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. BL-20170117AEJ

SECTION I - APPLICANT FEE INFORMATION

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

CC LICENSES, LLC

Accepted / Filed

JAN 17 2017

Federal Communications Commission
Office of the Secretary

MAILING ADDRESS (Line 1) (Maximum 35 characters)
2625 SOUTH MEMORIAL DRIVE

MAILING ADDRESS (Line 2) (Maximum 35 characters)
SUITE A

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
TULSA	OK	74129

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
918-664-4611	KLTC	71870

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
M M R	0 0 0 1	$ 700.00	

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

(A)	(B)	(C)	FOR FCC USE ONLY
M O R	0 0 0 1	$ 805.00	

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
	$ 1,505.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT CC LICENSES, LLC		
MAILING ADDRESS 2625 SOUTH MEMORIAL DRIVE SUITE A		
CITY TULSA	STATE OK	ZIP CODE 74129.

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
KLTC	DICKINSON, ND	BP-20141002ABB		March 17, 2018

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

☐ Yes ☐ No

If No, explain in an Exhibit.

Exhibit No.

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	
STEPHEN G DAVIS		
Title	Date	Telephone Number
SVP, RE, Facilities & Corp Development	1/16/2017	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
CC 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
KLTC	BP-20141002ABB	1460	UNLIMITED	0.77	5.0

2. Station location

State	City or Town
NORTH DAKOTA	DICKINSON

3. Transmitter location

State	County	City or Town	Street address (or other identification)
ND	STARK	DICKINSON	11291 39th Street SW

4. Main studio location

State	County	City or Town	Street address (or other identification)
ND	STARK	DICKINSON	11291 39th Street SW

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

State	County	City or Town	Street address (or other identification)
ND	STARK	DICKINSON	11291 39th Street SW

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
4.08	10

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	-j7.0	-j7.0

Antenna indications for directional operation

Towers	Antenna monitor Phase reading(s) in degrees		Antenna monitor sample current ratio(s)		Antenna base currents	
	Night	Day	Night	Day	Night	Day
1	0.0	NA	1.0	NA		
2	-176	NA	0.928	NA		

Manufacturer and type of antenna monitor: Potomac Instruments AM-19

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.
2ea. uniform cross section, guyed	2 ea. 51.79	2 ea. 52.4	NA	Exhibit No.

Excitation ☑ Series ☐ Shunt

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

North Latitude	West Longitude
46 ° 50 ' 56 "	102 ° 49 ' 47 "

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?

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	Jacob Wyatt
Address (include ZIP Code)	Date
113 West 4th St Ogallala, NE 69153	1-6-2017
	Telephone No. (Include Area Code) 308-289-1872

☑ Technical Director ☐ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☐ Other (specify)

APPLICATION FOR LICENSE INFORMATION

RADIO STATION KLTC

CC LICENSES, LLC

DICKINSON, NORTH DAKOTA

FID 71870

1460 KHZ 5KW NDD, 0.77KW DAN

January 3, 2017

APPLICATION FOR LICENSE INFORMATION
RADIO STATION KLTC
DICKINSON, NORTH DAKOTA

1460 KHZ 5KW NDD, 0.77KW DAN

Table of Contents

EXECUTIVE SUMMARY

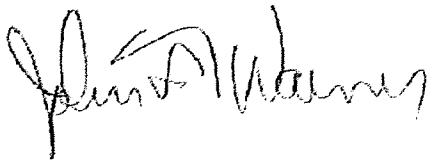
This engineering exhibit has been prepared in support of an application for license for non-directional daytime and directional nighttime operation of KLTC as authorized by construction permit BP-20141002ABB which was granted on March 17, 2015. The details of the construction are provided on Form 302 to which this report is attached.

Per the construction permit, the short and tall towers were removed. The remaining towers and ground system of the previously licensed nighttime array remain and were unchanged. Non-directional daytime operation utilizes tower one (#1) of the nighttime array. The remaining nighttime tower is de-tuned during non-directional daytime operation.

The system has been adjusted to produce nighttime directional antenna parameters within+/-5% in ratio and +/-3 degrees in phase of the modeled values as prescribed in the Rules.

All measurements contained in this report were made by Mr. Jacob Wyatt of the iHeart Media Corporate Engineering Staff or the undersigned.

Please refer any questions regarding this report to:



John F. Warner

johnwarner@clearchannel.com

443-255-5299

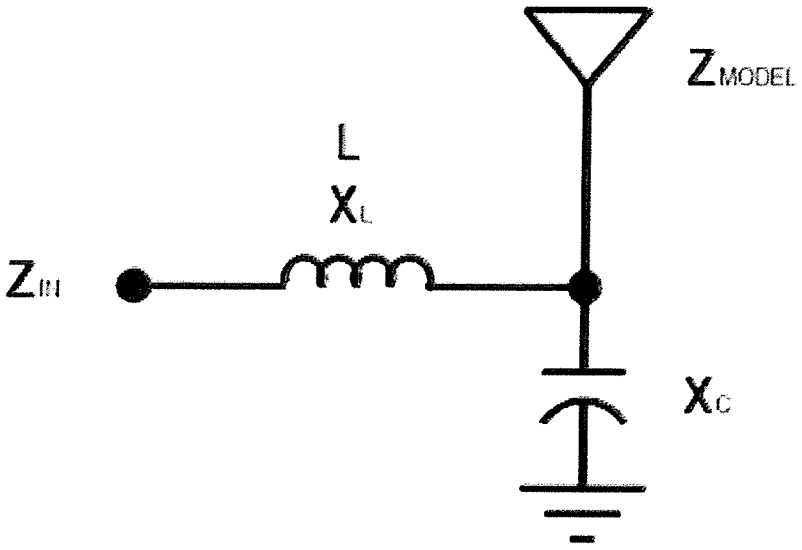
Analysis of Tower Impedance Measurements to Verify Method of Moments Model

Impedance measurements were made of the individual towers with the other tower bases open. Measurements were made using a Hewlett-Packard 8753ES network analyzer and a Tunwall Radio directional coupler in a calibrated measurement system. Measurements were made immediately adjacent to the torroidal antenna sampling transformers, inside the antenna coupling units. These measured values were related to the modeled values obtained using Expert MININEC Broadcast Professional V14.6. Heights of the towers were adjusted as permitted by Rule Section 73.151(c)(1). The tower radii were modeled at their actual values. The towers were segmented so that each segment is less than ten (10) degrees in length.

Tower	Actual Height Degrees	Model Height Degrees	Model Percent of Height	Model Equivalent Radius Meters	Model Percent Of Radius
1	90.8	92.7	102.1	.2182	100
2	90.8	93.2	102.6	.2182	100

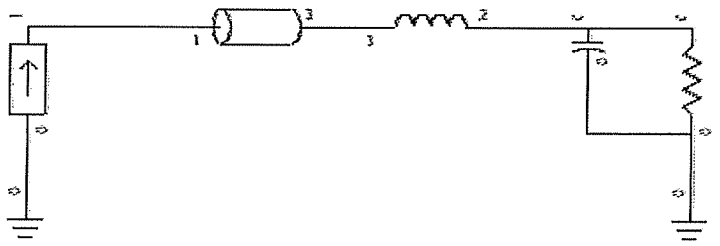
Method of Moments Model Details for Towers Driven Individually

The model was verified by comparison of modeled to measured tower impedances. The tower resistance and reactance were measured immediately adjacent to the torroidal base sampling transformers, inside the antenna tuning unit cabinets. The measured and modeled impedances were correlated using the Westberg Consulting WCAP Pro software program. WCAP is based on the SPICE nodal analysis program. The shunt capacitive reactance of the tower base insulator is represented in the drawing below as Xc. The series inductive reactance of the tower feed conductor is represented as Xl. Z model represents the modeled impedance of the tower and Zin represents the impedance measured at the sampling point. In the following WCAP tabulations, the modeled impedance is represented between nodes 3-0. The measured impedance is represented between nodes 2-0. Node 0 represents ground. The calculated reference point impedances appear under the "TO NODE IMPEDANCE" columns of the WCAP calculations, following the insignificantly short transmission line (TL 1-3) that was included in series with the drive current sources (I 0-1) to provide calculation points for the impedances.



Tower	L (uh)	Xl (+j)	Xc (-j)	Z Modeled	Z in Modeled	Z in Measured
1	3.98	36.51	-4630	44.33 +j33.67	45.02 +j69.98	45 +j70
2	3.69	33.85	-4630	45.23 +j36.3	45.99 +j69.97	46 +j70

WCAP – **KLTC Tower 1 Driven, others open**



WCAP OUTPUT AT FREQUENCY: 1.460 MHz

NODE VOLTAGES
Node: 1 8321.1857 ∠ 57.2471° V
Node: 2 5609.8006 ∠ 36.6303° V
Node: 3 8321.1465 ∠ 57.2469° V

	WCAP PART		CURRENT IN		CURRENT OUT	
TL	1→3	50.00000000	100.00 ∠	0.000° A	100.00 ∠	-0.000° A

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	2→0	44.33000000	5609.80 ∠	36.630° V	100.77 ∠	-0.587° A
C	2→0	0.00002500	5609.80 ∠	36.630° V	1.29 ∠	126.630° A
L	3→2	3.98000000	3651.08 ∠	90.000° V	100.00 ∠	-0.000° A

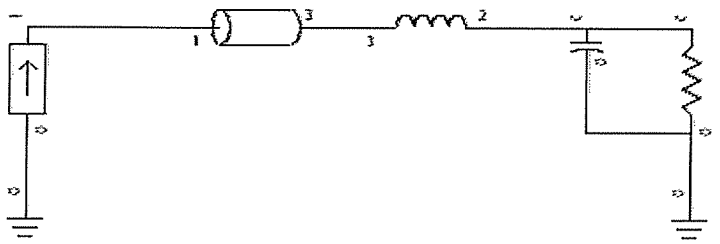
	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	2→0	44.33000000	44.33 + j	33.670	0.00 + j	0.000
C	2→0	0.00002500	0.00 - j	4360.409	0.00 + j	0.000
L	3→2	3.98000000	45.02 + j	69.981	45.02 + j	33.471
TL	1→3	50.00000000	45.02 + j	69.982	**45.02 + j**	**69.981**

	WCAP PART		VSWR
TL	1→3	50.00000000	3.9325

WCAP INPUT DATA:

```
   1.4600     0.00000000  0
R     44.33000000  2  0    33.67000000
C      0.00002500  2  0
L      3.98000000  3  2     0.00000000
TL    50.00000000  1  3   100.00000000     0.00100000     0.00000000
I    100.00000000  0  1     0.00000000
```

WCAP – **KLTC Tower 2 driven, others open**



WCAP OUTPUT AT FREQUENCY: 1.460 MHz

NODE VOLTAGES
Node: 1 8373.4261 ∠ 56.6863° V
Node: 2 5847.9619 ∠ 38.1495° V
Node: 3 8373.3872 ∠ 56.6861° V

WCAP PART		CURRENT IN		CURRENT OUT	
TL	1→3	50.00000000	100.00 ∠ 0.000° A	100.00 ∠	-0.000° A

WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	2→0	45.23000000	5847.96 ∠ 38.150° V	100.84 ∠	-0.600° A
C	2→0	0.00002500	5847.96 ∠ 38.150° V	1.34 ∠	128.150° A
L	3→2	3.69000000	3385.05 ∠ 90.000° V	100.00 ∠	-0.000° A

WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	2→0	45.23000000	45.23 + j 36.300	0.00 + j	0.000
C	2→0	0.00002500	-0.00 - j 4360.409	0.00 + j	0.000
L	3→2	3.69000000	45.99 + j 69.974	45.99 + j	36.124
TL	1→3	50.00000000	45.99 + j 69.975	**45.99 + j**	**69.974**

WCAP PART		VSWR
TL	1→3	50.00000000 3.8786

WCAP INPUT DATA:

```
   1.4600     0.00000000  0
R    45.23000000  2  0    36.30000000
C     0.00002500  2  0
L     3.69000000  3  2     0.00000000
TL   50.00000000  1  3   100.00000000    0.00100000    0.00000000
I   100.00000000  0  1     0.00000000
```

Tower 1 driven, others open

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.46	44.332	33.665	55.666	37.2	2.0342	-9.349	-.53632

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.218	12
		0	0	92.7		
2	none	90.3	35.	0	.218	12
		90.3	35.	93.2		

Number of wires = 2
current nodes = 24

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	7.725	2	7.76667
radius	1	.218	1	.218

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.46	0	1	.0214583	.0215741

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	13	0	-4,360.	0	0	0

Tower 2 driven, others open

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 13, sector 1							
1.46	45.23	36.298	57.994	38.7	2.1212	-8.8926	-.60004

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.218	12
		0	0	92.7		
2	none	90.3	35.	0	.218	12
		90.3	35.	93.2		

Number of wires = 2
current nodes = 24

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	1	7.725	2	7.76667
radius	1	.218	1	.218

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.46	0	1	.0214583	.0215741

Sources

source	node	sector	magnitude	phase	type
1	13	1	1.	0	voltage

Lumped loads

passive load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	
circuit						
1	1	0	-4,360.	0	0	0

CURRENT NODES

wire	coordinates (degrees) X	Y	Z	connections end1	end2	node no.
1	0	0	0	GND	1	1
1	0	0	7.725	1	1	2
1	0	0	15.45	1	1	3
1	0	0	23.175	1	1	4
1	0	0	30.9	1	1	5
1	0	0	38.625	1	1	6
1	0	0	46.35	1	1	7
1	0	0	54.075	1	1	8
1	0	0	61.8	1	1	9
1	0	0	69.525	1	1	10
1	0	0	77.25	1	1	11
1	0	0	84.975	1	END	12
2	73.9694	-51.7939	0	GND	2	13
2	73.9694	-51.7939	7.76667	2	2	14
2	73.9694	-51.7939	15.5333	2	2	15
2	73.9694	-51.7939	23.3	2	2	16
2	73.9694	-51.7939	31.0667	2	2	17
2	73.9694	-51.7939	38.8333	2	2	18
2	73.9694	-51.7939	46.6	2	2	19
2	73.9694	-51.7939	54.3667	2	2	20
2	73.9694	-51.7939	62.1333	2	2	21
2	73.9694	-51.7939	69.9	2	2	22
2	73.9694	-51.7939	77.6667	2	2	23
2	73.9694	-51.7939	85.4333	2	END	24

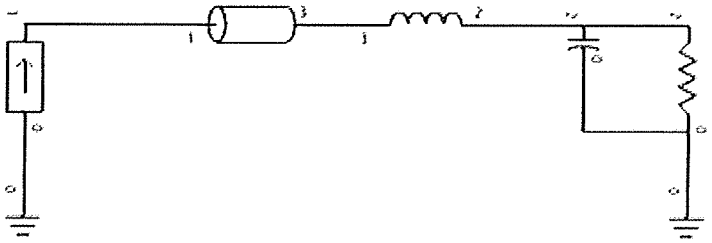
Derivation of Operating Parameters, Nighttime
Directional Array

Following verification of the moment method model of the individual array elements, by comparison of the measured and modeled base impedances, directional antenna array base parameters were calculated. Calculations were made to determine the complex voltage sources which when applied to the base of each array element produce current moment sums which when normalized, equate to the theoretical field parameters of the authorized directional pattern. Using these voltages, the tower currents were calculated. The currents at the ATU sampling points were related to those of the moment method model by using the WCAP Pro nodal analysis program from Westberg Consulting. The assumptions that were used for the single tower calculations were used in the directional array case as well. In the following WCAP calculations node 3 represents the reference point, node 2 represents the tower feed point, and node 0 represents ground. The tower operating impedance is represented from node 2 to ground (R 2-0). The current magnitude and phases at the sample point are represented following the insignificantly short transmission line (TL 1-3). The value shown at TL 1-3 has been rounded by the program. The actual current values shown as "I" in the "WCAP INPUT DATA" represent the values before rounding and were used in the calculation of antenna monitor amplitude and phase indications to yield greater accuracy.

In so much as the sample lines are equal in length and the sample torroids responses are identical, the antenna monitor amplitudes and phases have been calculated directly from the reference point currents and phases.

Tower	Model Pulse	Model Current Magnitude At Torroid, Amps	Model Current Phase at Torroid, Degrees	Modeled Antenna Monitor Ratio	Modeled Antenna Monitor Phase, Degrees
1	1	4.232	+2.7	1.000	0
2	13	3.927	+186.7	0.928	-176

WCAP Circuit Diagram



WCAP - KLTC T1 NIGHT

WCAP OUTPUT AT FREQUENCY: 1.460 MHz

NODE VOLTAGES
Node: 1 391.0838 ∠ 78.4711° V
Node: 2 244.2781 ∠ 69.5269° V
Node: 3 391.0819 ∠ 78.4711° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	1→3 50.00000000	4.23 ∠ 2.700° A	**4.23 ∠ 2.700° A**

WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	2→0 22.17000000	244.28 ∠ 69.527° V	4.28 ∠ 2.405° A
C	2→0 0.00002500	244.28 ∠ 69.527° V	0.06 ∠ 159.527° A
L	3→2 3.98000000	154.51 ∠ 92.700° V	4.23 ∠ 2.700° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→0 22.17000000	22.17 + j 52.540	0.00 + j 0.000
C	2→0 0.00002500	0.00 - j 4360.409	0.00 + j 0.000
L	3→2 3.98000000	22.71 + j 89.574	22.71 + j 53.064
TL	1→3 50.00000000	22.71 + j 89.576	22.71 + j 89.574

WCAP PART		VSWR
TL	1→3 50.00000000	9.6166

WCAP INPUT DATA:
1.4600 0.00000000 0
R 22.17000000 2 0 52.54000000
C 0.00002500 2 0
L 3.98000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I 4.23200000 0 1 2.70000000

WCAP - KLTC T2 NIGHT

WCAP OUTPUT AT FREQUENCY: 1.460 MHz

NODE VOLTAGES
Node: 1 388.8027 ∠ -97.0494° V
Node: 2 261.5976 ∠ -103.9888° V
Node: 3 388.8009 ∠ -97.0495° V

WCAP PART		CURRENT IN	CURRENT OUT
TL	1→3 50.00000000	3.93 ∠ -173.295° A	**3.93 ∠ -173.295° A**

WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	2→0 22.88000000	261.60 ∠ -103.989° V	3.98 ∠ -173.600° A
C	2→0 0.00002500	261.60 ∠ -103.989° V	0.06 ∠ -13.989° A
L	3→2 3.69000000	132.93 ∠ -83.295° V	3.93 ∠ -173.295° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	2→0 22.88000000	22.88 + j 61.560	0.00 + j 0.000
C	2→0 0.00002500	0.00 - j 4360.409	0.00 + j 0.000
L	3→2 3.69000000	23.54 + j 96.166	23.54 + j 62.316
TL	1→3 50.00000000	23.54 + j 96.168	23.54 + j 96.166

WCAP PART		VSWR
TL	1→3 50.00000000	10.3558

WCAP INPUT DATA:
1.4600 0.00000000 0
R 22.88000000 2 0 61.56000000
C 0.00002500 2 0
L 3.69000000 3 2 0.00000000
TL 50.00000000 1 3 100.00000000 0.00100000 0.00000000
I 3.92700000 0 1 186.70500000

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = 1.46 MHz

tower	field ratio magnitude	phase (deg)
1	1.	0
2	.95	184.

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	244.315	69.5	4.28398	2.4
13	261.584	256.	3.98313	186.4

Sum of square of source currents = 68.4356
Total power = 770. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.010458	-.00902404
Y(1, 2)	.00413491	.00623084
Y(2, 1)	.00413496	.0062308
Y(2, 2)	.00980415	-.0089296

TOWER IMPEDANCE MATRIX

impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	44.5617	33.6688
Z(1, 2)	22.5905	-21.9448
Z(2, 1)	22.5908	-21.9446
Z(2, 2)	45.4592	36.3025

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.46	22.173	52.543	57.03	67.1	4.9882	-3.5304	-2.5459
source = 2; node 13, sector 1							
1.46	22.884	61.557	65.673	69.6	5.7812	-3.0354	-2.9854

CURRENT rms
Frequency = 1.46 MHz
Input power = 770. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	4.28398	2.4	4.28037	.176041
2	0	0	7.725	4.4261	1.4	4.42478	.107719
3	0	0	15.45	4.42996	.8	4.42951	.0634186
4	0	0	23.175	4.33772	.4	4.33763	.027672
5	0	0	30.9	4.1565	360.	4.1565	-1.17E-03
6	0	0	38.625	3.89149	359.7	3.89142	-.0236271
7	0	0	46.35	3.54783	359.4	3.54761	-.0398218
8	0	0	54.075	3.13101	359.1	3.13061	-.0497763
9	0	0	61.8	2.6467	358.8	2.64616	-.0534751
10	0	0	69.525	2.10012	358.6	2.09951	-.050886
11	0	0	77.25	1.49426	358.4	1.49367	-.0419099

12	0	0	84.975	.824612	358.2	.824197	-.0261801
END	0	0	92.7	0	0	0	0
GND	73.9694	-51.7939	0	3.98313	186.4	-3.95836	-.443465
14	73.9694	-51.7939	7.76667	4.14388	185.4	-4.12545	-.390312
15	73.9694	-51.7939	15.5333	4.16442	184.8	-4.14968	-.349981
16	73.9694	-51.7939	23.3	4.09053	184.4	-4.07868	-.31115
17	73.9694	-51.7939	31.0667	3.92962	184.	-3.92014	-.272786
18	73.9694	-51.7939	38.8333	3.68686	183.7	-3.67938	-.234772
19	73.9694	-51.7939	46.6	3.36728	183.4	-3.36149	-.197318
20	73.9694	-51.7939	54.3667	2.97619	183.1	-2.97184	-.160767
21	73.9694	-51.7939	62.1333	2.51909	182.9	-2.51596	-.125498
22	73.9694	-51.7939	69.9	2.00109	182.6	-1.99898	-.0918751
23	73.9694	-51.7939	77.6667	1.42512	182.4	-1.42385	-.0601745
24	73.9694	-51.7939	85.4333	.787026	182.2	-.786437	-.0304266
END	73.9694	-51.7939	93.2	0	0	0	0

Sampling System Measurements

The following calculations confirm that the sample system as installed complies with Rule Section 73.151(c)(2)(1) in all respects. The sample torroids are Delta model TCT3 and their outputs are in agreement within the manufacturer's specification of +/-2% and +/-2º. The antenna monitor is a Potomac Instruments model 19D. The antenna monitor was recently returned to the manufacturer for calibration and holds a certificate of calibration dated 07/25/2016. The sample lines are equal in length and constructed of 1/4" Andrew FHJ1-50A coaxial cable that has a solid outer conductor and foam dielectric. The cables are equal in length within 1º as required. The cables have all been buried so as to be exposed to the same environmental conditions. The length of the cables was confirmed by measuring the impedance, looking into the line with the far end opened. The lines were found to be 3/4 wavelength long at the frequencies listed. These frequencies were used to calculate the electrical lengths of the lines at the operating frequency of 1460 kHz. Frequencies were calculated at which the lines were +/- 45º the length of the resonate frequency. The impedance was then calculated using the following formula:

$$Zo = ((R1^2+X1^2)^{1/2} * (R2^2+X2^2)^{1/2})^{1/2}$$

Sample Line Length Calculation

Tower	Resonate Frequency At 270º, kHz	Electrical Length at 1460 kHz, Degrees
1	961.9	409.81
2	961.58	409.95

Sample Line Impedance Calculation

Tower	270º Resonant Frequency kHz	45º Above Resonant Frequency kHz	Resistance Ohms	Reactance Ohms	45º Below Resonant Frequency kHz	Resistance Ohms	Reactance Ohms	Characteristic Impedance Ohms
1	961.90	1122.22	13.89	47.26	801.58	9.59	-47.68	48.95
2	961.58	1121.84	12.62	47.81	801.32	8.80	-48.38	49.31

The sample torroid calibration was confirmed by passing a common conductor through the torroids. The common conductor was driven by a Hewlett-Packard 8753ES vector network analyzer that was properly calibrated for response measurement. The output from the tower #1 torroid was fed to the reference receiver of the analyzer and the other output was alternately fed to the B input. The output of the tower 2 torroid was compared to that of the tower 1 torroid and the results noted in the chart below.

Sample Torroid Calibration Verification

Tower	Serial Number	Indicated Ratio	Indicated Phase
1	18152	1.00	0.0º
2	18151	1.0128	-0.05º

Sample Lines Terminated By Torroids

Tower	Serial Number	Impedance at Input to Sample Line with Torroid Connected
1	18152	49.0 –j1.92
2	18151	52.0 –j1.48

Item 6

Direct Measurement of Power

The common point network in the nighttime phasor was adjusted to provide the proper operating resistance of 50 ohms and a reactance of 0 (zero) ohms to the transmitter output. In order to compensate for hookup inductance between the power measurement point and the transmitter the common point reactance was set for a value of –j7 at the measurement point. The nighttime operating powers were calculated by adding 8.0% to the nighttime nominal operating power of 0.77kW. The common point current was then calculated as indicated below.

Pattern	Nominal Power Watts	Operating Power Watts	Operating Common Point Current, Amps
Night	770	832	4.08
Day	5000	5000	10

Item 7

Reference Field Strength Measurements

Reference field strength measurements were made on radials having existing monitor point limits on the current license as well as on radials in the main lobes as follows:

KLTC DA-Night

Reference Field Strength Measurements

Point #	Distance/km	Field Strength mv/m	Latitude	Longitude
35-1	1.37	267.0	N46° 51' 32.5"	W102° 49' 09.9"
35-2	2.81	108.0	N46° 52- 10.5"	W102° 48' 30.6"
35-3	3.68	87.8	N46° 52' 33.6"	W102° 48' 06.7"
127-1	1.86	3.54	N46° 50' 19.4"	W102° 48' 19.4"
127-2	2.98	0.758	N46° 49' 54.7"	W102° 47' 55.1"
127-3	3.87	6.58	N46° 49' 39.9"	W102° 47' 21.7"
215-1	2.20	173	N46° 49' 57.5"	W102° 50' 46.7"
215-2	2.86	54.5	N46° 49' 40.4"	W102° 51' 04.6"
215.3	3.74	34.7	N46° 49' 17.1"	W102° 51' 28.7"
305-1	1.59	25.6	N46° 51' 24.1"	W102° 50' 50.3"
305-2	5.74	0.615	N46° 52' 34.6"	W102° 53' 37.6"
305-3	8.70	1.13	N46° 53' 30.3"	W102° 55' 31.9"

All measurements were taken August 24, 2016 with Potomac Instruments FIM-4100 field strength meter with serial number 133. The meter was calibrated by its manufacturer on May 19, 2015.

Item 7

RFR Compliance

Operation of KLTC at 5 kW daytime and 0.77 kW nighttime will not result in exposure of workers or the general public to RF radiation in excess of levels specified in 47CFR 1.1310. Fences have been installed around all tower bases to comply with the minimum distance which exceeds the distances specified in OET Bulletin 65 for this frequency, calculated power levels in the towers and tower height to prevent electric and magnetic exposure greater than permissible levels. These fences limit access by the general public. If it becomes necessary for workers to enter the tower base areas for maintenance, the station will either reduce power or cease operation to provide RFR safety for the workers.

Item 8

Ground System Description

The ground system at KLTC remains as previously licensed and consists of 120 buried copper radials extending 51.5 meters plus 120 radials 15.24 meter interspersed between longer radials.

Item 7

RFR Compliance

Operation of KLTC at 5 kW daytime and 0.77 kW nighttime will not result in exposure of workers or the general public to RF radiation in excess of levels specified in 47CFR 1.1310. Fences have been installed around all tower bases to comply with the minimum distance which exceeds the distances specified in OET Bulletin 65 for this frequency, calculated power levels in the towers and tower height to prevent electric and magnetic exposure greater than permissible levels. These fences limit access by the general public. If it becomes necessary for workers to enter the tower base areas for maintenance, the station will either reduce power or cease operation to provide RFR safety for the workers.

Item 8

Ground System Description

The ground system at KLTC remains as previously licensed and consists of 120 buried copper radials extending 51.5 meters plus 120 radials 15.24 meter interspersed between longer radials.