH, 2021

DAYTIME		
Tower	**Ratio**	**Phase (deg)**
1	0.518	18.3
2	1.000	0.0
3	0.496	-37.2
Common Point Impedance = 50 +j12.5 Ohms Common Point Current = 32.45 Amperes Antenna Input Power = 52,650 Watts		

NIGHTTIME		
Tower	**Ratio**	**Phase (deg)**
1	0.534	-20.6
2	1.000	0.0
3	0.439	37.7
Common Point Impedance = 50 +j12.5 Ohms Common Point Current = 32.45 Amperes Antenna Input Power = 52,650 Watts		

SAMPLE LINE VERIFICATION MEASUREMENTS

STATION KJR - SEATTLE, WASHINGTON
950 kHz - 50 kW DAY, 50 kW NIGHT, U, DA-2
MARCH, 2021

Tower	Open Circuit Series Resonant Frequency[1] (kHz)	Open Circuit Measured Line Length[2] (degrees)	Resonant Frequency -45 degree Offset Frequency (kHz)	Resonant Frequency -45 degree Offset Impedance (Ohms)	Resonant Frequency +45 degree Offset Frequency (kHz)	Resonant Frequency +45 degree Offset Impedance (Ohms)	Calculated Characteristic Impedance (Ohms)	Reference Impedance Sample Toroid Connected[2] (Ohms)
1	1063.2	241.25	886.00	3.48 -j 47.62	1240.40	5.25 +j 47.54	47.79	47.1 -j 1.2
2	1063.8	241.12	886.50	3.48 -j 47.73	1241.10	5.36 +j 47.81	47.98	46.8 -j 1.1
3	1063.3	241.23	886.08	3.49 -j 47.72	1240.52	5.27 +j 47.81	47.97	47.3 -j 1.3

[1] At this frequency, the sample line electrical length is equal to 270°.
[2] At carrier frequency (950 kHz)

Figure 4

Figure 5

SAMPLE DEVICE VERIFICATION MEASUREMENTS

STATION KJR - SEATTLE, WASHINGTON
950 kHz - 50 kW DAY, 50 kW NIGHT, U, DA-2
MARCH, 2021

Reference Sample Toroid Number	Measured Sample Toroid Number	Measured	
		Field Ratio	Phase (degrees)
2	1	0.998	-0.15
2	3	1.006	-0.52

Sample Toroid Number	Type	Serial Number
1	Delta Electronics, TCT-1	17538
2	Delta Electronics, TCT-1HV	1823
3	Delta Electronics, TCT-1	17593

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION KJR - SEATTLE, WASHINGTON
950 kHz - 50 kW DAY, 50 kW NIGHT, U, DA-2
MARCH, 2021

29 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	2.09	- - -	1460	47° 26' 50.0"	122° 27' 22.0"	Location is at the NE corner of the intersection og 95th Place SW and SW Bank Road in front of mailbox cluster.
2	3.54	- - -	592	47° 27' 29.0"	122° 26' 49.0"	Location is at green mailbox to 8832 SW Dilworth Road across styreet from steel farm gate.
3	4.75	- - -	126	47° 28' 05.0"	122° 26' 17.0"	Location is at the end of road at 8732 Hawthorne Lane across from Pole #240142.

53 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	0.98	6920	- - -	47° 26' 10.0"	122° 27' 49.0"	Location is at black mailbox to 10221 SW 188th Street across form pole # 316359.
2	1.29	1920	- - -	47° 26' 26.0"	122° 27' 12.0"	Location is next to steel gate to 9402 SW 183rd Place.
3	1.84	1020	- - -	47° 26' 37.0"	122° 26' 58.0"	Location is at intersection of SW 180th Street and Beall Road next to mailbox to 9425 Beall Road.

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION KJR - SEATTLE, WASHINGTON
950 kHz - 50 kW DAY, 50 kW NIGHT, U, DA-2
MARCH, 2021

107 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	1.21	- - -	93.2	47° 25' 44.0"	122° 26' 59.0"	Location is at the southest corner of intersection of cemetary Road and 91st Avenue SW next to red fire hydrant.
2	1.84	- - -	77.4	47° 25' 40.0"	122° 26' 40.0"	Location is at white mailbox to 19710 87th Avenue SW on west side of road.
3	2.32	- - -	31.5	47° 25' 38.8"	122° 26' 21.1"	Location is on the east side of Ridge Road at mailbox #19728.

130 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	0.81	1260	- - -	47° 25' 42.0"	122° 27' 37.0"	Location is across street from pole #316058 on west side of Vashon Highway.
2	2.82	172	- - -	47° 25' 02.7"	122° 26' 25.0"	Location is on the east side of George Edwards Road at waters edge on cement platform 100 feet south of Ellisport Road.
3	7.65	146	- - -	47° 23' 21.0"	122° 23' 25.0"	Location is at the mailbox to 4715 Point Robinson Road

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION KJR - SEATTLE, WASHINGTON
950 kHz - 50 kW DAY, 50 kW NIGHT, U, DA-2
MARCH, 2021

153 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	1.37	- - -	273	47° 25' 19.0"	122° 27' 34.0"	Location is on south side of 204th Street across from red fire hydant, 300 feet east of Vashon Highway SW.
2	3.54	- - -	71.5	47° 24' 16.0"	122° 26' 51.0"	Location is at 8907 Quartermaster Drive across street from mailbox cluster and pole # 036011.
3	5.99	- - -	56.5	47° 23' 07.6"	122° 25' 54.6"	Location is on the east side of Dockton Road SW opposite gate in fence 100 ft south of driveway to #24349 Dockton Road.

207 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	0.97	1690	- - -	47° 25' 20.0"	122° 28' 39.0"	Location is at blue address sign to 11132 SW 204th Street next to phone pedestal #061251.
2	4.10	128.5	- - -	47° 23' 46.0"	122° 29' 49.0"	Location is at base of phone pedestal #133550 on north side of 232nd Street 600 feet east of airstrip.
3	6.92	55.2	- - -	47° 22' 30.0"	122° 30' 38.0"	Location is at black maibox to 13530 Bates Road SW, north side of road.

REFERENCE FIELD STRENGTH MEASUREMENTS

STATION KJR - SEATTLE, WASHINGTON
950 kHz - 50 kW DAY, 50 kW NIGHT, U, DA-2
MARCH, 2021

231 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	2.09	- - -	1085	47° 25' 15.0"	122° 29' 33.0"	Location is at 20506 Old Mill Road SW next to phone pedestal #015150 and transformer # 315800.
2	2.90	- - -	534	47° 24' 58.0"	122° 30' 01.0"	Location is on Westside Highway SW across street from pole # 315636 and 360 feet northwest of horse crossing sign
3	4.43	- - -	127.5	47° 24' 26.0"	122° 30' 57.0"	Location is at the intersection of 141st Avenue SW and SW 220th Street, 30 feet west of the mailbox cluster.

288 Degree Radial

Point Number	Distance (km)	Daytime Field (mV/m)	Nighttime Field (mV/m)	Geographic Coordinates (NAD83)		Description
				Latitude	Longitude	
1	2.33	137.1	- - -	47° 26' 23.0"	122° 29' 51.0"	Location is at the address sign for 12620 and 12628 184th Avenue S, near base of phone riser.
2	2.50	114.4	- - -	47° 26' 30.0"	122° 30' 11.0"	Location is at the address sign for 18132 and 18130 Thorsen Road across street from pole #316569.
3	3.19	50.50	- - -	47° 26' 33.9"	122° 30' 30.9"	Location is on the west side of Westside Highway opposite drive to #18103.

APPENDIX A

Individual Tower Models

Consulting Engineers
CTJC
CARL T. JONES CORPORATION

IMPEDANCE – TOWER #1
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
.95	96.558	128.61	160.82	53.1	5.6993	-3.0799	-2.9418

GEOMETRY – TOWER #1
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.2911	36
		0	0	109.47		
2	none	156.4	130.	0	.2911	36
		156.4	130.	110.98		
3	none	312.8	130.	0	.2911	36
		312.8	130.	108.76		

Number of wires = 3
current nodes = 108

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	3	3.02111	2	3.08278
radius	1	.2911	1	.2911

ELECTRICAL DESCRIPTION – TOWER #1
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	.95	0	1	8.39E-03	8.56E-03

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	1	.1	0	0	0	0
2	37	.1	-22.55	0	0	0
3	73	.1	-17.85	0	0	0

IMPEDANCE – TOWER #2
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 37, sector 1							
.95	99.523	129.56	163.37	52.5	5.6904	-3.0849	-2.937

GEOMETRY – TOWER #2
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.2911	36
		0	0	109.47		
2	none	156.4	130.	0	.2911	36
		156.4	130.	110.98		
3	none	312.8	130.	0	.2911	36
		312.8	130.	108.76		

Number of wires = 3
current nodes = 108

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	3	3.02111	2	3.08278
radius	1	.2911	1	.2911

ELECTRICAL DESCRIPTION – TOWER #2
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	.95	0	1	8.39E-03	8.56E-03

Sources

source	node	sector	magnitude	phase	type
1	37	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	.1	-12.53	0	0	0
2	37	.1	0	0	0	0
3	73	.1	-17.85	0	0	0

IMPEDANCE – TOWER #3
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 73, sector 1							
.95	93.679	124.1	155.49	53.	5.5142	-3.1856	-2.8418

GEOMETRY – TOWER #3
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.2911	36
		0	0	109.47		
2	none	156.4	130.	0	.2911	36
		156.4	130.	110.98		
3	none	312.8	130.	0	.2911	36
		312.8	130.	108.76		

Number of wires = 3
current nodes = 108

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	3	3.02111	2	3.08278
radius	1	.2911	1	.2911

ELECTRICAL DESCRIPTION – TOWER #3
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	.95	0	1	8.39E-03	8.56E-03

Sources

source	node	sector	magnitude	phase	type
1	73	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	.1	-12.53	0	0	0
2	37	.1	-22.55	0	0	0
3	73	.1	0	0	0	0

APPENDIX B

Daytime Directional Pattern Model

Consulting Engineers
CTJC
CARL T. JONES CORPORATION

IMPEDANCE – DAYTIME OPERATION
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
.95	60.525	85.993	105.16	54.9	4.2445	-4.1711	-2.0952
source = 2; node 37, sector 1							
.95	79.661	120.41	144.38	56.5	5.6853	-3.0877	-2.9343
source = 3; node 73, sector 1							
.95	104.75	65.043	123.31	31.8	3.0525	-5.9088	-1.2873

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.2911	36
		0	0	109.47		
2	none	156.4	130.	0	.2911	36
		156.4	130.	110.98		
3	none	312.8	130.	0	.2911	36
		312.8	130.	108.76		

Number of wires = 3
current nodes = 108

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	3	3.02111	2	3.08278
radius	1	.2911	1	.2911

ELECTRICAL DESCRIPTION – DAYTIME OPERATION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.95	0	1	8.39E-03	8.56E-03

Sources

source	node	sector	magnitude	phase	type
1	1	1	1,531.24	81.6	voltage
2	37	1	4,071.56	64.9	voltage
3	73	1	1,859.16	353.8	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	.1	0	0	0	0
2	37	.1	0	0	0	0
3	73	.1	0	0	0	0

RMS CURRENT – DAYTIME OPERATION
Frequency = .95 MHz
Input power = 50,000. watts
Efficiency = 99.88 %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	10.2965	26.8	9.19204	4.63932
2	0	0	3.04083	10.6857	25.3	9.66148	4.56505
3	0	0	6.08167	10.8914	24.5	9.91314	4.51128

4	0	0	9.1225	11.0435	23.8	10.1051	4.45493
5	0	0	12.1633	11.153	23.2	10.2509	4.39411
6	0	0	15.2042	11.2252	22.7	10.3574	4.32791
7	0	0	18.245	11.2629	22.2	10.4279	4.25594
8	0	0	21.2858	11.2677	21.8	10.4645	4.17803
9	0	0	24.3267	11.2408	21.4	10.4687	4.09416
10	0	0	27.3675	11.1828	21.	10.4413	4.00437
11	0	0	30.4083	11.0946	20.6	10.3832	3.90875
12	0	0	33.4492	10.9766	20.3	10.2951	3.80742
13	0	0	36.49	10.8296	20.	10.1777	3.70056
14	0	0	39.5308	10.6539	19.7	10.0314	3.58835
15	0	0	42.5717	10.4503	19.4	9.85707	3.471
16	0	0	45.6125	10.2194	19.1	9.65519	3.34871
17	0	0	48.6533	9.96173	18.9	9.42637	3.22174
18	0	0	51.6942	9.67804	18.6	9.17139	3.09033
19	0	0	54.735	9.36907	18.4	8.89095	2.95474
20	0	0	57.7758	9.03546	18.2	8.58569	2.81523
21	0	0	60.8167	8.67801	17.9	8.25639	2.67207
22	0	0	63.8575	8.29759	17.7	7.9039	2.52553
23	0	0	66.8983	7.89491	17.5	7.52892	2.3759
24	0	0	69.9392	7.47091	17.3	7.13237	2.22344
25	0	0	72.98	7.02627	17.1	6.71491	2.06842
26	0	0	76.0208	6.5619	16.9	6.27743	1.9111
27	0	0	79.0617	6.07855	16.7	5.82067	1.75173
28	0	0	82.1025	5.57692	16.6	5.3453	1.59053
29	0	0	85.1433	5.05762	16.4	4.85193	1.42768
30	0	0	88.1842	4.52107	16.2	4.34097	1.26334
31	0	0	91.225	3.96741	16.1	3.81257	1.09754
32	0	0	94.2658	3.3963	15.9	3.26642	.930241
33	0	0	97.3067	2.80661	15.7	2.70142	.761158
34	0	0	100.348	2.19556	15.6	2.11491	.589602
35	0	0	103.388	1.55665	15.4	1.50061	.413922
36	0	0	106.429	.876168	15.3	.845268	.230632
END	0	0	109.47	0	0	0	0
GND	-100.532	-119.809	0	19.9407	8.4	19.7257	2.92068
38	-100.532	-119.809	3.08278	21.0133	6.5	20.8792	2.37043
39	-100.532	-119.809	6.16556	21.6028	5.4	21.506	2.04289
40	-100.532	-119.809	9.24833	22.0618	4.6	21.9916	1.75824
41	-100.532	-119.809	12.3311	22.4191	3.8	22.3688	1.50123
42	-100.532	-119.809	15.4139	22.6895	3.2	22.6542	1.26424
43	-100.532	-119.809	18.4967	22.8803	2.6	22.8565	1.0436
44	-100.532	-119.809	21.5794	22.9956	2.1	22.9803	.837285
45	-100.532	-119.809	24.6622	23.0382	1.6	23.0292	.64414
46	-100.532	-119.809	27.745	23.01	1.2	23.0053	.463444
47	-100.532	-119.809	30.8278	22.9125	.7	22.9106	.294772
48	-100.532	-119.809	33.9106	22.7471	.3	22.7467	.13787
49	-100.532	-119.809	36.9933	22.515	360.	22.515	-7.4E-03
50	-100.532	-119.809	40.0761	22.2174	359.6	22.2169	-.141124
51	-100.532	-119.809	43.1589	21.8555	359.3	21.8539	-.263319
52	-100.532	-119.809	46.2417	21.4307	359.	21.4274	-.373992
53	-100.532	-119.809	49.3245	20.9441	358.7	20.9388	-.473134
54	-100.532	-119.809	52.4072	20.3974	358.4	20.3896	-.560732
55	-100.532	-119.809	55.49	19.7918	358.2	19.7816	-.636772
56	-100.532	-119.809	58.5728	19.1291	357.9	19.1163	-.701252
57	-100.532	-119.809	61.6556	18.4109	357.7	18.3955	-.754179
58	-100.532	-119.809	64.7383	17.6388	357.4	17.6209	-.795559
59	-100.532	-119.809	67.8211	16.8147	357.2	16.7944	-.825441
60	-100.532	-119.809	70.9039	15.9404	357.	15.918	-.843861
61	-100.532	-119.809	73.9867	15.0175	356.8	14.9934	-.850869
62	-100.532	-119.809	77.0695	14.0481	356.5	14.0226	-.846534
63	-100.532	-119.809	80.1522	13.0337	356.3	13.0072	-.830928
64	-100.532	-119.809	83.235	11.9759	356.2	11.9489	-.804122
65	-100.532	-119.809	86.3178	10.8762	356.	10.8491	-.766171

66	-100.532	-119.809	89.4006	9.73545	355.8	9.709	-.71712
67	-100.532	-119.809	92.4833	8.5541	355.6	8.52884	-.656957
68	-100.532	-119.809	95.5661	7.33158	355.4	7.30816	-.585571
69	-100.532	-119.809	98.6489	6.06538	355.2	6.04451	-.502692
70	-100.532	-119.809	101.732	4.74967	355.1	4.73214	-.4077
71	-100.532	-119.809	104.814	3.37046	354.9	3.35715	-.29917
72	-100.532	-119.809	107.897	1.8979	354.7	1.8899	-.174078
END	-100.532	-119.809	110.98	0	0	0	0
GND	-201.064	-239.619	0	10.6616	322.	8.39951	-6.56641
74	-201.064	-239.619	3.02111	10.9714	319.4	8.32887	-7.14157
75	-201.064	-239.619	6.04222	11.1365	317.9	8.26877	-7.45976
76	-201.064	-239.619	9.06333	11.257	316.7	8.19834	-7.71404
77	-201.064	-239.619	12.0844	11.3404	315.7	8.11603	-7.92059
78	-201.064	-239.619	15.1056	11.3908	314.8	8.02107	-8.08775
79	-201.064	-239.619	18.1267	11.4096	313.9	7.91316	-8.21955
80	-201.064	-239.619	21.1478	11.3981	313.1	7.79225	-8.31855
81	-201.064	-239.619	24.1689	11.3569	312.4	7.65846	-8.38607
82	-201.064	-239.619	27.19	11.2864	311.7	7.51195	-8.42341
83	-201.064	-239.619	30.2111	11.1872	311.1	7.35292	-8.43133
84	-201.064	-239.619	33.2322	11.0595	310.5	7.18166	-8.41047
85	-201.064	-239.619	36.2533	10.9038	309.9	6.99847	-8.36147
86	-201.064	-239.619	39.2744	10.7205	309.4	6.80373	-8.28482
87	-201.064	-239.619	42.2956	10.5101	308.9	6.59782	-8.18115
88	-201.064	-239.619	45.3167	10.2731	308.4	6.38115	-8.05098
89	-201.064	-239.619	48.3378	10.0101	307.9	6.15416	-7.89478
90	-201.064	-239.619	51.3589	9.72157	307.5	5.91731	-7.71326
91	-201.064	-239.619	54.38	9.40824	307.1	5.67107	-7.50693
92	-201.064	-239.619	57.4011	9.07076	306.7	5.41595	-7.27641
93	-201.064	-239.619	60.4222	8.70989	306.3	5.15244	-7.02243
94	-201.064	-239.619	63.4433	8.32632	305.9	4.88105	-6.74559
95	-201.064	-239.619	66.4645	7.92082	305.5	4.6023	-6.44657
96	-201.064	-239.619	69.4856	7.49421	305.2	4.3167	-6.12611
97	-201.064	-239.619	72.5067	7.04725	304.8	4.02476	-5.7849
98	-201.064	-239.619	75.5278	6.58074	304.5	3.72696	-5.42364
99	-201.064	-239.619	78.5489	6.0954	304.2	3.42378	-5.04298
100	-201.064	-239.619	81.57	5.59193	303.9	3.11562	-4.64356
101	-201.064	-239.619	84.5911	5.0709	303.6	2.80284	-4.22588
102	-201.064	-239.619	87.6122	4.53271	303.3	2.48571	-3.79035
103	-201.064	-239.619	90.6333	3.97749	303.	2.16432	-3.33708
104	-201.064	-239.619	93.6545	3.40488	302.7	1.83853	-2.86584
105	-201.064	-239.619	96.6756	2.81371	302.4	1.50776	-2.37563
106	-201.064	-239.619	99.6967	2.2012	302.1	1.17062	-1.86411
107	-201.064	-239.619	102.718	1.56079	301.9	.823772	-1.3257
108	-201.064	-239.619	105.739	.878763	301.6	.460219	-.748614
END	-201.064	-239.619	108.76	0	0	0	0

APPENDIX C

Nighttime Directional Pattern Model

Consulting Engineers
CTJC
CARL T. JONES CORPORATION

IMPEDANCE – NIGHTTIME OPERATION
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
.95	69.069	64.013	94.171	42.8	2.9532	-6.124	-1.2155
source = 2; node 37, sector 1							
.95	93.356	111.88	145.71	50.2	4.8791	-3.6116	-2.4822
source = 3; node 73, sector 1							
.95	37.228	105.5	111.88	70.6	7.9415	-2.1992	-4.0086

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.2911	36
		0	0	109.47		
2	none	156.4	130.	0	.2911	36
		156.4	130.	110.98		
3	none	312.8	130.	0	.2911	36
		312.8	130.	108.76		

Number of wires = 3
current nodes = 108

	minimum wire	minimum value	maximum wire	maximum value
Individual wires				
segment length	3	3.02111	2	3.08278
radius	1	.2911	1	.2911

ELECTRICAL DESCRIPTION – NIGHTTIME OPERATION
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	.95	0	1	8.39E-03	8.56E-03

Sources

source	node	sector	magnitude	phase	type
1	1	1	1,430.46	32.3	voltage
2	37	1	4,160.13	60.2	voltage
3	73	1	1,636.42	115.1	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	.1	0	0	0	0
2	37	.1	0	0	0	0
3	73	.1	0	0	0	0

RMS CURRENT – NIGHTTIME OPERATION
Frequency = .95 MHz
Input power = 50,000. watts
Efficiency = 99.87 %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	10.7409	349.5	10.5597	-1.96458
2	0	0	3.04083	11.0427	347.7	10.7911	-2.34402
3	0	0	6.08167	11.1977	346.8	10.9013	-2.55966

4	0	0	9.1225	11.3066	346.	10.9702	-2.7377
5	0	0	12.1633	11.3775	345.3	11.0047	-2.88876
6	0	0	15.2042	11.4146	344.7	11.0083	-3.01823
7	0	0	18.245	11.4199	344.1	10.9829	-3.12878
8	0	0	21.2858	11.3947	343.6	10.9297	-3.22191
9	0	0	24.3267	11.3398	343.1	10.8494	-3.29859
10	0	0	27.3675	11.2559	342.6	10.7429	-3.35946
11	0	0	30.4083	11.1436	342.2	10.6106	-3.40497
12	0	0	33.4492	11.0033	341.8	10.4532	-3.43551
13	0	0	36.49	10.8356	341.4	10.2713	-3.45134
14	0	0	39.5308	10.6411	341.1	10.0654	-3.45277
15	0	0	42.5717	10.4203	340.7	9.83606	-3.44001
16	0	0	45.6125	10.1737	340.4	9.58405	-3.41332
17	0	0	48.6533	9.90208	340.1	9.30991	-3.37295
18	0	0	51.6942	9.60605	339.8	9.01441	-3.31914
19	0	0	54.735	9.28628	339.5	8.69819	-3.25216
20	0	0	57.7758	8.94348	339.2	8.36196	-3.17229
21	0	0	60.8167	8.57848	339.	8.00657	-3.07981
22	0	0	63.8575	8.19202	338.7	7.63272	-2.97503
23	0	0	66.8983	7.7849	338.5	7.24119	-2.85827
24	0	0	69.9392	7.358	338.2	6.83287	-2.72986
25	0	0	72.98	6.91208	338.	6.40844	-2.59011
26	0	0	76.0208	6.44795	337.8	5.96871	-2.43936
27	0	0	79.0617	5.96638	337.6	5.51441	-2.27792
28	0	0	82.1025	5.46808	337.3	5.04621	-2.1061
29	0	0	85.1433	4.95364	337.1	4.56467	-1.92415
30	0	0	88.1842	4.42349	336.9	4.0702	-1.73228
31	0	0	91.225	3.87778	336.8	3.56295	-1.53055
32	0	0	94.2658	3.31621	336.6	3.04267	-1.31888
33	0	0	97.3067	2.73766	336.4	2.50834	-1.09683
34	0	0	100.348	2.13948	336.2	1.95756	-.86332
35	0	0	103.388	1.51538	336.	1.38463	-.615772
36	0	0	106.429	.852065	335.8	.777464	-.348662
END	0	0	109.47	0	0	0	0
GND	-100.532	-119.809	0	20.1884	10.	19.8819	3.50438
38	-100.532	-119.809	3.08278	21.2014	7.7	21.0098	2.84373
39	-100.532	-119.809	6.16556	21.7598	6.5	21.6213	2.45049
40	-100.532	-119.809	9.24833	22.1938	5.5	22.0934	2.10878
41	-100.532	-119.809	12.3311	22.5302	4.6	22.4582	1.80029
42	-100.532	-119.809	15.4139	22.7827	3.8	22.7322	1.51585
43	-100.532	-119.809	18.4967	22.9577	3.1	22.9236	1.25106
44	-100.532	-119.809	21.5794	23.0591	2.5	23.0373	1.0035
45	-100.532	-119.809	24.6622	23.0893	1.9	23.0764	.771757
46	-100.532	-119.809	27.745	23.0499	1.4	23.0432	.554981
47	-100.532	-119.809	30.8278	22.9425	.9	22.9397	.352659
48	-100.532	-119.809	33.9106	22.7681	.4	22.7675	.164483
49	-100.532	-119.809	36.9933	22.528	360.	22.528	-9.72E-03
50	-100.532	-119.809	40.0761	22.2232	359.6	22.2226	-.170049
51	-100.532	-119.809	43.1589	21.855	359.2	21.8527	-.316531
52	-100.532	-119.809	46.2417	21.4245	358.8	21.4198	-.449178
53	-100.532	-119.809	49.3245	20.933	358.4	20.9253	-.567981
54	-100.532	-119.809	52.4072	20.382	358.1	20.3709	-.672925
55	-100.532	-119.809	55.49	19.7728	357.8	19.758	-.764
56	-100.532	-119.809	58.5728	19.107	357.5	19.0885	-.841209
57	-100.532	-119.809	61.6556	18.3862	357.2	18.364	-.904552
58	-100.532	-119.809	64.7383	17.6122	356.9	17.5863	-.954056
59	-100.532	-119.809	67.8211	16.7866	356.6	16.7574	-.989765
60	-100.532	-119.809	70.9039	15.9112	356.4	15.879	-1.01174
61	-100.532	-119.809	73.9867	14.9879	356.1	14.9531	-1.02003
62	-100.532	-119.809	77.0695	14.0183	355.8	13.9816	-1.01473
63	-100.532	-119.809	80.1522	13.0043	355.6	12.9661	-.995931
64	-100.532	-119.809	83.235	11.9473	355.4	11.9084	-.963723
65	-100.532	-119.809	86.3178	10.8488	355.1	10.8099	-.918164

66	-100.532	-119.809	89.4006	9.70969	354.9	9.67159	-.859318
67	-100.532	-119.809	92.4833	8.53044	354.7	8.49405	-.787165
68	-100.532	-119.809	95.5661	7.31044	354.5	7.27669	-.701581
69	-100.532	-119.809	98.6489	6.04714	354.3	6.01708	-.602242
70	-100.532	-119.809	101.732	4.73483	354.1	4.70957	-.488407
71	-100.532	-119.809	104.814	3.35952	353.9	3.34035	-.358372
72	-100.532	-119.809	107.897	1.89151	353.7	1.87998	-.208514
END	-100.532	-119.809	110.98	0	0	0	0
GND	-201.064	-239.619	0	10.3428	44.5	7.37399	7.25244
74	-201.064	-239.619	3.02111	10.8202	43.6	7.83326	7.46436
75	-201.064	-239.619	6.04222	11.0745	43.1	8.08272	7.57064
76	-201.064	-239.619	9.06333	11.267	42.7	8.27725	7.64403
77	-201.064	-239.619	12.0844	11.4108	42.4	8.42984	7.69056
78	-201.064	-239.619	15.1056	11.5131	42.1	8.54708	7.71354
79	-201.064	-239.619	18.1267	11.5773	41.8	8.63243	7.71453
80	-201.064	-239.619	21.1478	11.6053	41.5	8.68772	7.69452
81	-201.064	-239.619	24.1689	11.5985	41.3	8.71424	7.65429
82	-201.064	-239.619	27.19	11.5582	41.1	8.71304	7.59432
83	-201.064	-239.619	30.2111	11.4848	40.9	8.68468	7.51513
84	-201.064	-239.619	33.2322	11.3793	40.7	8.62988	7.41712
85	-201.064	-239.619	36.2533	11.2422	40.5	8.54906	7.30073
86	-201.064	-239.619	39.2744	11.0743	40.3	8.44292	7.16631
87	-201.064	-239.619	42.2956	10.876	40.2	8.31182	7.01437
88	-201.064	-239.619	45.3167	10.6481	40.	8.15626	6.8453
89	-201.064	-239.619	48.3378	10.3914	39.9	7.97687	6.65956
90	-201.064	-239.619	51.3589	10.1064	39.7	7.77421	6.45764
91	-201.064	-239.619	54.38	9.79392	39.6	7.54872	6.24002
92	-201.064	-239.619	57.4011	9.45476	39.4	7.30109	6.00722
93	-201.064	-239.619	60.4222	9.08966	39.3	7.03186	5.75976
94	-201.064	-239.619	63.4433	8.69949	39.2	6.74174	5.49818
95	-201.064	-239.619	66.4645	8.28509	39.1	6.43136	5.22305
96	-201.064	-239.619	69.4856	7.84728	39.	6.10136	4.9349
97	-201.064	-239.619	72.5067	7.38695	38.9	5.75242	4.63431
98	-201.064	-239.619	75.5278	6.9049	38.7	5.38515	4.32178
99	-201.064	-239.619	78.5489	6.40194	38.6	5.00021	3.99785
100	-201.064	-239.619	81.57	5.87879	38.5	4.59812	3.66297
101	-201.064	-239.619	84.5911	5.33604	38.4	4.17938	3.31754
102	-201.064	-239.619	87.6122	4.77412	38.3	3.7443	2.96184
103	-201.064	-239.619	90.6333	4.19315	38.2	3.29297	2.59594
104	-201.064	-239.619	93.6545	3.59274	38.2	2.82507	2.21963
105	-201.064	-239.619	96.6756	2.97163	38.1	2.33961	1.83216
106	-201.064	-239.619	99.6967	2.32682	38.	1.83421	1.43171
107	-201.064	-239.619	102.718	1.65137	37.9	1.30334	1.01406
108	-201.064	-239.619	105.739	.930623	37.8	.735398	.570307
END	-201.064	-239.619	108.76	0	0	0	0