SoN

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.

SNC 1/17/13

FOR COMMISSION USE ONLY
FILE NO. BAML-20130115ADS

SECTION I - APPLICANT FEE INFORMATION

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

Kiertron, Inc.

copy notices and communications to:

MAILING ADDRESS (Line 1) (Maximum 35 characters)
P.O. Box 3003

MAILING ADDRESS (Line 2) (Maximum 35 characters)

Miller and Neely, PC
6900 Wisconsin Ave., Suite 704
Bethesda, MD 20815

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Blue Bell	PA	19422

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
(215) 628-3500	KBRT	FRN 0001519610

FACID 34588

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

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

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

C. If Yes, provide the following information:

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

(A) FEE TYPE CODE	(B) FEE MULTIPLE	(C) FEE DUE FOR FEE TYPE CODE IN COLUMN (A)	FOR FCC USE ONLY
M M R	0 0 0 1	$ 635.00	

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	$ 730.00	

	TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
ADD ALL AMOUNTS SHOWN IN COLUMN C, AND ENTER THE TOTAL HERE. THIS AMOUNT SHOULD EQUAL YOUR ENCLOSED REMITTANCE.	$ 1,365.00	

Received & Inspected
JAN 15 2013
FCC Mail Room

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT Kiertron, Inc. FRN0001519610		
MAILING ADDRESS P.O. Box 3003		
CITY Blue Bell	STATE PA	ZIP CODE 19422

2. This application is for:

[X] Commercial [ ] Noncommercial

[X] AM Directional [ ] AM Non-Directional

Call letters FAC 34588 KBRT	Community of License	Construction Permit File No.	Modification of Construction Permit File No(s).	Expiration Date of Last Construction Permit
	Costa Mesa, CA	BP-20101201AAA	BMP-20120809AAQ	01/26/2015

3. Is the station now operating pursuant to automatic program test authority in accordance with 47 C.F.R. Section 73.1620? [ ] Yes [X] No

If No, explain in an Exhibit. Written program test authority requested also MDCL authority requested herein — Exhibit No. E-1

4. Have all the terms, conditions, and obligations set forth in the above described construction permit been fully met? [X] Yes [ ] No

If No, state exceptions in an Exhibit. Exhibit No. N/A

5. Apart from the changes already reported, has any cause or circumstance arisen since the grant of the underlying construction permit which would result in any statement or representation contained in the construction permit application to be now incorrect? [ ] Yes [X] No

If Yes, explain in an Exhibit. IBOC restrictions authorized in special condition #5 are implemented as specified. — Exhibit No. N/A

6. Has the permittee filed its Ownership Report (FCC Form 323) or ownership certification in accordance with 47 C.F.R. Section 73.3615(b)? [ ] Yes [ ] No [X] Does not apply

If No, explain in an Exhibit. Exhibit No. N/A

7. Has an adverse finding been made or an adverse final action been taken by any court or administrative body with respect to the applicant or parties to the application in a civil or criminal proceeding, brought under the provisions of any law relating to the following: any felony; mass media related antitrust or unfair competition; fraudulent statements to another governmental unit; or discrimination? [ ] Yes [X] No

If the answer is Yes, attach as an Exhibit a full disclosure of the persons and matters involved, including an identification of the court or administrative body and the proceeding (by dates and file numbers), and the disposition of the litigation. Where the requisite information has been earlier disclosed in connection with another application or as required by 47 U.S.C. Section 1.65(c), the applicant need only provide: (i) an identification of that previous submission by reference to the file number in the case of an application, the call letters of the station regarding which the application or Section 1.65 information was filed, and the date of filing; and (ii) the disposition of the previously reported matter. Exhibit No. N/A

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. N/A

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	
Donald B. Crawford		
Title	Date	Telephone Number
President	01/11/2013	(215) 628-3500

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

Kiertron, Inc.

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

[X] Station License [ ] Direct Measurement of Power

1. Facilities authorized in construction permit

Call Sign	File No. of Construction Permit (if applicable)	Frequency (kHz)	Hours of Operation	Power in kilowatts	
				Night	Day
KBRT	BMP-20120809AAQ	740	Unlimited	50.0	0.19

2. Station location

State	City or Town
California	Costa Mesa

3. Transmitter location

State	County	City or Town	Street address (or other identification)
CA	Orange	Silverado	9193 Black Star Cyn Road

4. Main studio location

State	County	City or Town	Street address (or other identification)
CA	Orange	Costa Mesa	3183-D Airway Ave.

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

State	County	City or Town	Street address (or other identification)
CA	Orange	Costa Mesa	3183-D Airway Ave.

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

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

Attach as an Exhibit a detailed description of the sampling system as installed. Exhibit No. E-1

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
2.02	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	50	0	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
ASR 1276731	1	-39.7	-39.7	0.476	0.476		
1276732	2	-102.6	+102.6	0.880	0.880		
1276733	3	0.0	0.0	1.000	1.000		
1276734	4	-98.3	-98.3	0.567	0.567		

Manufacturer and type of antenna monitor: Potomac Instruments Type 1900

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.
See E-1 Page 41	See E-1 Page 41	See E-1 Page 41	See E-1 Page 41	Exhibit No. N/A

Excitation [X] Series [ ] Shunt

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

North Latitude	33 °	49 '	44 "	West Longitude	117 °	38 '	18 "

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. E-1

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

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.

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 (check appropriate box below)
Wendell C. Alexander	
Address (include ZIP Code)	Date
Crawford Broadcasting Company	01/11/2013
2821 S. Parker Road, Suite 1205	Telephone No. (Include Area Code)
Aurora CO 80014	(303) 433-0104

[X] Technical Director

[ ] Registered Professional Engineer

[ ] Chief Operator

[ ] Technical Consultant

[ ] Other (specify)

EXHIBIT E-1

APPLICATION FOR LICENSE INFORMATION
RADIO STATION KBRT
COSTA MESA, CALIFORNIA

BMP-20120809AAQ

Kiertron, Inc.

January 11, 2013

740 kHz 50 kW-D/0.19 kW-N DA-2

CRAWFORD
BROADCASTING
COMPANY

EXECUTIVE SUMMARY

This engineering exhibit supports an application for license to cover a construction permit for a change in day and night facilities for radio station KBRT, Costa Mesa, California (FCC FID No. 34588, BMP-20120809AAQ) pursuant to the AM technical rules permitting moment-method modeling of eligible AM directional arrays [47 C.F.R. §73.151(c)].

KBRT is currently licensed on 740 kHz with 10 kW day and 0.113 kW night using the same directional parameters day and night. The construction permit specifies a site change as well as both day and night power increases to 50 kW and 0.19 kW, respectively, using the same four-tower directional array and pattern. It is desired to license both the day and night facilities pursuant to the AM modeling option.

Information is provided herein showing that the directional antenna parameters for the day and night patterns authorized by the FCC have been determined in accordance with the requirements of 47 C.F.R. §73.151(c). The system has been adjusted to produce antenna monitor parameters within ±5 percent in ratio and ±3 degrees in phase of the modeled values, as required by the Rules. A modified station license is requested herewith specifying the new operating parameters.

The new KBRT facility was adjusted to the model-determined operating parameters and reference field intensity measurements were made while operating pursuant to 47 C.F.R. §73.1615. KBRT is presently operating from its licensed site and facilities pending grant of program test authority. Program test authority is requested herewith.

KBRT intends to take advantage of the built-in MDCL power-saving technology available with its Nautel NX-50 main transmitter. As such, we herewith request a waiver of 47 C.F.R. §73.1560(a) for the purpose of allowing MDCL operation in accordance with Public Notice, DA 11-1535, dated September 13, 2011.

Analysis of Tower Impedance Measurements to Verify Method of Moments Model

Tower base impedance measurements were made at the final J-plugs within the Antenna Tuning Units (ATUs) using a Delta Electronics OIB-1 operating impedance bridge. The other towers were all open-circuited at the same points where the impedance measurements were made for them. This arrangement left only the static drain chokes in shunt across the ATU outputs and the short feed tubing between the ATU outputs and the tower bases in series in the impedance measurements.

ACSModel (MININEC 3.1 core) was used to model the KBRT array.

A lumped load with a reactance of –j10,000 was modeled at the base of the other towers to simulate an open circuit at each tower base.

The tower heights were adjusted in the model in order to achieve calibration of the model with the measured base impedances. All modeled tower heights were within 75 to 125 percent of the physical tower height as required by the FCC Rules.

The modeled radius for each tower was the physical radius of the tower as determined by the formula $3T/2\pi$, where T is the tower face width in meters. The KBRT radiators are uniform cross-section triangular towers and have face widths of 0.6097 meters. Each tower's radius was modeled at 0.2911 meters.

Each tower is fed with a short length of ¾-inch copper tubing that exhibits some amount of series inductive reactance. This tubing connects to each tower immediately above the base insulator.

Tower #1 supports a 4-foot parabolic antenna for WQPJ213, an 11 GHz fixed microwave link. This antenna is mounted at the 275-foot level and is fed with multimode fiber-optic cable. No top-loading effects were observed as a result of this antenna and it was not necessary to account for it in the model.

A circuit model was constructed for each tower using the shunt static drain choke reactance, the assumed series feed tubing and shunt base region reactances. This model was used with WCAP Professional version 1.1.02 to determine the effects of these reactances on the ATU output impedance at each tower. In each of the WCAP tabulations, node 2 represents the ATU output reference point and node 3 represents the tower base as shown on the circuit model schematic provided with each tabulation. Node 0 represents ground potential. The ATU output impedances can be found in the "TO IMPEDANCE" column of each WCAP tabulation, following the phantom 1.0 ohm resistor inserted in the model to provide a calculation point for the impedance. The complex base impedance of each tower from the moment method model is represented in each case by the complex load from node 3 to ground. A value of 90 pF was assumed for the base insulator.

At tower #3, the antenna tuning unit cabinet is quite large and is located in close proximity to the tower base. A capacitor with a value of 100 pF was used in the circuit model in addition to the capacitor representing base insulator to account for the stray capacitance produced by the proximity to the ATU cabinet. The total capacitance used in the tower #3 circuit model is 190 pF, the reactance for which is 1,132 ohms, As such, the total shunt capacitance used to model base region effects is less than 250 pF and the reactance is greater than five times the

magnitude of the tower base operating impedance, thus complying with the limits set forth in 47 C.F.R. §73.151(c)(1)(viii).

§73.151(c)(1)(vii) permits the use of a lumped series inductance of 10 uH or less between the output port of each antenna tuning unit and the associated tower. In each case, the value of lumped series inductance was below this 10 uH limit.

The WCAP circuit model tabulation immediately follows the model for each tower.

The modeled and measured impedances at the ATU output J-plugs with the other towers open-circuited at their ATU output J-plugs agree within ±2 ohms and ±4 percent as required by the FCC rules.

Table 1 – Analysis of Tower Impedance Measurements to Verify Moment Method Model

Twr.	Z_{BASE} (Modeled)	Z_{ATU} (Modeled)	Z_{ATU} (Measured)	Series L (uH)	Shunt C pF	Phys. Height (deg.)	Model Height (deg.)	% Phys. Height
1	22.1 –j61.1	21.1 –j16.7	21.0 –j17.0	9.25	90	74.5	74.8	100.4
2	22.0 –j62.6	21.0 –j19.9	21.0 –j19.9	8.88	90	74.5	74.5	100.0
3	21.2 –j66.5	19.0 –j19.9	19.0 –j19.9	9.30	190	74.5	73.8	99.1
4	23.0 –j56.8	22.0 –j18.5	22.0 –j18.5	8.00	90	74.5	75.6	101.5

****
ACSModel
(MININEC 3.1 Core)
01-08-2013 20:42:18
****

KBRT
Calibration Model
Tower 1 Driven, All Others Floated

Frequency = 0.740 MHz Wavelength = 405.13513 Meters

No. of Wires: 4

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-1	
0	0	84.17808	0.2911	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
50.64189	87.71432	0		-2	
50.64189	87.71432	83.84046	0.2911	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
-44.53305	122.3536	0		-3	
-44.53305	122.3536	83.0527	0.2911	0	20

Wire No. 4 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
-95.17562	34.64109	0		-4	
-95.17562	34.64109	85.07838	0.2911	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
0	0	0	0.2911	-1	1	1
0	0	4.208904	0.2911	1	1	2
0	0	8.417808	0.2911	1	1	3
0	0	12.62671	0.2911	1	1	4
0	0	16.83562	0.2911	1	1	5
0	0	21.04452	0.2911	1	1	6
0	0	25.25342	0.2911	1	1	7
0	0	29.46233	0.2911	1	1	8
0	0	33.67123	0.2911	1	1	9
0	0	37.88013	0.2911	1	1	10
0	0	42.08904	0.2911	1	1	11
0	0	46.29794	0.2911	1	1	12
0	0	50.50685	0.2911	1	1	13
0	0	54.71575	0.2911	1	1	14
0	0	58.92465	0.2911	1	1	15
0	0	63.13356	0.2911	1	1	16
0	0	67.34246	0.2911	1	1	17
0	0	71.55137	0.2911	1	1	18

0	0	75.76027	0.2911	1	1	19
0	0	79.96917	0.2911	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
50.64189	87.71432	0	0.2911	-2	2	21
50.64189	87.71432	4.192023	0.2911	2	2	22
50.64189	87.71432	8.384047	0.2911	2	2	23
50.64189	87.71432	12.57607	0.2911	2	2	24
50.64189	87.71432	16.76809	0.2911	2	2	25
50.64189	87.71432	20.96012	0.2911	2	2	26
50.64189	87.71432	25.15214	0.2911	2	2	27
50.64189	87.71432	29.34416	0.2911	2	2	28
50.64189	87.71432	33.53619	0.2911	2	2	29
50.64189	87.71432	37.72821	0.2911	2	2	30
50.64189	87.71432	41.92023	0.2911	2	2	31
50.64189	87.71432	46.11225	0.2911	2	2	32
50.64189	87.71432	50.30428	0.2911	2	2	33
50.64189	87.71432	54.4963	0.2911	2	2	34
50.64189	87.71432	58.68832	0.2911	2	2	35
50.64189	87.71432	62.88035	0.2911	2	2	36
50.64189	87.71432	67.07237	0.2911	2	2	37
50.64189	87.71432	71.26439	0.2911	2	2	38
50.64189	87.71432	75.45641	0.2911	2	2	39
50.64189	87.71432	79.64844	0.2911	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
-44.53305	122.3536	0	0.2911	-3	3	41
-44.53305	122.3536	4.152635	0.2911	3	3	42
-44.53305	122.3536	8.30527	0.2911	3	3	43
-44.53305	122.3536	12.45791	0.2911	3	3	44
-44.53305	122.3536	16.61054	0.2911	3	3	45
-44.53305	122.3536	20.76318	0.2911	3	3	46
-44.53305	122.3536	24.91581	0.2911	3	3	47
-44.53305	122.3536	29.06845	0.2911	3	3	48
-44.53305	122.3536	33.22108	0.2911	3	3	49
-44.53305	122.3536	37.37372	0.2911	3	3	50
-44.53305	122.3536	41.52635	0.2911	3	3	51
-44.53305	122.3536	45.67899	0.2911	3	3	52
-44.53305	122.3536	49.83162	0.2911	3	3	53
-44.53305	122.3536	53.98426	0.2911	3	3	54
-44.53305	122.3536	58.13689	0.2911	3	3	55
-44.53305	122.3536	62.28953	0.2911	3	3	56
-44.53305	122.3536	66.44216	0.2911	3	3	57
-44.53305	122.3536	70.5948	0.2911	3	3	58
-44.53305	122.3536	74.74744	0.2911	3	3	59
-44.53305	122.3536	78.90007	0.2911	3	0	60

Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
-95.17562	34.64109	0	0.2911	-4	4	61
-95.17562	34.64109	4.253919	0.2911	4	4	62
-95.17562	34.64109	8.507837	0.2911	4	4	63
-95.17562	34.64109	12.76176	0.2911	4	4	64
-95.17562	34.64109	17.01567	0.2911	4	4	65
-95.17562	34.64109	21.26959	0.2911	4	4	66
-95.17562	34.64109	25.52351	0.2911	4	4	67
-95.17562	34.64109	29.77743	0.2911	4	4	68
-95.17562	34.64109	34.03135	0.2911	4	4	69

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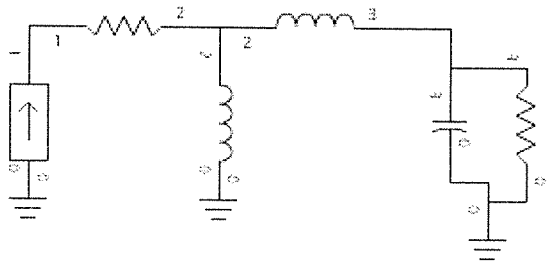
-95.17562       34.64109       38.28527       0.2911        4     4      70
-95.17562       34.64109       42.53919       0.2911        4     4      71
-95.17562       34.64109       46.79311       0.2911        4     4      72
-95.17562       34.64109       51.04703       0.2911        4     4      73
-95.17562       34.64109       55.30095       0.2911        4     4      74
-95.17562       34.64109       59.55486       0.2911        4     4      75
-95.17562       34.64109       63.80878       0.2911        4     4      76
-95.17562       34.64109       68.0627        0.2911        4     4      77
-95.17562       34.64109       72.31662       0.2911        4     4      78
-95.17562       34.64109       76.57054       0.2911        4     4      79
-95.17562       34.64109       80.82446       0.2911        4     0      80

Sources:  1
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 100.0, 0.0

Number of Loads:  3
Pulse No., Resistance, Reactance:  21 , 0 ,-10000
Pulse No., Resistance, Reactance:  41 , 0 ,-10000
Pulse No., Resistance, Reactance:  61 , 0 ,-10000

********************    SOURCE DATA     ********************
Pulse  1       Voltage = (100.0, 0.0j)
               Current = (0.5228, 1.4474j)
               Impedance = (22.077, -61.116j)
               Power = 26.14 Watts
```



WCAP - KBRT Tower 1 Calibration Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

NODE VOLTAGES

Node:	1	27.6976 ∠ -37.1999° V
Node:	2	26.9078 ∠ -38.4873° V
Node:	3	63.4298 ∠ -70.5427° V

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	1→2	1.00000000	1.00 ∠	0.000° V	1.00 ∠	0.000° A
L	2→0	2920.70000000	26.91 ∠	-38.487° V	0.00 ∠	-128.487° A
L	2→3	9.25000000	43.06 ∠	90.089° V	1.00 ∠	0.089° A
C	3→0	0.00009000	63.43 ∠	-70.543° V	0.03 ∠	19.457° A
R	3→0	22.10000000	63.43 ∠	-70.543° V	0.98 ∠	-0.428° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	1→2	1.00000000	22.06 - j	16.746	21.06 - j	16.746
L	2→0	2920.70000000	0.00 + j	13579.962	0.00 + j	0.000
L	2→3	9.25000000	21.01 - j	16.758	21.01 - j	59.766
C	3→0	0.00009000	0.00 - j	2389.714	0.00 + j	0.000
R	3→0	22.10000000	22.10 - j	61.100	0.00 + j	0.000

WCAP INPUT DATA:

	0.7400	0.00000000	0	
I	1.00000000	0	1	0.00000000
R	1.00000000	1	2	0.00000000
L	2920.70000000	2	0	0.00000000
L	9.25000000	2	3	0.00000000
C	0.00009000	3	0	
R	22.10000000	3	0	-61.10000000

****
ACSModel
(MININEC 3.1 Core)
01-08-2013 20:45:40
****

KBRT
Calibration Model
Tower 2 Driven, All Others Floated

Frequency = 0.740 MHz Wavelength = 405.13513 Meters

No. of Wires: 4

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-1	
0	0	84.17808	0.2911	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
50.64189	87.71432	0		-2	
50.64189	87.71432	83.84046	0.2911	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
-44.53305	122.3536	0		-3	
-44.53305	122.3536	83.0527	0.2911	0	20

Wire No. 4 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
-95.17562	34.64109	0		-4	
-95.17562	34.64109	85.07838	0.2911	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
0	0	0	0.2911	-1	1	1
0	0	4.208904	0.2911	1	1	2
0	0	8.417808	0.2911	1	1	3
0	0	12.62671	0.2911	1	1	4
0	0	16.83562	0.2911	1	1	5
0	0	21.04452	0.2911	1	1	6
0	0	25.25342	0.2911	1	1	7
0	0	29.46233	0.2911	1	1	8
0	0	33.67123	0.2911	1	1	9
0	0	37.88013	0.2911	1	1	10
0	0	42.08904	0.2911	1	1	11
0	0	46.29794	0.2911	1	1	12
0	0	50.50685	0.2911	1	1	13
0	0	54.71575	0.2911	1	1	14
0	0	58.92465	0.2911	1	1	15
0	0	63.13356	0.2911	1	1	16
0	0	67.34246	0.2911	1	1	17

0	0	71.55137	0.2911	1	1	18
0	0	75.76027	0.2911	1	1	19
0	0	79.96917	0.2911	1	0	20

Wire No. 2 Coordinates

X	Y	Z	Radius	Connection End1	End2	Pulse No.
50.64189	87.71432	0	0.2911	-2	2	21
50.64189	87.71432	4.192023	0.2911	2	2	22
50.64189	87.71432	8.384047	0.2911	2	2	23
50.64189	87.71432	12.57607	0.2911	2	2	24
50.64189	87.71432	16.76809	0.2911	2	2	25
50.64189	87.71432	20.96012	0.2911	2	2	26
50.64189	87.71432	25.15214	0.2911	2	2	27
50.64189	87.71432	29.34416	0.2911	2	2	28
50.64189	87.71432	33.53619	0.2911	2	2	29
50.64189	87.71432	37.72821	0.2911	2	2	30
50.64189	87.71432	41.92023	0.2911	2	2	31
50.64189	87.71432	46.11225	0.2911	2	2	32
50.64189	87.71432	50.30428	0.2911	2	2	33
50.64189	87.71432	54.4963	0.2911	2	2	34
50.64189	87.71432	58.68832	0.2911	2	2	35
50.64189	87.71432	62.88035	0.2911	2	2	36
50.64189	87.71432	67.07237	0.2911	2	2	37
50.64189	87.71432	71.26439	0.2911	2	2	38
50.64189	87.71432	75.45641	0.2911	2	2	39
50.64189	87.71432	79.64844	0.2911	2	0	40

Wire No. 3 Coordinates

X	Y	Z	Radius	Connection End1	End2	Pulse No.
-44.53305	122.3536	0	0.2911	-3	3	41
-44.53305	122.3536	4.152635	0.2911	3	3	42
-44.53305	122.3536	8.30527	0.2911	3	3	43
-44.53305	122.3536	12.45791	0.2911	3	3	44
-44.53305	122.3536	16.61054	0.2911	3	3	45
-44.53305	122.3536	20.76318	0.2911	3	3	46
-44.53305	122.3536	24.91581	0.2911	3	3	47
-44.53305	122.3536	29.06845	0.2911	3	3	48
-44.53305	122.3536	33.22108	0.2911	3	3	49
-44.53305	122.3536	37.37372	0.2911	3	3	50
-44.53305	122.3536	41.52635	0.2911	3	3	51
-44.53305	122.3536	45.67899	0.2911	3	3	52
-44.53305	122.3536	49.83162	0.2911	3	3	53
-44.53305	122.3536	53.98426	0.2911	3	3	54
-44.53305	122.3536	58.13689	0.2911	3	3	55
-44.53305	122.3536	62.28953	0.2911	3	3	56
-44.53305	122.3536	66.44216	0.2911	3	3	57
-44.53305	122.3536	70.5948	0.2911	3	3	58
-44.53305	122.3536	74.74744	0.2911	3	3	59
-44.53305	122.3536	78.90007	0.2911	3	0	60

Wire No. 4 Coordinates

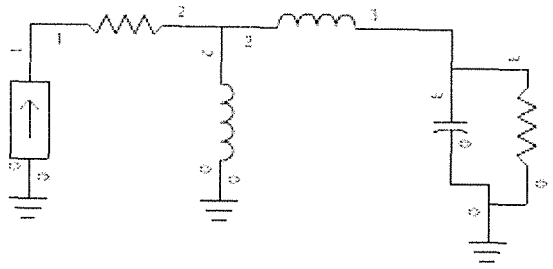
X	Y	Z	Radius	Connection End1	End2	Pulse No.
-95.17562	34.64109	0	0.2911	-4	4	61
-95.17562	34.64109	4.253919	0.2911	4	4	62
-95.17562	34.64109	8.507837	0.2911	4	4	63
-95.17562	34.64109	12.76176	0.2911	4	4	64
-95.17562	34.64109	17.01567	0.2911	4	4	65
-95.17562	34.64109	21.26959	0.2911	4	4	66
-95.17562	34.64109	25.52351	0.2911	4	4	67
-95.17562	34.64109	29.77743	0.2911	4	4	68

```
-95.17562       34.64109        34.03135        0.2911          4     4      69
-95.17562       34.64109        38.28527        0.2911          4     4      70
-95.17562       34.64109        42.53919        0.2911          4     4      71
-95.17562       34.64109        46.79311        0.2911          4     4      72
-95.17562       34.64109        51.04703        0.2911          4     4      73
-95.17562       34.64109        55.30095        0.2911          4     4      74
-95.17562       34.64109        59.55486        0.2911          4     4      75
-95.17562       34.64109        63.80878        0.2911          4     4      76
-95.17562       34.64109        68.0627         0.2911          4     4      77
-95.17562       34.64109        72.31662        0.2911          4     4      78
-95.17562       34.64109        76.57054        0.2911          4     4      79
-95.17562       34.64109        80.82446        0.2911          4     0      80

Sources:  1
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 100.0, 0.0

Number of Loads:  3
Pulse No., Resistance, Reactance:  1 , 0 ,-10000
Pulse No., Resistance, Reactance:  41 , 0 ,-10000
Pulse No., Resistance, Reactance:  61 , 0 ,-10000

********************    SOURCE DATA     ********************
Pulse  21      Voltage = (100.0, 0.0j)
               Current = (0.4996, 1.421j)
               Impedance = (22.021, -62.628j)
               Power = 24.98 Watts
```



WCAP - KBRT Tower 2 Calibration Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

NODE VOLTAGES

Node:	1	29.6416 ∠ -42.1678° V
Node:	2	28.9082 ∠ -43.4985° V
Node:	3	64.7582 ∠ -71.0464° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	1.00 ∠ 0.000° V	1.00 ∠ 0.000° A
L	2→0	2920.70000000	28.91 ∠ -43.498° V	0.00 ∠ -133.498° A
L	2→3	8.88000000	41.35 ∠ 90.088° V	1.00 ∠ 0.088° A
C	3→0	0.00009000	64.76 ∠ -71.046° V	0.03 ∠ 18.954° A
R	3→0	22.02000000	64.76 ∠ -71.046° V	0.98 ∠ -0.426° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	21.97 - j 19.899	20.97 - j 19.899
L	2→0	2920.70000000	0.00 + j 13579.962	0.00 + j 0.000
L	2→3	8.88000000	20.91 - j 19.902	20.91 - j 61.190
C	3→0	0.00009000	-0.00 - j 2389.714	0.00 + j 0.000
R	3→0	22.02000000	22.02 - j 62.600	0.00 + j 0.000

WCAP INPUT DATA:

	0.7400	0.00000000	0	
I	1.00000000	0	1	0.00000000
R	1.00000000	1	2	0.00000000
L	2920.70000000	2	0	0.00000000
L	8.88000000	2	3	0.00000000
C	0.00009000	3	0	
R	22.02000000	3	0	-62.60000000

```
****************************************
                ACSModel
          (MININEC 3.1 Core)
      01-08-2013          20:47:59
****************************************

KBRT
Calibration Model
Tower 3 Driven, All Others Floated

Frequency = 0.740 MHz     Wavelength = 405.13513 Meters

No. of Wires: 4

Wire No. 1   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
 0             0             0                         -1
 0             0             84.17808     0.2911        0              20

Wire No. 2   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
 50.64189      87.71432      0                         -2
 50.64189      87.71432      83.84046     0.2911        0              20

Wire No. 3   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
-44.53305      122.3536      0                         -3
-44.53305      122.3536      83.0527      0.2911        0              20

Wire No. 4   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
-95.17562      34.64109      0                         -4
-95.17562      34.64109      85.07838     0.2911        0              20

                **** ANTENNA GEOMETRY ****

Wire No.  1  Coordinates                                  Connection  Pulse
X             Y             Z          Radius     End1  End2        No.
 0             0             0          0.2911     -1    1           1
 0             0             4.208904   0.2911      1    1           2
 0             0             8.417808   0.2911      1    1           3
 0             0             12.62671   0.2911      1    1           4
 0             0             16.83562   0.2911      1    1           5
 0             0             21.04452   0.2911      1    1           6
 0             0             25.25342   0.2911      1    1           7
 0             0             29.46233   0.2911      1    1           8
 0             0             33.67123   0.2911      1    1           9
 0             0             37.88013   0.2911      1    1           10
 0             0             42.08904   0.2911      1    1           11
 0             0             46.29794   0.2911      1    1           12
 0             0             50.50685   0.2911      1    1           13
 0             0             54.71575   0.2911      1    1           14
 0             0             58.92465   0.2911      1    1           15
 0             0             63.13356   0.2911      1    1           16
 0             0             67.34246   0.2911      1    1           17
```

0	0	71.55137	0.2911	1	1	18
0	0	75.76027	0.2911	1	1	19
0	0	79.96917	0.2911	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
50.64189	87.71432	0	0.2911	-2	2	21
50.64189	87.71432	4.192023	0.2911	2	2	22
50.64189	87.71432	8.384047	0.2911	2	2	23
50.64189	87.71432	12.57607	0.2911	2	2	24
50.64189	87.71432	16.76809	0.2911	2	2	25
50.64189	87.71432	20.96012	0.2911	2	2	26
50.64189	87.71432	25.15214	0.2911	2	2	27
50.64189	87.71432	29.34416	0.2911	2	2	28
50.64189	87.71432	33.53619	0.2911	2	2	29
50.64189	87.71432	37.72821	0.2911	2	2	30
50.64189	87.71432	41.92023	0.2911	2	2	31
50.64189	87.71432	46.11225	0.2911	2	2	32
50.64189	87.71432	50.30428	0.2911	2	2	33
50.64189	87.71432	54.4963	0.2911	2	2	34
50.64189	87.71432	58.68832	0.2911	2	2	35
50.64189	87.71432	62.88035	0.2911	2	2	36
50.64189	87.71432	67.07237	0.2911	2	2	37
50.64189	87.71432	71.26439	0.2911	2	2	38
50.64189	87.71432	75.45641	0.2911	2	2	39
50.64189	87.71432	79.64844	0.2911	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
-44.53305	122.3536	0	0.2911	-3	3	41
-44.53305	122.3536	4.152635	0.2911	3	3	42
-44.53305	122.3536	8.30527	0.2911	3	3	43
-44.53305	122.3536	12.45791	0.2911	3	3	44
-44.53305	122.3536	16.61054	0.2911	3	3	45
-44.53305	122.3536	20.76318	0.2911	3	3	46
-44.53305	122.3536	24.91581	0.2911	3	3	47
-44.53305	122.3536	29.06845	0.2911	3	3	48
-44.53305	122.3536	33.22108	0.2911	3	3	49
-44.53305	122.3536	37.37372	0.2911	3	3	50
-44.53305	122.3536	41.52635	0.2911	3	3	51
-44.53305	122.3536	45.67899	0.2911	3	3	52
-44.53305	122.3536	49.83162	0.2911	3	3	53
-44.53305	122.3536	53.98426	0.2911	3	3	54
-44.53305	122.3536	58.13689	0.2911	3	3	55
-44.53305	122.3536	62.28953	0.2911	3	3	56
-44.53305	122.3536	66.44216	0.2911	3	3	57
-44.53305	122.3536	70.5948	0.2911	3	3	58
-44.53305	122.3536	74.74744	0.2911	3	3	59
-44.53305	122.3536	78.90007	0.2911	3	0	60

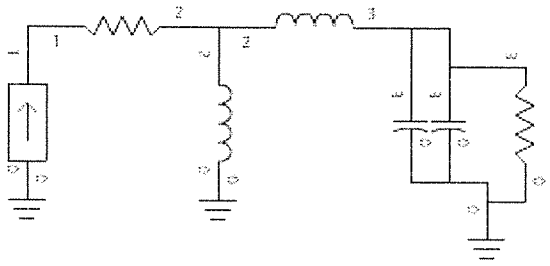
Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
-95.17562	34.64109	0	0.2911	-4	4	61
-95.17562	34.64109	4.253919	0.2911	4	4	62
-95.17562	34.64109	8.507837	0.2911	4	4	63
-95.17562	34.64109	12.76176	0.2911	4	4	64
-95.17562	34.64109	17.01567	0.2911	4	4	65
-95.17562	34.64109	21.26959	0.2911	4	4	66
-95.17562	34.64109	25.52351	0.2911	4	4	67
-95.17562	34.64109	29.77743	0.2911	4	4	68

```
-95.17562       34.64109       34.03135       0.2911        4     4      69
-95.17562       34.64109       38.28527       0.2911        4     4      70
-95.17562       34.64109       42.53919       0.2911        4     4      71
-95.17562       34.64109       46.79311       0.2911        4     4      72
-95.17562       34.64109       51.04703       0.2911        4     4      73
-95.17562       34.64109       55.30095       0.2911        4     4      74
-95.17562       34.64109       59.55486       0.2911        4     4      75
-95.17562       34.64109       63.80878       0.2911        4     4      76
-95.17562       34.64109       68.0627        0.2911        4     4      77
-95.17562       34.64109       72.31662       0.2911        4     4      78
-95.17562       34.64109       76.57054       0.2911        4     4      79
-95.17562       34.64109       80.82446       0.2911        4     0      80

Sources:  1
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 100.0, 0.0

Number of Loads:  3
Pulse No., Resistance, Reactance:  1 , 0 ,-10000
Pulse No., Resistance, Reactance:  21 , 0 ,-10000
Pulse No., Resistance, Reactance:  61 , 0 ,-10000

********************    SOURCE DATA     ********************
Pulse  41      Voltage = (100.0, 0.0j)
               Current = (0.4356, 1.3652j)
               Impedance = (21.213, -66.48j)
               Power = 21.78 Watts
```



WCAP - KBRT Tower 3 Calibration Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

NODE VOLTAGES
Node: 1 28.1914 ∠ -44.9199° V
Node: 2 27.4924 ∠ -46.3916° V
Node: 3 66.0110 ∠ -73.2514° V

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	1→2	1.00000000	1.00 ∠	0.000° V	1.00 ∠	0.000° A
L	2→0	2920.70000000	27.49 ∠	-46.392° V	0.00 ∠	-136.392° A
L	2→3	9.30000000	43.30 ∠	90.080° V	1.00 ∠	0.080° A
C	3→0	0.00009000	66.01 ∠	-73.251° V	0.03 ∠	16.749° A
R	3→0	21.20000000	66.01 ∠	-73.251° V	0.95 ∠	-0.934° A
C	3→0	0.00010000	66.01 ∠	-73.251° V	0.03 ∠	16.749° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	1→2	1.00000000	19.96 - j	19.906	18.96 - j	19.906
L	2→0	2920.70000000	-0.00 + j	13579.962	0.00 + j	0.000
L	2→3	9.30000000	18.91 - j	19.904	18.91 - j	63.145
C	3→0	0.00009000	0.00 - j	2389.714	0.00 + j	0.000
R	3→0	21.20000000	21.20 - j	66.500	0.00 + j	0.000
C	3→0	0.00010000	0.00 - j	2150.742	0.00 + j	0.000

WCAP INPUT DATA:

	0.7400	0.00000000	0	
I	1.00000000	0	1	0.00000000
R	1.00000000	1	2	0.00000000
L	2920.70000000	2	0	0.00000000
L	9.30000000	2	3	0.00000000
C	0.00009000	3	0	
R	21.20000000	3	0	-66.50000000
C	0.00010000	3	0	

```
****************************************
                ACSModel
          (MININEC 3.1 Core)
      01-08-2013          20:52:19
****************************************

KBRT
Calibration Model
Tower 4 Driven, All Others Floated

Frequency = 0.740 MHz     Wavelength = 405.13513 Meters

No. of Wires: 4

Wire No. 1   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
 0             0             0                         -1
 0             0             84.17808     0.2911        0              20

Wire No. 2   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
 50.64189      87.71432      0                         -2
 50.64189      87.71432      83.84046     0.2911        0              20

Wire No. 3   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
-44.53305      122.3536      0                         -3
-44.53305      122.3536      83.0527      0.2911        0              20

Wire No. 4   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
-95.17562      34.64109      0                         -4
-95.17562      34.64109      85.07838     0.2911        0              20

                **** ANTENNA GEOMETRY ****

Wire No.  1  Coordinates                                  Connection Pulse
X              Y             Z          Radius     End1 End2  No.
 0             0             0          0.2911     -1   1     1
 0             0             4.208904   0.2911     1    1     2
 0             0             8.417808   0.2911     1    1     3
 0             0             12.62671   0.2911     1    1     4
 0             0             16.83562   0.2911     1    1     5
 0             0             21.04452   0.2911     1    1     6
 0             0             25.25342   0.2911     1    1     7
 0             0             29.46233   0.2911     1    1     8
 0             0             33.67123   0.2911     1    1     9
 0             0             37.88013   0.2911     1    1     10
 0             0             42.08904   0.2911     1    1     11
 0             0             46.29794   0.2911     1    1     12
 0             0             50.50685   0.2911     1    1     13
 0             0             54.71575   0.2911     1    1     14
 0             0             58.92465   0.2911     1    1     15
 0             0             63.13356   0.2911     1    1     16
 0             0             67.34246   0.2911     1    1     17
 0             0             71.55137   0.2911     1    1     18
```

0	0	79.76027	0.2911	1	1	19
0	0	79.96917	0.2911	1	0	20

Wire No. 2 Coordinates

X	Y	Z	Radius	Connection End1	Connection End2	Pulse No.
50.64189	87.71432	0	0.2911	-2	2	21
50.64189	87.71432	4.192023	0.2911	2	2	22
50.64189	87.71432	8.384037	0.2911	2	2	23
50.64189	87.71432	12.57606	0.2911	2	2	24
50.64189	87.71432	16.76809	0.2911	2	2	25
50.64189	87.71432	20.96012	0.2911	2	2	26
50.64189	87.71432	25.15214	0.2911	2	2	27
50.64189	87.71432	29.34416	0.2911	2	2	28
50.64189	87.71432	33.53619	0.2911	2	2	29
50.64189	87.71432	37.72821	0.2911	2	2	30
50.64189	87.71432	41.92023	0.2911	2	2	31
50.64189	87.71432	46.11225	0.2911	2	2	32
50.64189	87.71432	50.30428	0.2911	2	2	33
50.64189	87.71432	54.4963	0.2911	2	2	34
50.64189	87.71432	58.68832	0.2911	2	2	35
50.64189	87.71432	62.88035	0.2911	2	2	36
50.64189	87.71432	67.07237	0.2911	2	2	37
50.64189	87.71432	71.26439	0.2911	2	2	38
50.64189	87.71432	75.45641	0.2911	2	2	39
50.64189	87.71432	79.64844	0.2911	2	0	40

Wire No. 3 Coordinates

X	Y	Z	Radius	Connection End1	Connection End2	Pulse No.
-44.53305	122.3536	0	0.2911	-3	3	41
-44.53305	122.3536	4.151635	0.2911	3	3	42
-44.53305	122.3536	8.30327	0.2911	3	3	43
-44.53305	122.3536	12.45491	0.2911	3	3	44
-44.53305	122.3536	16.61654	0.2911	3	3	45
-44.53305	122.3536	20.77818	0.2911	3	3	46
-44.53305	122.3536	24.93981	0.2911	3	3	47
-44.53305	122.3536	29.10145	0.2911	3	3	48
-44.53305	122.3536	33.26308	0.2911	3	3	49
-44.53305	122.3536	37.42472	0.2911	3	3	50
-44.53305	122.3536	41.58635	0.2911	3	3	51
-44.53305	122.3536	45.74799	0.2911	3	3	52
-44.53305	122.3536	49.90962	0.2911	3	3	53
-44.53305	122.3536	54.07126	0.2911	3	3	54
-44.53305	122.3536	58.23289	0.2911	3	3	55
-44.53305	122.3536	62.39453	0.2911	3	3	56
-44.53305	122.3536	66.55616	0.2911	3	3	57
-44.53305	122.3536	70.7178	0.2911	3	3	58
-44.53305	122.3536	74.87943	0.2911	3	3	59
-44.53305	122.3536	79.04107	0.2911	3	0	60

Wire No. 4 Coordinates

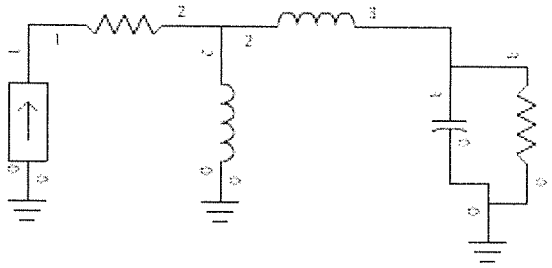
X	Y	Z	Radius	Connection End1	Connection End2	Pulse No.
-95.17562	34.64103	0	0.2911	-4	4	61
-95.17562	34.64103	4.253919	0.2911	4	4	62
-95.17562	34.64103	8.507837	0.2911	4	4	63
-95.17562	34.64103	12.76176	0.2911	4	4	64
-95.17562	34.64103	17.01567	0.2911	4	4	65
-95.17562	34.64103	21.26959	0.2911	4	4	66
-95.17562	34.64103	25.5235	0.2911	4	4	67
-95.17562	34.64103	29.77743	0.2911	4	4	68
-95.17562	34.64103	34.03136	0.2911	4	4	69

```
-95.17562       34.64109       38.28527       0.2911        4     4      70
-95.17562       34.64109       42.53919       0.2911        4     4      71
-95.17562       34.64109       46.79311       0.2911        4     4      72
-95.17562       34.64109       51.04703       0.2911        4     4      73
-95.17562       34.64109       55.30095       0.2911        4     4      74
-95.17562       34.64109       59.55486       0.2911        4     4      75
-95.17562       34.64109       63.80878       0.2911        4     4      76
-95.17562       34.64109       68.0627        0.2911        4     4      77
-95.17562       34.64109       72.31662       0.2911        4     4      78
-95.17562       34.64109       76.57054       0.2911        4     4      79
-95.17562       34.64109       80.82446       0.2911        4     0      80

Sources:  1
Pulse No., Voltage Magnitude, Phase (Degrees): 61, 100.0, 0.0

Number of Loads:  3
Pulse No., Resistance, Reactance:  1 , 0 ,-10000
Pulse No., Resistance, Reactance:  21 , 0 ,-10000
Pulse No., Resistance, Reactance:  41 , 0 ,-10000

**********     SOURCE DATA     **********
Pulse  61      Voltage = (100.0, 0.0j)
               Current = (0.6133, 1.5135j)
               Impedance = (22.997, -56.752j)
               Power = 30.67 Watts
```



WCAP - KBRT Tower 4 Calibration Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

NODE VOLTAGES
Node: 1 29.5067 ∠ -38.7794° V
Node: 2 28.7339 ∠ -40.0284° V
Node: 3 59.9362 ∠ -68.4014° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1-2	1.00000000	1.00 ∠ 0.000° V	1.00 ∠ 0.000° A
L	2-0	2920.70000000	28.73 ∠ -40.028° V	0.00 ∠ -130.028° A
L	2-3	8.00000000	37.25 ∠ 90.093° V	1.00 ∠ 0.093° A
C	3-0	0.00009000	59.94 ∠ -68.401° V	0.03 ∠ 21.599° A
R	3-0	23.00000000	59.94 ∠ -68.401° V	0.98 ∠ -0.446° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1-2	1.00000000	23.00 - j 18.481	22.00 - j 18.481
L	2-0	2920.70000000	0.00 + j 13579.962	0.00 + j 0.000
L	2-3	8.00000000	21.94 - j 18.491	21.94 - j 55.688
C	3-0	0.00009000	0.00 - j 2389.714	0.00 + j 0.000
R	3-0	23.00000000	23.00 - j 56.800	0.00 + j 0.000

WCAP INPUT DATA:

	0.7400	0.00000000	0	
I	1.00000000	0	1	0.00000000
R	1.00000000	1	2	0.00000000
L	2920.70000000	2	0	0.00000000
L	8.00000000	2	3	0.00000000
C	0.00009000	3	0	
R	23.00000000	3	0	-56.80000000

Derivation of Operating Parameters for Day Directional Operation

Once calibrated against the measured individual open-circuited base impedances, the moment method model was utilized for day directional antenna calculations. These calculations were made to determine the complex voltage source values to be applied at ground level for each tower of the array to produce the current moment sums for the towers which, when normalized to the reference tower, equate to the theoretical field parameters of the authorized directional pattern. These voltage sources were then applied in the model and the tower currents were calculated.

Day Antenna Model

Twenty segments were used for each tower. The KBRT towers are base sampled, which is permitted for towers of 120 electrical degrees or less. As such, the first (ground) segment of each tower was used to determine the model operating parameters of the array.

A circuit model was constructed to determine the effect of the series feed inductance and shunt base region capacitance on the ATU output current. Again, this model was used with the WCAP Professional program.

This effect was, as expected, minimal, and the results are tabulated in the table below along with the base operating parameters for the day array.

Twr.	Node	Current Magnitude (amperes)	Current Phase (degrees)	WCAP Current Offset for Unity I_{BASE}	WCAP Phase Offset for Unity $Ø_{BASE}$ (degrees)	Antenna Monitor Ratio	Antenna Monitor Phase (degrees)
1	1	23.2553	-37.7	1.025	+0.7	0.476	-39.7
2	21	43.0568	+105.3	1.025	+0.0	0.880	+102.6
3	41	47.3868	+1.9	1.058	+0.8	1.000	0.0
4	61	28.2243	-96.4	1.008	+0.8	0.567	-98.3

```
****************************************
                ACSModel
           (MININEC 3.1 Core)
      01-08-2013          21:32:40
****************************************

KBRT
Daytime Directional Operation


Frequency = 0.740 MHz     Wavelength = 405.13513 Meters

No. of Wires: 4

Wire No. 1   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
 0             0             0                         -1
 0             0             84.17808     0.2911         0              20

Wire No. 2   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
 50.64189      87.71432      0                         -2
 50.64189      87.71432      83.84046     0.2911         0              20

Wire No. 3   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
-44.53305      122.3536      0                         -3
-44.53305      122.3536      83.0527      0.2911         0              20

Wire No. 4   Coordinates                                  End          No. of
   X             Y             Z          Radius     Connection
Segments
-95.17562      34.64109      0                         -4
-95.17562      34.64109      85.07838     0.2911         0              20

                **** ANTENNA GEOMETRY ****

Wire No.  1  Coordinates                                  Connection Pulse
X             Y             Z          Radius     End1 End2  No.
 0             0             0          0.2911     -1   1     1
 0             0             4.208904   0.2911     1    1     2
 0             0             8.417808   0.2911     1    1     3
 0             0             12.62671   0.2911     1    1     4
 0             0             16.83562   0.2911     1    1     5
 0             0             21.04452   0.2911     1    1     6
 0             0             25.25342   0.2911     1    1     7
 0             0             29.46233   0.2911     1    1     8
 0             0             33.67123   0.2911     1    1     9
 0             0             37.88013   0.2911     1    1     10
 0             0             42.08904   0.2911     1    1     11
 0             0             46.29794   0.2911     1    1     12
 0             0             50.50685   0.2911     1    1     13
 0             0             54.71575   0.2911     1    1     14
 0             0             58.92465   0.2911     1    1     15
 0             0             63.13356   0.2911     1    1     16
 0             0             67.34246   0.2911     1    1     17
```

0	0	71.55137	0.2911	1	1	18
0	0	75.76027	0.2911	1	1	19
0	0	79.96917	0.2911	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
50.64189	87.71432	0	0.2911	-2	2	21
50.64189	87.71432	4.192023	0.2911	2	2	22
50.64189	87.71432	8.384047	0.2911	2	2	23
50.64189	87.71432	12.57607	0.2911	2	2	24
50.64189	87.71432	16.76809	0.2911	2	2	25
50.64189	87.71432	20.96012	0.2911	2	2	26
50.64189	87.71432	25.15214	0.2911	2	2	27
50.64189	87.71432	29.34416	0.2911	2	2	28
50.64189	87.71432	33.53619	0.2911	2	2	29
50.64189	87.71432	37.72821	0.2911	2	2	30
50.64189	87.71432	41.92023	0.2911	2	2	31
50.64189	87.71432	46.11225	0.2911	2	2	32
50.64189	87.71432	50.30428	0.2911	2	2	33
50.64189	87.71432	54.4963	0.2911	2	2	34
50.64189	87.71432	58.68832	0.2911	2	2	35
50.64189	87.71432	62.88035	0.2911	2	2	36
50.64189	87.71432	67.07237	0.2911	2	2	37
50.64189	87.71432	71.26439	0.2911	2	2	38
50.64189	87.71432	75.45641	0.2911	2	2	39
50.64189	87.71432	79.64844	0.2911	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
-44.53305	122.3536	0	0.2911	-3	3	41
-44.53305	122.3536	4.152635	0.2911	3	3	42
-44.53305	122.3536	8.30527	0.2911	3	3	43
-44.53305	122.3536	12.45791	0.2911	3	3	44
-44.53305	122.3536	16.61054	0.2911	3	3	45
-44.53305	122.3536	20.76318	0.2911	3	3	46
-44.53305	122.3536	24.91581	0.2911	3	3	47
-44.53305	122.3536	29.06845	0.2911	3	3	48
-44.53305	122.3536	33.22108	0.2911	3	3	49
-44.53305	122.3536	37.37372	0.2911	3	3	50
-44.53305	122.3536	41.52635	0.2911	3	3	51
-44.53305	122.3536	45.67899	0.2911	3	3	52
-44.53305	122.3536	49.83162	0.2911	3	3	53
-44.53305	122.3536	53.98426	0.2911	3	3	54
-44.53305	122.3536	58.13689	0.2911	3	3	55
-44.53305	122.3536	62.28953	0.2911	3	3	56
-44.53305	122.3536	66.44216	0.2911	3	3	57
-44.53305	122.3536	70.5948	0.2911	3	3	58
-44.53305	122.3536	74.74744	0.2911	3	3	59
-44.53305	122.3536	78.90007	0.2911	3	0	60

Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
-95.17562	34.64109	0	0.2911	-4	4	61
-95.17562	34.64109	4.253919	0.2911	4	4	62
-95.17562	34.64109	8.507837	0.2911	4	4	63
-95.17562	34.64109	12.76176	0.2911	4	4	64
-95.17562	34.64109	17.01567	0.2911	4	4	65
-95.17562	34.64109	21.26959	0.2911	4	4	66
-95.17562	34.64109	25.52351	0.2911	4	4	67
-95.17562	34.64109	29.77743	0.2911	4	4	68

-95.17562	34.64109	34.03135	0.2911	4	4	69
-95.17562	34.64109	38.28527	0.2911	4	4	70
-95.17562	34.64109	42.53919	0.2911	4	4	71
-95.17562	34.64109	46.79311	0.2911	4	4	72
-95.17562	34.64109	51.04703	0.2911	4	4	73
-95.17562	34.64109	55.30095	0.2911	4	4	74
-95.17562	34.64109	59.55486	0.2911	4	4	75
-95.17562	34.64109	63.80878	0.2911	4	4	76
-95.17562	34.64109	68.0627	0.2911	4	4	77
-95.17562	34.64109	72.31662	0.2911	4	4	78
-95.17562	34.64109	76.57054	0.2911	4	4	79
-95.17562	34.64109	80.82446	0.2911	4	0	80

Sources: 4
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 1721.0, -96.6
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 2734.5, 17.3
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 3291.8, -72.1
Pulse No., Voltage Magnitude, Phase (Degrees): 61, 1210.2, -115.7

Number of Loads: 0

********** SOURCE DATA **********
Pulse 1 Voltage = (-197.0202, -1709.6807j)
Current = (18.3921, -14.2317j)
Impedance = (38.291, -63.328j)
Power = 10353.98 Watts

Pulse 21 Voltage = (2611.4575, 811.1731j)
Current = (-11.3595, 41.5313j)
Impedance = (2.171, -63.473j)
Power = 2012.15 Watts

Pulse 41 Voltage = (1011.8479, -3132.4116j)
Current = (47.3611, 1.5609j)
Impedance = (19.164, -66.771j)
Power = 21516.33 Watts

Pulse 61 Voltage = (-524.3434, -1090.6593j)
Current = (-3.1316, -28.0501j)
Impedance = (40.465, -14.175j)
Power = 16117.55 Watts

Total Power = 50000.003 Watts

********** CURRENT DATA **********

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	18.3921	-14.2317	23.2553	-37.7323
2	17.6009	-14.1082	22.5573	-38.7143
3	17.0013	-13.9424	21.9871	-39.3544
4	16.3948	-13.7117	21.3729	-39.9073
5	15.7592	-13.4141	20.6952	-40.4042
6	15.0858	-13.0495	19.9467	-40.8605
7	14.371	-12.6184	19.1246	-41.2845
8	13.6138	-12.1218	18.2284	-41.6821
9	12.8144	-11.5613	17.2589	-42.0571
10	11.9736	-10.9383	16.2177	-42.4127
11	11.0929	-10.2546	15.1066	-42.7513

12	10.1738	-9.5122	13.9279	-43.075
13	9.2182	-8.7128	12.6841	-43.3855
14	8.2276	-7.8581	11.3773	-43.6842
15	7.2034	-6.9496	10.0093	-43.9726
16	6.1465	-5.988	8.5811	-44.2519
17	5.0562	-4.9727	7.0917	-44.5232
18	3.9295	-3.9005	5.5367	-44.7879
19	2.7578	-2.7623	3.9033	-45.0476
20	1.5174	-1.5337	2.1575	-45.3068
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	-11.3595	41.5313	43.0568	105.2972
22	-10.9771	40.2896	41.7582	105.2406
23	-10.6701	39.269	40.6928	105.2013
24	-10.3443	38.1665	39.5434	105.1647
25	-9.9897	36.9491	38.2757	105.129
26	-9.6023	35.6042	36.8763	105.0933
27	-9.1809	34.1276	35.341	105.0571
28	-8.7257	32.5189	33.6692	105.0201
29	-8.2372	30.7799	31.863	104.9822
30	-7.7165	28.9135	29.9255	104.943
31	-7.1651	26.9237	27.8608	104.9025
32	-6.5845	24.8147	25.6734	104.8608
33	-5.9762	22.5909	23.368	104.8176
34	-5.3418	20.2565	20.949	104.773
35	-4.6826	17.8148	18.4199	104.727
36	-3.9996	15.2676	15.7828	104.6795
37	-3.2928	12.6135	13.0362	104.6306
38	-2.5607	9.8446	10.1722	104.5803
39	-1.798	6.9382	7.1674	104.5282
40	-0.9897	3.8341	3.9598	104.4738
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	47.3611	1.5609	47.3868	1.8877
42	45.8861	1.1208	45.8998	1.3992
43	44.6888	0.8429	44.6968	1.0806
44	43.4063	0.6096	43.4106	0.8046
45	41.9989	0.4075	42.0009	0.5559
46	40.4513	0.2308	40.452	0.3269
47	38.7581	0.0767	38.7582	0.1134
48	36.9184	-0.0563	36.9185	-0.0874
49	34.934	-0.1691	34.9344	-0.2773
50	32.8079	-0.2623	32.8089	-0.4581
51	30.5441	-0.3363	30.546	-0.6308
52	28.1474	-0.3913	28.1501	-0.7964
53	25.6223	-0.4275	25.6258	-0.9558
54	22.9732	-0.445	22.9775	-1.1097
55	20.2038	-0.444	20.2086	-1.2589
56	17.3155	-0.4243	17.3207	-1.4038
57	14.3065	-0.3859	14.3117	-1.5451
58	11.1676	-0.3282	11.1724	-1.6834
59	7.8724	-0.2501	7.8764	-1.8195
60	4.3524	-0.1486	4.3549	-1.956
E	0.0	0.0	0.0	0.0

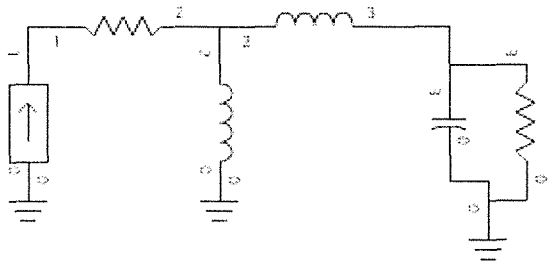
Wire No. 4 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
61	-3.1316	-28.0501	28.2243	-96.3703
62	-3.5993	-27.7464	27.9788	-97.3911
63	-3.8641	-27.3827	27.654	-98.0322
64	-4.0535	-26.8988	27.2025	-98.5697
65	-4.1824	-26.2888	26.6194	-99.0398
66	-4.2576	-25.5513	25.9036	-99.4603
67	-4.2826	-24.6873	25.056	-99.8415
68	-4.2598	-23.6983	24.0782	-100.1902
69	-4.1909	-22.5871	22.9726	-100.5114
70	-4.0774	-21.3566	21.7423	-100.8089
71	-3.9206	-20.01	20.3905	-101.0857
72	-3.7218	-18.5511	18.9207	-101.3442
73	-3.4821	-16.9832	17.3365	-101.5868
74	-3.2026	-15.3096	15.641	-101.8151
75	-2.8841	-13.5331	13.837	-102.0308
76	-2.5274	-11.6549	11.9258	-102.2353
77	-2.1323	-9.6741	9.9063	-102.4301
78	-1.6976	-7.5844	7.7721	-102.6165
79	-1.2192	-5.3682	5.5049	-102.7962
80	-0.6861	-2.9782	3.0562	-102.9724
E	0.0	0.0	0.0	0.0

Current Moments (amp-meters) Peak

Frequency: 740 kHz
Input Power: 50,000 Watts

Wire	Real	Imag	Vert. Current Moment Magnitude	Phase
1	880.2251	-778.7572	1175.2697	-41.50
2	-559.6954	2088.8112	2162.4965	105.00
3	2350.5395	-0.0003	2350.5395	0.00
4	-271.4310	-1539.3618	1563.1089	-100.00



WCAP - KBRT Tower 1 DA Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

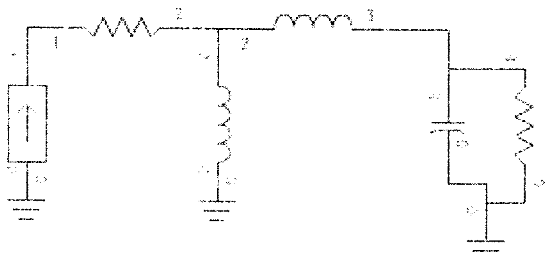
NODE VOLTAGES
Node: 1 1002.5393 ∠ -64.0848° V
Node: 2 981.3781 ∠ -64.7187° V
Node: 3 1720.2912 ∠ -96.5560° V

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	1→2	1.00000000	23.84 ∠	-36.991° V	23.84 ∠	-36.991° A
L	2→0	2920.70000000	981.38 ∠	-64.719° V	0.07 ∠	-154.719° A
L	2→3	9.25000000	1026.64 ∠	53.162° V	23.87 ∠	-36.838° A
C	3→0	0.00009000	1720.29 ∠	-96.556° V	0.72 ∠	-6.556° A
R	3→0	38.30000000	1720.29 ∠	-96.556° V	23.25 ∠	-37.732° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	1→2	1.00000000	37.44 - j	19.155	36.44 - j	19.155
L	2→0	2920.70000000	0.00 + j	13579.962	0.00 + j	0.000
L	2→3	9.25000000	36.34 - j	19.226	36.34 - j	62.234
C	3→0	0.00009000	0.00 - j	3389.714	0.00 + j	0.000
R	3→0	38.30000000	38.30 - j	63.300	0.00 + j	0.000

WCAP INPUT DATA:

	0.7400	0.00000000	0	
I	23.83700000	0	1	-36.99130000
R	1.00000000	1	2	0.00000000
L	2920.70000000	2	0	0.00000000
L	9.25000000	2	3	0.00000000
C	0.00009000	3	0	
R	38.30000000	3	0	-63.30000000



WCAP - KBRT Power [illegible] UA Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

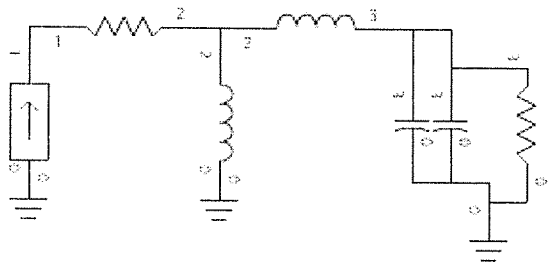
NODE VOLTAGES
Node: 1 [illegible] ∡ [illegible] V
Node: 2 912.5550 ∡ 21.0741° V
Node: 3 2734.3109 ∡ 17.2562° V

WCAP PART			BRANCH VOLTAGE	BRANCH CURRENT
S	1-0	[illegible]	44.13 ∡ 105.339° V	44.13 ∡ 205.339° A
L	2-0	[illegible]	912.55 ∡ 21.074° V	0.07 ∡ -68.926° A
L	2-3	8.86[illegible]	1874.80 ∡ -164.652° V	41.[illegible] ∡ 105.348° A
C	3-0	0.05000000	2734.32 ∡ 17.256° V	1.14 ∡ 107.256° A
R	3-0	[illegible]	[illegible]31.32 ∡ 17.256° V	43.05 ∡ 108.237° A

WCAP PART			FROM IMPEDANCE	TO IMPEDANCE
R	1-2	1.00000000	3.07 - j 20.575	1.07 - j 29.5[illegible]
L	2-0	[illegible]	0.01 + j 13559.962	0.00 + j 0.000
L	2-3	[illegible]	1.06 - j 16.544	1.06 - j 61.822
C	3-0	0.00000000	0.00 - j [illegible]84.714	[illegible] + j [illegible]
R	3-0	[illegible]	[illegible]	[illegible]

WCAP INPUT DATA:

	[illegible]	[illegible]		
I	4[illegible]0000	0	1	105.33920000
R	1.00000000	1	2	0.00000000
L	[illegible]00000	2	0	0.00500000
L	[illegible]00000	2	3	0.00000000
C	0.05000000	3	0	
R	[illegible]	3	0	-63.47300000



WCAP - KBRT Tower 3 DA Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

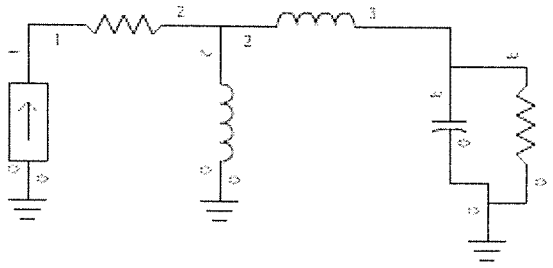
NODE VOLTAGES
Node: 1 1356.8175 ∠ -45.1995° V
Node: 2 1323.7525 ∠ -46.8104° V
Node: 3 3292.8428 ∠ -72.0980° V

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	1→2	1.00000000	50.13 ∠	2.732° V	50.12 ∠	2.732° A
L	2→0	2920.70000000	1323.75 ∠	-46.810° V	0.10 ∠	-136.810° A
L	2→3	9.30000000	2170.87 ∠	92.804° V	50.20 ∠	2.804° A
C	3→0	0.00009000	3292.84 ∠	-72.098° V	1.58 ∠	17.902° A
R	3→0	19.16400000	3292.84 ∠	-72.098° V	47.39 ∠	1.688° A
C	3→0	0.00010000	3292.84 ∠	-72.098° V	1.53 ∠	17.902° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	1→2	1.00000000	18.13 - j	20.092	17.13 - j	20.092
L	2→0	2920.70000000	0.00 + j	13579.962	0.00 + j	0.000
L	2→3	9.30000000	17.08 - j	20.084	17.08 - j	63.325
C	3→0	0.00009000	-0.01 - j	2389.714	0.00 + j	0.000
R	3→0	19.16400000	19.16 - j	66.771	0.00 + j	0.000
C	3→0	0.00010000	0.00 - j	2150.742	0.00 + j	0.000

WCAP INPUT DATA:

```
      0.2400       0.00000000   0
I       50.13000000   0   1       2.73170000
R        1.00000000   1   2       0.00000000
L     2920.70000000   2   0       0.00000000
L        9.30000000   2   3       0.00000000
C        0.00009000   3   0
R       19.16400000   3   0     -60.77100000
C        0.00010000   3   0
```



WCAP - KBPT Tower 4 DA Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

NODE VOLTAGES
Node: 1 1326.4070 ∠ -66.7129° V
Node: 2 1301.5719 ∠ -66.1086° V
Node: 3 1210.0258 ∠ -115.6758° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	28.44 ∠ -95.574° V	28.44 ∠ -95.574° A
L	2→0	2920.70000000	1301.57 ∠ -66.109° V	0.10 ∠ -156.109° A
L	2→3	8.00000000	1056.12 ∠ -5.406° V	28.39 ∠ -95.406° A
C	3→0	0.00009000	1210.03 ∠ -115.676° V	0.51 ∠ -25.676° A
R	3→0	40.46500000	1210.03 ∠ -115.676° V	28.22 ∠ -96.370° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	40.85 + j 22.512	39.85 + j 22.512
L	2→0	2920.70000000	0.00 + j 13579.962	0.00 + j 0.000
L	2→3	8.00000000	39.98 + j 22.432	39.98 - j 14.764
C	3→0	0.00009000	0.00 - j 2389.714	0.00 + j 0.000
R	3→0	40.46500000	40.47 - j 14.175	0.00 + j 0.000

WCAP INPUT DATA:

	0.7400	0.00000000	0	
I	28.44000000	0	1	-95.57430000
R	1.00000000	1	2	0.00000000
L	2920.70000000	2	0	0.00000000
L	8.00000000	2	3	0.00000000
C	0.00009000	3	0	
R	40.46500000	3	0	-14.17500000

Derivation of Operating Parameters for Night Directional Antenna

The KBRT night array is identical in all respects to the day array with the exception of antenna input power. As such, the night operating parameters as indicated on the antenna monitor will be identical to those for day operation. For the sake of completeness, the antenna model itself was re-run with the sources adjusted for the proper night input power, and that model is shown herein. Likewise, the day directional circuit models were adjusted for the night input power, and those models are provided and shown herein.

Twr.	Node	Current Magnitude (amperes)	Current Phase (degrees)	WCAP Current Offset for Unity I_{BASE}	WCAP Phase Offset for Unity $Ø_{BASE}$ (degrees)	Antenna Monitor Ratio	Antenna Monitor Phase (degrees)
1	1	1.4336	-37.7	1.025	+0.7	0.476	-39.7
2	21	2.6542	+105.3	1.025	+0.0	0.880	+102.6
3	41	2.9211	+1.9	1.058	+0.8	1.000	0.0
4	61	1.7399	-96.4	1.008	+0.8	0.567	-98.3

KBRT
Night Directional Operation

Frequency = 0.740 MHz Wavelength = 405.13513 Meters

No. of Wires: 4

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-1	
0	0	84.17808	0.2911	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
50.64189	87.71432	0		-2	
50.64189	87.71432	83.84046	0.2911	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
-44.53305	122.3536	0		-3	
-44.53305	122.3536	83.0527	0.2911	0	20

Wire No. 4 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
-90.17562	34.64109	0		-4	
-90.17562	34.64109	85.07938	0.2911	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
0	0	0	0.2911	-1	1	1
0	0	4.208904	0.2911	1	1	2
0	0	8.417808	0.2911	1	1	3
0	0	12.62671	0.2911	1	1	4
0	0	16.83562	0.2911	1	1	5
0	0	21.04452	0.2911	1	1	6
0	0	25.25342	0.2911	1	1	7
0	0	29.46233	0.2911	1	1	8
0	0	33.67123	0.2911	1	1	9
0	0	37.88013	0.2911	1	1	10
0	0	42.08904	0.2911	1	1	11
0	0	46.29794	0.2911	1	1	12
0	0	50.50685	0.2911	1	1	13
0	0	54.71575	0.2911	1	1	14
0	0	58.92465	0.2911	1	1	15
0	0	63.13356	0.2911	1	1	16
0	0	67.34246	0.2911	1	1	17

0	0	71.55137	0.2911	1	1	18
0	0	75.76027	0.2911	1	1	19
0	0	79.96917	0.2911	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
50.64189	87.71432	0	0.2911	-2	2	21
50.64189	87.71432	4.192023	0.2911	2	2	22
50.64189	87.71432	8.384047	0.2911	2	2	23
50.64189	87.71432	12.57607	0.2911	2	2	24
50.64189	87.71432	16.76809	0.2911	2	2	25
50.64189	87.71432	20.96012	0.2911	2	2	26
50.64189	87.71432	25.15214	0.2911	2	2	27
50.64189	87.71432	29.34416	0.2911	2	2	28
50.64189	87.71432	33.53619	0.2911	2	2	29
50.64189	87.71432	37.72821	0.2911	2	2	30
50.64189	87.71432	41.92023	0.2911	2	2	31
50.64189	87.71432	46.11225	0.2911	2	2	32
50.64189	87.71432	50.30428	0.2911	2	2	33
50.64189	87.71432	54.4963	0.2911	2	2	34
50.64189	87.71432	58.68832	0.2911	2	2	35
50.64189	87.71432	62.88035	0.2911	2	2	36
50.64189	87.71432	67.07237	0.2911	2	2	37
50.64189	87.71432	71.26439	0.2911	2	2	38
50.64189	87.71432	75.45641	0.2911	2	2	39
50.64189	87.71432	79.64844	0.2911	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
-44.53305	122.3536	0	0.2911	-3	3	41
-44.53305	122.3536	4.152635	0.2911	3	3	42
-44.53305	122.3536	8.30527	0.2911	3	3	43
-44.53305	122.3536	12.45791	0.2911	3	3	44
-44.53305	122.3536	16.61054	0.2911	3	3	45
-44.53305	122.3536	20.76318	0.2911	3	3	46
-44.53305	122.3536	24.91581	0.2911	3	3	47
-44.53305	122.3536	29.06845	0.2911	3	3	48
-44.53305	122.3536	33.22108	0.2911	3	3	49
-44.53305	122.3536	37.37372	0.2911	3	3	50
-44.53305	122.3536	41.52635	0.2911	3	3	51
-44.53305	122.3536	45.67899	0.2911	3	3	52
-44.53305	122.3536	49.83162	0.2911	3	3	53
-44.53305	122.3536	53.98426	0.2911	3	3	54
-44.53305	122.3536	58.13689	0.2911	3	3	55
-44.53305	122.3536	62.28953	0.2911	3	3	56
-44.53305	122.3536	66.44216	0.2911	3	3	57
-44.53305	122.3536	70.5948	0.2911	3	3	58
-44.53305	122.3536	74.74744	0.2911	3	3	59
-44.53305	122.3536	78.90007	0.2911	3	0	60

Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
-95.17562	34.64109	0	0.2911	-4	4	61
-95.17562	34.64109	4.253919	0.2911	4	4	62
-95.17562	34.64109	8.507837	0.2911	4	4	63
-95.17562	34.64109	12.76176	0.2911	4	4	64
-95.17562	34.64109	17.01567	0.2911	4	4	65
-95.17562	34.64109	21.26959	0.2911	4	4	66
-95.17562	34.64109	25.52351	0.2911	4	4	67
-95.17562	34.64109	29.77743	0.2911	4	4	68

-95.17562	34.64109	34.03135	0.2911	4	4	69
-95.17562	34.64109	38.28527	0.2911	4	4	70
-95.17562	34.64109	42.53919	0.2911	4	4	71
-95.17562	34.64109	46.79311	0.2911	4	4	72
-95.17562	34.64109	51.04703	0.2911	4	4	73
-95.17562	34.64109	55.30095	0.2911	4	4	74
-95.17562	34.64109	59.55486	0.2911	4	4	75
-95.17562	34.64109	63.80878	0.2911	4	4	76
-95.17562	34.64109	68.0627	0.2911	4	4	77
-95.17562	34.64109	72.31662	0.2911	4	4	78
-95.17562	34.64109	76.57054	0.2911	4	4	79
-95.17562	34.64109	80.82446	0.2911	4	0	80

Sources: 4
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 106.1, -96.6
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 168.6, 17.3
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 202.9, -72.1
Pulse No., Voltage Magnitude, Phase (Degrees): 61, 74.6, -115.7

Number of Loads: 0

********** SOURCE DATA **********

Pulse 1
Voltage = (-12.1451, -105.3918j)
Current = (1.1338, -0.8773j)
Impedance = (38.291, -63.328j)
Power = 39.35 Watts

Pulse 21
Voltage = (160.981, 50.0041j)
Current = (-0.7002, 2.5602j)
Impedance = (2.171, -63.473j)
Power = 7.65 Watts

Pulse 41
Voltage = (62.3745, -193.0948j)
Current = (2.9195, 0.0962j)
Impedance = (19.164, -66.771j)
Power = 81.76 Watts

Pulse 61
Voltage = (-32.3227, -67.2328j)
Current = (-0.193, -1.7291j)
Impedance = (40.465, -14.175j)
Power = 61.25 Watts

Total Power = 190.000 Watts

********** CURRENT DATA **********

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	1.1338	-0.8773	1.4336	-37.7323
2	1.085	-0.8697	1.3905	-38.7143
3	1.048	-0.8595	1.3554	-39.3544
4	1.0106	-0.8452	1.3175	-39.9073
5	0.9715	-0.8269	1.2757	-40.4042
6	0.93	-0.8044	1.2296	-40.8605
7	0.8859	-0.7778	1.1789	-41.2845
8	0.8392	-0.7472	1.1237	-41.6821
9	0.7899	-0.7127	1.0639	-42.0571
10	0.7381	-0.6743	0.9997	-42.4127
11	0.6838	-0.6321	0.9312	-42.7513

12	0.6272	-0.5864	0.8586	-43.075
13	0.5682	-0.5371	0.7819	-43.3855
14	0.5072	-0.4844	0.7013	-43.6842
15	0.4441	-0.4284	0.617	-43.9726
16	0.3789	-0.3691	0.529	-44.2519
17	0.3117	-0.3065	0.4372	-44.5232
18	0.2422	-0.2404	0.3413	-44.7879
19	0.17	-0.1703	0.2406	-45.0476
20	0.0935	-0.0945	0.133	-45.3068
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	-0.7002	2.5602	2.6542	105.2972
22	-0.6767	2.4836	2.5742	105.2406
23	-0.6577	2.4207	2.5085	105.2013
24	-0.6377	2.3527	2.4376	105.1647
25	-0.6158	2.2777	2.3595	105.129
26	-0.5919	2.1948	2.2732	105.0933
27	-0.566	2.1038	2.1786	105.0571
28	-0.5379	2.0046	2.0755	105.0201
29	-0.5078	1.8974	1.9642	104.9822
30	-0.4757	1.7823	1.8447	104.943
31	-0.4417	1.6597	1.7175	104.9025
32	-0.4059	1.5297	1.5826	104.8608
33	-0.3684	1.3926	1.4405	104.8176
34	-0.3293	1.2487	1.2914	104.773
35	-0.2887	1.0982	1.1355	104.727
36	-0.2465	0.9412	0.9729	104.6795
37	-0.203	0.7775	0.8036	104.6307
38	-0.1579	0.6069	0.6271	104.5803
39	-0.1108	0.4277	0.4418	104.5282
40	-0.061	0.2364	0.2441	104.4738
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	2.9195	0.0962	2.9211	1.8877
42	2.8286	0.0691	2.8295	1.3992
43	2.7548	0.052	2.7553	1.0806
44	2.6757	0.0376	2.676	0.8046
45	2.589	0.0251	2.5891	0.5559
46	2.4936	0.0142	2.4936	0.3269
47	2.3892	0.0047	2.3892	0.1134
48	2.2758	-0.0035	2.2758	-0.0874
49	2.1535	-0.0104	2.1535	-0.2773
50	2.0224	-0.0162	2.0225	-0.4581
51	1.8829	-0.0207	1.883	-0.6308
52	1.7351	-0.0241	1.7353	-0.7964
53	1.5795	-0.0264	1.5797	-0.9558
54	1.4162	-0.0274	1.4164	-1.1097
55	1.2454	-0.0274	1.2457	-1.2589
56	1.0674	-0.0262	1.0677	-1.4038
57	0.8819	-0.0238	0.8822	-1.5451
58	0.6884	-0.0202	0.6887	-1.6834
59	0.4853	-0.0154	0.4855	-1.8195
60	0.2683	-0.0092	0.2685	-1.956
E	0.0	0.0	0.0	0.0

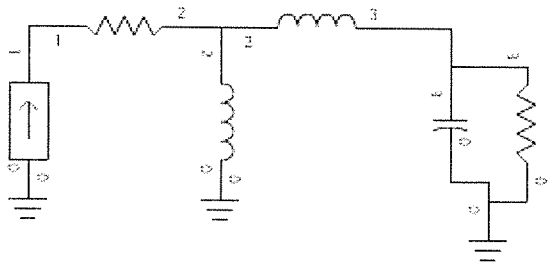
Wire No. 4 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
61	-0.193	-1.7291	1.7399	-96.3703
62	-0.2219	-1.7104	1.7247	-97.3911
63	-0.2382	-1.688	1.7047	-98.0322
64	-0.2499	-1.6582	1.6769	-98.5697
65	-0.2578	-1.6205	1.6409	-99.0398
66	-0.2625	-1.5751	1.5968	-99.4603
67	-0.264	-1.5218	1.5446	-99.8415
68	-0.2626	-1.4609	1.4843	-100.1902
69	-0.2583	-1.3924	1.4161	-100.5114
70	-0.2513	-1.3165	1.3403	-100.8089
71	-0.2417	-1.2335	1.257	-101.0856
72	-0.2294	-1.1436	1.1664	-101.3442
73	-0.2146	-1.0469	1.0687	-101.5868
74	-0.1974	-0.9437	0.9642	-101.8151
75	-0.1778	-0.8342	0.853	-102.0308
76	-0.1558	-0.7185	0.7352	-102.2353
77	-0.1314	-0.5963	0.6107	-102.4301
78	-0.1046	-0.4675	0.4791	-102.6165
79	-0.0752	-0.3309	0.3393	-102.7962
80	-0.0423	-0.1836	0.1884	-102.9724
E	0.0	0.0	0.0	0.0

Current Moments (amp-meters) Peak

Frequency: 740 kHz
Input Power: 190 Watts

Wire	Real	Imag	Vert. Current Moment Magnitude	Phase
1	54.2607	-48.0058	72.4485	-41.50
2	-34.5019	128.7630	133.3052	105.00
3	144.8970	0.0000	144.8970	0.00
4	-16.7321	-94.8926	96.3565	-100.00



WCAP - KBRT Tower 1 DA-N Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

NODE VOLTAGES

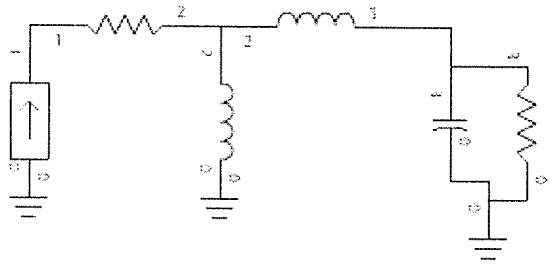
Node:	1	61.8002 ∠	-64.0848° V
Node:	2	60.4057 ∠	-64.7187° V
Node:	3	106.0450 ∠	-96.5560° V

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	1→2	1.00000000	1.47 ∠	-36.991° V	1.47 ∠	-36.991° A
L	2→0	2920.70000000	60.50 ∠	-64.719° V	0.09 ∠	-154.719° A
L	2→3	9.25000000	63.29 ∠	53.162° V	1.47 ∠	-36.838° A
C	3→0	0.00009000	106.05 ∠	-96.556° V	0.04 ∠	-6.556° A
R	3→0	38.30000000	106.05 ∠	-96.556° V	1.43 ∠	-37.732° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	1→2	1.00000000	37.44 - j	19.155	36.44 - j	19.155
L	2→0	2920.70000000	0.00 + j	13579.962	0.00 + j	0.000
L	2→3	9.25000000	36.34 - j	19.226	36.34 - j	62.234
C	3→0	0.00009000	0.00 - j	2389.714	0.00 + j	0.000
R	3→0	38.30000000	38.30 - j	63.300	0.00 + j	0.000

WCAP INPUT DATA:

	0.7400	0.00000000	0	
I	1.46940000	0	1	-36.99130000
R	1.00000000	1	2	0.00000000
L	2920.70000000	2	0	0.00000000
L	9.25000000	2	3	0.00000000
C	0.00009000	3	0	
R	38.30000000	3	0	-63.30000000



WCAP - KBRT Tower 2 DA-N Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

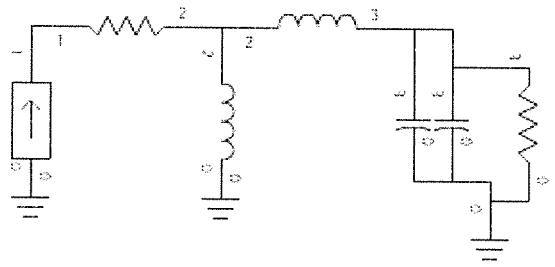
NODE VOLTAGES
Node: 1 56.5953 ∠ 23.8157° V
Node: 2 56.2587 ∠ 21.0741° V
Node: 3 169.5700 ∠ 17.2562° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	2.72 ∠ 105.339° V	2.72 ∠ 105.339° A
L	2→0	2920.70000000	56.26 ∠ 21.074° V	0.00 ∠ -68.926° A
L	2→3	8.88000000	113.50 ∠ -164.652° V	2.72 ∠ 105.348° A
C	3→0	0.00009000	168.57 ∠ 17.256° V	0.07 ∠ 107.256° A
R	3→0	2.17100000	168.57 ∠ 17.256° V	2.65 ∠ 105.297° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	3.07 - j 20.575	2.07 - j 20.575
L	2→0	2920.70000000	0.00 + j 13579.962	0.00 + j 0.000
L	2→3	8.88000000	2.06 - j 20.544	2.06 - j 61.633
C	3→0	0.00009000	0.01 - j 2389.714	0.00 + j 0.000
R	3→0	2.17100000	2.17 - j 63.473	0.00 + j 0.000

WCAP INPUT DATA:

	0.7400	0.90000000	0	
I	2.72060000	0	1	105.33920000
R	1.00000000	1	2	0.00000000
L	2920.70000000	2	0	0.00000000
L	8.88000000	2	3	0.00000000
C	0.00009000	3	0	
R	2.17100000	3	0	-63.47300000



WCAP - KBRT Tower 3 DA-N Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

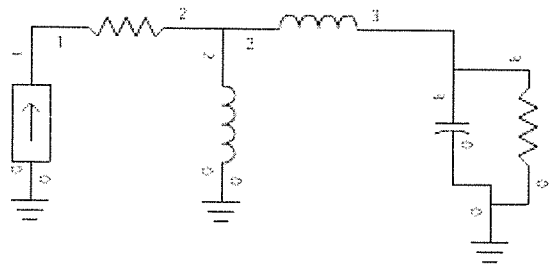
NODE VOLTAGES
Node: 1 93.6474 ∠ -45.1995° V
Node: 2 81.6090 ∠ -46.8105° V
Node: 3 203.0028 ∠ -72.0980° V

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	1→2	1.00000000	3.09 ∠	2.732° V	3.09 ∠	2.7317° A
L	2→0	2920.70000000	81.61 ∠	-46.810° V	0.01 ∠	-136.810° A
L	2→3	9.30000000	133.83 ∠	92.804° V	3.10 ∠	2.804° A
C	3→0	0.00009000	203.00 ∠	-72.098° V	0.08 ∠	17.902° A
R	3→0	19.16400000	203.00 ∠	-72.098° V	2.92 ∠	1.888° A
C	3→0	0.00010000	203.00 ∠	-72.098° V	0.09 ∠	17.902° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	1→2	1.00000000	18.13 - j	20.092	17.13 - j	20.092
L	2→0	2920.70000000	0.00 + j	13579.962	0.00 + j	0.000
L	2→3	9.30000000	17.08 - j	20.084	17.08 - j	63.325
C	3→0	0.00009000	0.01 - j	2389.714	0.00 + j	0.000
R	3→0	19.16400000	19.16 - j	66.771	0.00 + j	0.000
C	3→0	0.00010000	0.00 - j	2150.742	0.00 + j	0.000

WCAP INPUT DATA:

	0.7400	0.00000000	0	
I	3.09050000	0	1	2.73170000
R	1.00000000	1	2	0.00000000
L	2920.70000000	2	0	0.00000000
L	9.30000000	2	3	0.00000000
C	0.00009000	3	0	
R	19.16400000	3	0	-66.77100000
C	0.00010000	3	0	



WCAP - KBRT Tower 4 DA-N Model

WCAP OUTPUT AT FREQUENCY: 0.740 MHz

NODE VOLTAGES
Node: 1 81.7811 ∠ -66.7129° V
Node: 2 80.2499 ∠ -66.1086° V
Node: 3 74.6055 ∠ -115.6758° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	1.75 ∠ -95.574° V	1.75 ∠ -95.574° A
L	2→0	2920.70000000	80.25 ∠ -66.109° V	0.01 ∠ -156.109° A
L	2→3	8.00000000	65.12 ∠ -5.406° V	1.75 ∠ -95.406° A
C	3→0	0.00009000	74.61 ∠ -115.676° V	0.03 ∠ -25.676° A
R	3→0	40.46500000	74.61 ∠ -115.676° V	1.74 ∠ -96.370° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	40.85 + j 22.512	39.85 + j 22.512
L	2→0	2920.70000000	0.00 + j 13579.962	0.00 + j 0.000
L	2→3	8.00000000	39.98 + j 22.432	39.98 - j 14.764
C	3→0	0.00009000	0.00 - j 2389.714	0.00 + j 0.000
R	3→0	40.46500000	40.47 - j 14.175	0.00 + j 0.000

WCAP INPUT DATA:

	0.7400	0.00000000	0	
I	1.75350000	0	1	-95.57430000
R	1.00000000	1	2	0.00000000
L	2920.70000000	2	0	0.00000000
L	8.00000000	2	3	0.00000000
C	0.00009000	3	0	
R	40.46500000	3	0	-14.17500000

Summary of Post Construction Certified Array Geometry

With respect to Question 9, Section III, Page 2 of the attached Form 302-AM, the tower information is as follows:

Tower No.	ASRN	Height above base insulator (meters)	Height above ground w/o obst. lighting (meters)	Overall height above ground (meters)
1	1276731	83.8	84.8	85.7
2	1276732	83.8	84.8	85.7
3	1276733	83.8	84.8	85.7
4	1276734	83.8	84.8	85.7

All towers are uniform cross-section, steel, guyed vertical radiators.

A Certified Survey drawing is shown in Appendix B attached hereto.

The tower relative distances provided in feet on the Certified Survey drawing were converted to electrical degrees at 740 kHz and used along with the survey tower azimuths relative to True North to calculate the as-built X-Y coordinates of each tower relative to the center of the array. Likewise, the X-Y coordinates of the specified (CP) tower locations were calculated in the same way. The difference between the X-Y coordinates of the specified tower location and the X-Y coordinates of the as-built tower location was then used to compute the displacement of each tower from the specified location. Below is a tabulation showing those distances and other data that is relevant to their determination.

	Specified Array Geometry					As-Built Certification		As-Built Displacement
Twr.	Spacing (degrees)	Spacing (feet)	Azimuth (deg. T.)	X (deg.)	Y (deg.)	X (deg.)	Y (deg.)	(deg.)
1	Ref.	Ref.	Ref.	19.786	-54.361	19.755	-54.373	0.033
2	90.0	332.4	60.0	64.785	23.579	64.799	23.543	0.039
3	115.7	427.4	110.0	-19.786	54.361	-19.755	54.373	0.033
4	90.0	332.4	160.0	-64.785	-23.579	-67.799	-23.543	0.039

Extraordinary care was exercised in the survey, excavation and construction processes to insure that towers were built in the proper locations. This is evident in the as-built displacements noted above, the worst case of which is 0.039 electrical degrees. As such, all of the displacements are well below the 1.5 electrical degree tolerance specified by the FCC.

Sampling System

The sampling system consists of Delta Electronics TCT-1 current transformers installed at the output of each antenna tuning unit, immediately adjacent to the final J-plug. Samples from the current transformers are fed to the antenna monitor via equal lengths of Andrew LDF4-50J ½-inch foam-dielectric coaxial transmission lines. The antenna monitor is a Potomac Instruments Type 1901, which was modified and calibrated at the factory immediately prior to installation at the new site.

Impedance measurements were made of the antenna sampling system using an Agilent E5062A network analyzer. The measurements were made looking into the antenna monitor ends of the sample lines with the tower ends of the sample lines open-circuited.

The table below shows the frequencies above and below the carrier frequency where resonance, defined as zero reactance corresponding with low resistance, was found. As the length of distortionless transmission line is 180 electrical degrees at the difference frequency between adjacent frequencies of resonance, and frequencies of resonance occur at odd multiples of 90 degrees electrical length, the sample line length at the resonant frequency above carrier frequency, which is the closest one to the carrier frequency, was found to be 270 electrical degrees. The electrical length at carrier frequency appearing in the table below was calculated by ratioing the frequencies.

Twr.	Sample Line Open-Circuited Resonance Below 740 kHz (kHz)	Sample Line Open-Circuited Resonance Above 740 kHz (kHz)	Sample Line Calculated Electrical Length At 740 kHz (deg.)
1	411.8	1235.5	161.7
2	412.3	1237.0	161.5
3	411.8	1235.5	161.7
4	411.8	1235.5	161.7

Because the electrical lengths were determined to be identical to within the nearest 0.2 degree, the sample lines meet the requirement in the Rules that they be equal in length within one electrical degree.

To determine the characteristic impedance values of the sample lines, open-circuited measurements were made with frequencies offset to produce ± 45 degrees of electrical length from resonance. Because of the limitations of the vector network analyzer (lower frequency limit is 300 kHz), the 225- and 315-degree frequencies were used rather than the 45 and 135 degree frequencies.

The characteristic impedance was calculated using the following formula, where $R_1 + j X_1$ and $R_2 + j X_2$ are the measured impedances at the +45 and -45 degree offset frequencies, respectively:

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

Twr.	+ 45 Deg. Offset Frequency (kHz)	+45 Deg. Measured Impedance (ohms)	- 45 Deg. Offset Frequency (kHz)	-45 Deg. Measured Impedance (ohms)	Calculated Characteristic Impedance (ohms)
1	1441.4	4.4 +j49.7	1029.6	4.1 –j50.5	50.3
2	1443.2	4.5 +j50.1	1030.8	4.1 –j50.2	50.3
3	1441.4	4.5 +j50.0	1029.6	4.2 –j50.3	50.3
4	1441.4	4.5 +j50.2	1029.6	4.0 –j50.1	50.3

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

The calibration of the Delta TCT-1 current transformers, which were installed new from the factory at the new site, was verified by removing them all from the ATUs and installing them on a test jig so that each was located very close to the adjacent transformer (spacing of less than two inches). Short transmission lines of equal length were connected between the outputs of all four current transformers and the inputs of the antenna monitor. The Potomac 1901 antenna monitor was calibrated using the internal calibration function. A single source of RF current on the carrier frequency was fed through a conductor passing through all of the current transformers, and the differential phases and ratios were noted on the antenna monitor as follows:

Twr.	Serial No.	Ratio	Phase (deg.)
1	18115	1.000	0.0
2	18114	1.000	0.0
3	18113	Ref.	Ref.
4	18116	1.000	0.0

The requirement that the sample current transformers are accurate to within the manufacturer's specification (±2% ratio and ±2 degrees phase) has thus been demonstrated.

The impedance of each of the sample lines was measured with the sample current transformers attached. These impedances are tabulated below:

Twr.	R (ohms)	X (ohms)
1	48.8	+0.7
2	48.9	+0.7
3	48.8	+0.8
4	48.8	+0.7

Direct Measurement of Power

Common point impedance measurements were made using a Delta CPB-1A common point bridge installed in the common point bus of the phasing and coupling system. The resistance value was adjusted to 50 ohms and the reactance value was adjusted to zero.

Appendix A

Reference Field Strength Measurements

Reference field strength measurements were made on January 9, 2013 using two Potomac Instruments FIM-41 field intensity meters, S/Ns 1898 and 1323. Measurements were made at three locations along radials at the azimuths with radiation values specified on the construction permit and, additionally, on the major lobe radial. The measured field strengths and descriptions and WGS-84 GPS coordinates for the reference measurement points are shown in the following tables. FIM-41 S/N 1898 has a calibration date of February 13, 2012. A copy of the calibration certificate is supplied herewith as Appendix C. FIM-41 S/N 1323 was checked against FIM-41 S/N 1898 and found to be in agreement.

Because the day and night operating parameters are identical with the exception of antenna input power, separate night reference field strength measurements were not made.

Daytime

Radial 32.5°

Point No.	Dist. km	Latitude	Longitude	Date	Time	Field mV/m	Point Description
1	5.22	32-52-8.25	117-36-29.7	01/09/13	1540	62	1187 Hummingbird Lane
2	8.01	33-53-24.7	117-35-31.8	01/09/13	1558	41	372 N. Smith
3	9.42	33-54-0.2	117-34-59.7	01/09/13	1606	50	1391 Palos Verdes Dr.

Radial 78.5°

Point No.	Dist. km	Latitude	Longitude	Date	Time	Field mV/m	Point Description
1	4.59	33-50-14.6	117-35-23.0	01/09/13	1229	80	3294 Clearing Cir.
2	6.38	33-50-25.7	117-34-14.92	01/09/13	1245	50	184 Tamarack Dr.
3	9.12	33-50-42.7	117-32-30.7	01/09/13	1255	61	1312 Radcliffe Dr.

Radial 104.0°

Point No.	Dist. km	Latitude	Longitude	Date	Time	Field mV/m	Point Description
1	9.86	33-48-25.4	117-32-5.9	01/09/13	1340	34.5	1800 Eagle Glenn Pkwy. at the golf club entrance
2	12.8	33-48-2.3	117-30-13.3	01/09/13	1320	29	Access Rd. paralleling E. side of I-15
3	15.7	33-47-36.6	117-28-25.5	01/09/13	1505	33.0	Dawson Canyon east to entrance of waste disposal

Radial 208.5°

Point No.	Dist. km	Latitude	Longitude	Date	Time	Field mV/m	Point Description
1	0.99	33-49-15.9	117-38-39.3	01/09/13	1235	2800	BSC Rd. 1.2 mi. SW Site
2	2.23	33-48-40.7	117-39-02.4	01/09/13	1243	1480	BSC Rd. 2.6 mi. SW Site
3	4.01	33-47-49.9	117-39-35.4	01/09/13	1251	870	BSC Rd. 4.0 mi. SW Site

Radial 311.5°

Point No.	Dist. km	Latitude	Longitude	Date	Time	Field mV/m	Point Description
1	8.17	33-52-39.6	117-42-18.7	01/09/13	1352	44	SW Corner Brush Canyon & Mulberry Way
2	8.45	33-52-45.8	117-42-26.5	01/09/13	1356	46	Meadowland Dr. 0.1 mi. E. of De Bryant
3	8.78	33-52-54.0	117-42-35.4	01/09/13	1400	62	Kodiak Mtn. at Terraza

Radial 339.5°

Point No.	Dist. km	Latitude	Longitude	Date	Time	Field mV/m	Point Description
1	1.4	33-50-26.5	117-38-40.1	01/09/13	1154	1080	N. Main Div. 1.1 mi. NW Site
2	1.92	33-50-42.3	117-38-47.0	01/09/13	1158	870	N. Main Div. 1.5 mi. NW Site
3	2.32	33-50-54.5	117-38-52.5	01/09/13	1201	830	On Spur Rd. 1.8 mi. NW Site

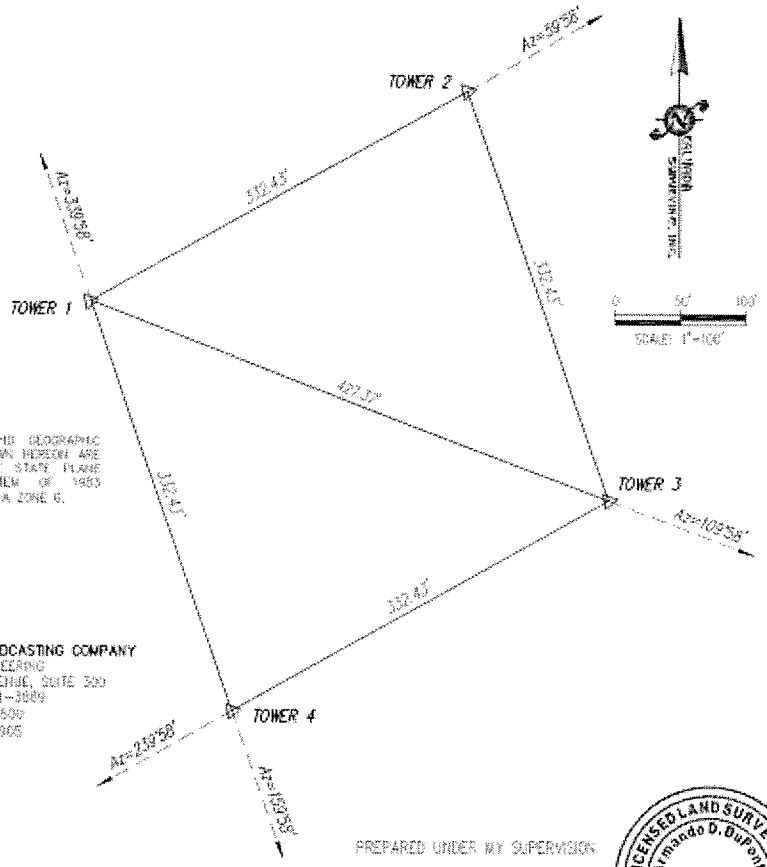
Appendix B

Certified Survey

TOWERS LAYOUT

"OAK FLAT TOWERS"

BLACK STAR CANYON ROAD, SILVERDO, CA 92676



Note:

THE AZIMUTHS AND GEOGRAPHIC COORDINATES SHOWN HEREON ARE BASED UPON THE STATE PLANE COORDINATE SYSTEM OF 1983 (NAD83), CALIFORNIA ZONE 6.

Prepared for:

CRAWFORD BROADCASTING COMPANY
CORPORATE ENGINEERING
2150 W. 29TH AVENUE, SUITE 300
DENVER, CO 80211-3989
TEL: (303) 433-5500
FAX: (303) 433-6965

TWR. NO.	LATITUDE	LONGITUDE
TOWER 1	33°49'44.93"N	117°38'23.12"W
TOWER 2	33°49'46.57"N	117°38'19.71"W
TOWER 3	33°49'43.48"N	117°38'18.30"W
TOWER 4	33°49'41.84"N	117°38'21.77"W

PREPARED UNDER MY SUPERVISION

ARMANDO D. DUPONT, P.L.S. 7760

LICENSED LAND SURVEYOR
Armando D. DuPont
L.S. 7760
Exp. 12/31/13
STATE OF CALIFORNIA

SHEET 1 OF 1

CAL VADA SURVEYING, INC.
411 JENKS CIRCLE, SUITE 205, CORONA, CA. 92880-1782
PHONE: 951-280-9960 FAX: 951-280-9746

Job No. 11958
Drawn By: RG
Date: 08/06/12
www.calvada.com

Appendix C

Certificate of FIM Calibration

POTOMAC INSTRUMENTS, inc.
Frederick, Maryland

CERTIFICATE OF CALIBRATION

Field Intensity Meter Type FIM-41 Serial Number 1898

This instrument was calibrated in an induction field of 220.0 millivolts per meter. At each measurement frequency the measured field was recorded and a correction factor K was computed; the indicated field must be multiplied by K to obtain the true field.

kHz	K	kHz	K	MHz	K	MHz	K
540	1.014	1100	1.000	1.6	0.991	3.5	1.000
600	1.005	1200	1.000	1.9	0.991	3.8	1.000
700	1.005	1300	1.000	2.2	0.995	4.1	0.986
800	1.000	1400	1.000	2.5	1.000	4.4	0.995
900	1.000	1500	1.000	2.8	1.000	4.7	0.995
1000	1.000	1600	1.000	3.2	1.000	5.0	0.977

The calibrating field is maintained equal to the National Institute of Standards and Technology (NIST) standard field within an accuracy of 1.0 percent. NIST states that the absolute accuracy of its field is "believed to be within 3.0 percent."

The error at points on the meter scale other than the calibration point is less than 3.0 percent. The attenuator ratios are correct within 2.0 percent. These accuracies apply for battery voltages that are indicated by the instrument's battery check circuit to be useable.

NEXT RECOMMENDED CALIBRATION DATE: February 12, 2014

Calibrated by _____ Date: Feb. 13, 2012

STATE OF MARYLAND

Technician Zachary Babendreier, personally appeared before me on Feb.14, 2012, and testified under oath that the above calibration was made either by himself or under his direction and that the statements in the above certificate are true to the best of his knowledge and belief.

MARCELLA R. LALIBERTE NOTARY PUBLIC FREDERICK COUNTY, MD

Marcella R. Laliberte
NOTARY PUBLIC
Frederick County
State of Maryland
My Commission Expires
December 17, 2012

Marcella R. Laliberte
Notary Public