SCIARRINO & SHUBERT, PLLC

BROADCAST & MEDIA LEGAL SERVICES

Dawn M. Sciarrino	Lee W. Shubert	Christine McLaughlin*†	Shelley Sadowsky*†‡
dawn@sciarrinolaw.com	lee@sciarrinolaw.com	christine@sciarrinolaw.com	shelley@sciarrinolaw.com
(202) 350-9658	(202) 350-9658	(202) 375-9166	(202) 997-9392.

March 22, 2013

VIA HAND DELIVERY

Marlene H. Dortch, Secretary
Federal Communications Commission
Office of the Secretary
9300 East Hampton Drive
Capitol Heights, MD 20743

Re: KTSA(AM), San Antonio, TX (FIN: 721087)
File No. BMML-20130208ABX

Dear Ms. Dortch:

BMP San Antonio License Company, L.P. ("BMP"), licensee of KTSA(AM), by counsel, hereby amends the above-referenced application to correct the post-construction survey data and typographical errors.

Should you have any questions regarding this matter, kindly contact the undersigned counsel.

Very truly yours,

/s/ Dawn M. Sciarrino

Dawn M. Sciarrino

Enclosure

5425 TREE LINE DR. CENTREVILLE, VA 20120-1676
703.991.7120 (FAX)

*Of Counsel • †Admitted in District of Columbia but not Virginia • ‡Admitted in Maryland

AMENDMENT

FILED/ACCEPTED
MAR 22 2013
Federal Communications Commission
Office of the Secretary

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT BMP SAN ANTONIO LICENSE COMPANY, L.P.		
MAILING ADDRESS 8750 NORTH CENTRAL EXPRESSWAY, SUITE 645		
CITY DALLAS	STATE TX	ZIP CODE 75231

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
KTSA	SAN ANTONIO	N/A	N/A	N/A

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	
JOAN LEONARD		
Title	Date	Telephone Number
SENIOR VICE PRESIDENT/CONTROLLER OF GENERAL PARTNER	3-18-13	(214) 692-2000

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

BMP SAN ANTONIO LICENSE COMPANY, L.P.

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
KTSA		550	UNLIMITED	5.0	5.0

2. Station location

State	City or Town
SAN ANTONIO	TEXAS

3. Transmitter location

State	County	City or Town	Street address (or other identification)
TX	BEXAR	SAN ANTONIO	4050 EISENHAUER RD.

4. Main studio location

State	County	City or Town	Street address (or other identification)
TX	BEXAR	SAN ANTONIO	4050 EISENHAUER RD

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

State	County	City or Town	Street address (or other identification)
TX	BEXAR	SAN ANTONIO	4050 EISENHAUER RD.

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. 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
12.26	12.35

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	32.8	0.0	+j4.3

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	+60.4°	N/A	0.720	N/A	N/A	12.35A
2	+177.1°	N/A	0.579	N/A	N/A	N/A
3	0.0°	N/A	1.000	N/A	N/A	N/A
4	+119.5°	N/A	0.780	N/A	N/A	N/A

Manufacturer and type of antenna monitor: POTOMAC INSTRUMENTS 1904-4

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.
GUYED VERTICAL STEEL	121.9	124	125	Exhibit No. N/A

Excitation ☑ Series ☐ Shunt

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

North Latitude	29 °	29 '	46 "	West Longitude	98 °	24 '	54 "

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. E-1

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 (Refurbishment of existing plant)

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

Reconstruction of existing plant; Replacement of ground system

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)
J. S. SELLMEYER, P.E.	J. S. Sellmeyer
Address (include ZIP Code) Sellmeyer Engineering 2 Pecan Grove Circle Lucas, TX 75002	Date 6/18/2013 Telephone No. (Include Area Code) 972-542-2056

☐ Technical Director

☑ Registered Professional Engineer

☐ Chief Operator

☐ Technical Consultant

☐ Other (specify)

STATE OF TEXAS J. S. SELLMEYER 38530 REGISTERED PROFESSIONAL ENGINEER

SELLMEYER ENGINEERING
BROADCAST & COMMUNICATIONS CONSULTING ENGINEERS
2 Pecan Grove Circle
Lucas, Texas, 75002
MEMBER AFCCE

EXHIBIT E-1

AMENDMENT TO:
FCC FORM 302-AM
APPLICATION FOR STATION LICENSE

BMP SAN ANTONIO LICENSE COMPANY, L.P.
RADIO STATION KTSA
550 KHZ, 5 KW, DA-N-UNL
SAN ANTONIO, TEXAS
METHOD OF MOMENTS ADJUSTMENT
FACILTY ID: 71087

MARCH. 2013

SELLMEYER ENGINEERING
BROADCAST & COMMUNICATIONS CONSULTING ENGINEERS
2 Pecan Grove Circle
Lucas, Texas, 75002
MEMBER AFCCE

EXHIBIT E-1

TABLE OF CONTENTS
BMP SAN ANTONIO LICENSE COMPANY, L.P.
RADIO STATION KTSA
550 KHZ, 5 KW, DA-N UNL
SAN ANTONIO, TEXAS
METHOD OF MOMENTS ADJUSTMENT
TWO STATION DIPLEX
FACILTY ID: 71087
REV-1

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4	+119.5°	N/A	0.790	N/A	N/A	N/A

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SECTION III - Page 2

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

Reconstruction of existing plant; Replacement of ground system

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)
J. S. SELLMEYER, P.E.	J. S. Sellmeyer
Address (include ZIP Code) Sellmeyer Engineering 2 Pecan Grove Circle Lucas, TX 75002	Date 6/18/2013 Telephone No. (Include Area Code) 972-542-2056

STATE OF TEXAS J. S. SELLMEYER 38535 REGISTERED PROFESSIONAL ENGINEER

☐ Technical Director ☑ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☐ Other (specify)

SELLMEYER ENGINEERING
BROADCAST & COMMUNICATIONS CONSULTING ENGINEERS
2 Pecan Grove Circle
Lucas, Texas, 75002
MEMBER AFCCE

ENGINEERING STATEMENT IN SUPPORT OF APPLICATION FOR STATION LICENSE BMP SAN ANTONIO LICENSE COMPANY, L.P. RADIO STATION KTSA 550 KHZ, 5 KW-DA-N UNL SAN ANTONIO, TEXAS METHOD OF MOMENTS ADJUSTMENT TWO STATION DIPLEX FACILTY ID: 71087 REV-1

The instant amendment follows a review of the documents following the Initial filing which revealed several typographical errors and incorporates minor editorial changes. The sections where changes have occurred are labeled "REV-1".

This Firm represents BMP SAN ANTONIO LICENSE COMPANY, L.P. licensee of Radio Station KTSA. The instant application covers a complete refurbishment of the KTSA Transmitter Plant conducted concurrently with installation of a new transmitter plant for co-owned station KZDC authorized by construction permit file number: BP-20101206AAP. The two stations are diplexed into the five towers located on the KTSA property. Tower-5 is a newly constructed tower which is not used by KTSA and is detuned at the KTSA operating frequency. An STA to operate KTSA with parameters at variance with the licensed parameters or at reduced power with a non-directional antenna was requested and granted prior to beginning construction of the two plants.

The KTSA directional array specifications are unchanged from those originally authorized in 1948.

The KTSA directive array was adjusted by the Method of Moments procedures permitted by Section 73.151(c) of the Rules. The underlying measurements and models for the individual towers driven separately are described in Section 1 of this report. The derivation of the operating parameters for the directive array appears in Section 2 of this report.

Following completion of the initial adjustment, the system was operated during daytime hours while the Harmonic and Spurious Radiation measurements were made with KZDC and KTSA operating with their new nighttime facilities at full power. Following completion of these measurements the Reference Point measurements for both stations were completed.

The Antenna Monitoring system was installed in exact accordance with Section 73.68 of the Rules as described in Section 3 of this report.

The monitor points listed in the current license were checked following adjustment of the KTSA nighttime array with the resulting measured fields being below the specified limits.

The KTSA Directive array is adjusted to within three degrees and five percent of the parameters listed in Section-3 of the attached report.

The KTSA nighttime directive array has been operating under terms of the current STA since the KZDC Nighttime Directive array began operation under Program Test Authority.

All work on this project was performed by me personally or under my direct supervision. Lyndon H. Willoughby assisted with the adjustment of the KTSA and KZDC antenna systems.

CERTIFICATION OF ENGINEER

I hereby state that:

I am President of Sellmeyer Engineering

The Firm of Sellmeyer Engineering has been retained by BMP San Antonio License Company, L.P. to prepare this Engineering Exhibit

I am a graduate of Arizona State University with the degree of Bachelor of Science in Engineering

I am a Registered Professional Engineer in the States of Ohio and Texas

My qualifications as an Engineer are a matter of record with the Federal Communications Commission

This Engineering Exhibit was prepared by me personally or under my direct supervision, and

All facts stated herein are true and correct to the best of my knowledge and belief.

J. S. Sellmeyer P. E.

March 18, 2013

Sellmeyer Engineering
2 Pecan Grove Circle
Lucas, Texas 75002
972-542-2056
jack@sellmeyereng.com
Texas Firm Number: F-004814

SELLMEYER ENGINEERING
BROADCAST & COMMUNICATIONS CONSULTING ENGINEERS
2 Pecan Grove Circle
Lucas, Texas, 75002
MEMBER AFCCE

RADIO STATION KTSA
550 KHZ, 5 KW-UNL, DA-N
SAN ANTONIO, TEXAS
SECTION-1
REV-1
Analysis of Measured Tower Impedance Data
For Verification of Method of Moments Model

The KTSA Nighttime Directive Array is diplexed with the KZDC (1250 kHz) array using three of the four KTSA towers. A fifth tower (5) of equal height and cross section was constructed for the exclusive use of co-owned KZDC, 1250 kHz. The towers, for purposes of the KTSA Construction Permit, are numbered 1 through 5 with Tower-5 being the KZDC Tower-4. KTSA towers 2, 3 and 4 correspond to KZDC towers 1, 2 and3 respectively. This arrangement corresponds to the KZDC numbering convention. Tower-5 is detuned at the 550 kHz channel and KTSA Tower-1, physical Tower-1, is detuned at the 1250 kHz channel. A sample loop is located at the phase reversal location on each of these towers and is connected to a run of ½ inch Heliax cable which is terminated at the base of each tower to provide a null indication for system maintenance purposes.

The electrical height of all five towers is 80.5 degrees at the 550 kHz channel. The face widths are identical, although minor differences exist in the cross bracing details. Base current sampling by means of Toroidal Current Transformers ("TCT") is employed at the tower bases for the 550 kHz antenna monitoring System.

Each Tower was modeled in ACSModel, which uses a Mininec 3.1 core. Each tower is modeled using 20 wire segments. The segment radii are specified in meters. A nodal analysis program, WCAP, was used to correlate the modeled and measured base impedances, base currents and phases to the measured impedances at the output terminals of the Antenna Coupler Units ("ACU") cabinets and the

modeled base current phases to those at the tower bases.

Each tower was adjusted individually to provide correlation of the model impedance, when corrected for stray capacitance and inductance introduced by the series feeder pipes and shunting components such as the tower lighting chokes, base insulator, feed through insulators and Isocouplers, where applicable, to the measured impedances at the TCT, or ACU output terminals. Isocouplers are used for an FM antenna on Tower-1 and an STL antenna on Tower-2. All strays are included in the individual WCAP models.

The modeled tower height and equivalent radius are within the permitted height ranges of 75 to 125 percent of the physical height and within the permitted equivalent radius of 80 to 150 percent of the physical radius. The KTSA Table of Tower Physical and Modeled Dimensions shows the height and radius of each element of the array. Tower-5 is not used in the KTSA array and is detuned at the KTSA frequency.

Tower base impedance measurements were made at the output test jack ("J-Plug") of each of the ACU's using a Hewlett Packard 8753C network analyzer connected to an RF Power Amplifier, a resistive attenuator and a directional coupler in a calibrated measurement system. The other towers were open circuited at the companion ACU output jack. Tower-5 is detuned at the KTSA frequency and has no ACU for the KTSA operation. The impedance measurements for this tower were made at the output J-Plug of the Antenna Coupling Unit ("ACU") for Station KZDC. This point follows the combining filters and directly feeds the tower base.

The reference point at each tower is the output Jack of the Antenna Coupling Unit which is located inside a concrete block building for KTSA Towers 1-4. This unit is connected directly to the tower feed point with a short length of large copper tubing. The base current at this point is measured by the TCT and transmitted to the Antenna Monitor through the sample line. The Antenna Coupling Unit for Tower-5 is enclosed in a weatherproof aluminum cabinet located on a concrete pad adjacent to the tower.

There are no components in shunt with the ACU outputs except for the

tower lighting choke, base insulator, other stray capacitances such as Isocouplers on KTSA Towers 1 and 2, and Voltage Sampling Units on towers 2-5 for Station KZDC.

The reactance of the four wire tower lighting chokes at the operating frequency of 550 kHz was supplied by the manufacturer and incorporated with all of the stray capacitive reactances in the Base Region Calibration Model. The base loads for the undriven towers were derived from the Base Region Circuit Model.

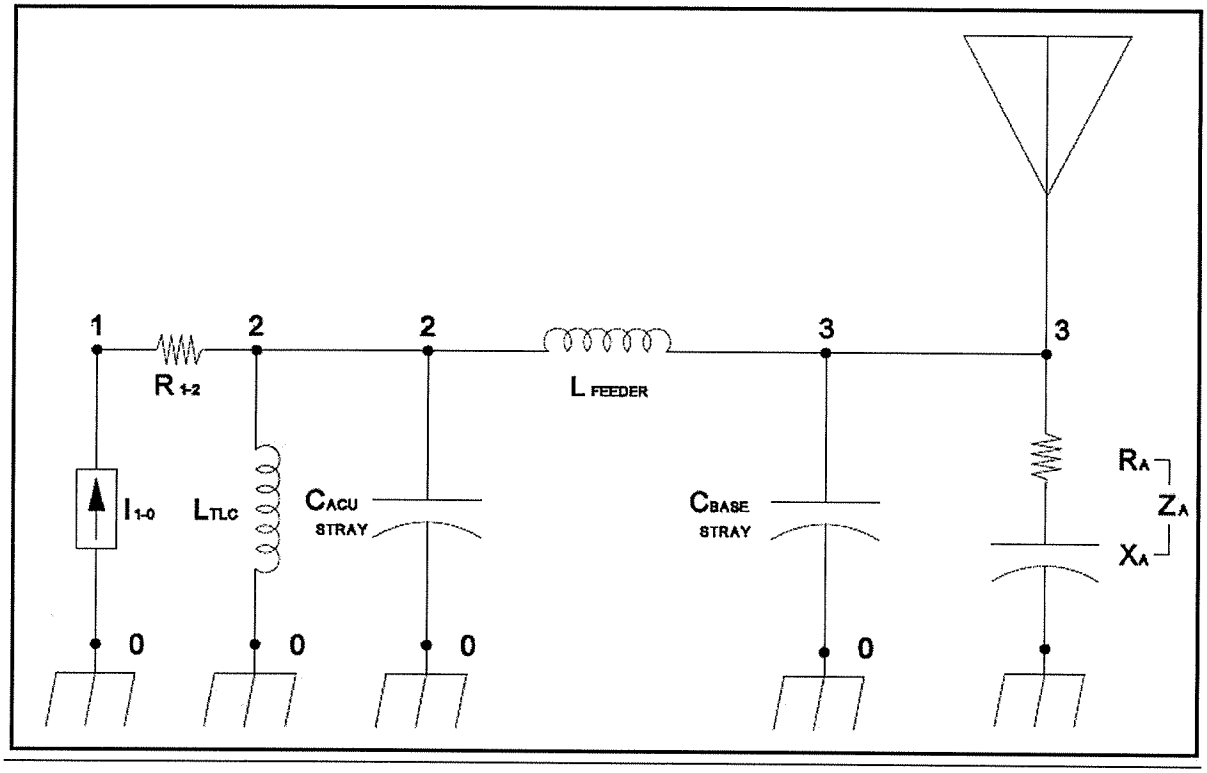
Circuit calculations were performed to relate the method of moments modeled impedances to the TCT measurement (reference) points as shown on the following pages.

In addition to the page showing the schematic of the assumed circuit and tabulation of calculated values, pages showing the results of calculations using the WCAP network analysis program from Westberg Consulting are provided for each tower. WCAP performs such calculations using nodal analysis, as do other modern circuit analysis programs such as the commonly available ones based on SPICE software.

In each of the WCAP tabulations, Node-2 represents the ACU reference point "the Output Jack" and Node-3 represents the tower feed point. Node 0 represents ground potential. It should be noted that the ACU Current and Phase at Node-3 (R_{3-0}) is the modeled current and phase from the MOM model for each of the four elements. The Node-2 Current and Phase are an exact translation of the Node-3 values to the output terminal of the associated ACU.

The calculated ACU output impedances appear after the "TO IMPEDANCE" columns of the WCAP Tabulations, following the phantom 1 ohm resistor (R_{1-2}) that is placed in series with the current source to provide calculation points for the impedances. The tower feed point impedances from the method of moments model are represented by complex loads from Node-3 to ground (R_{3-0}). The modeled and measured base impedances at the ACU output jacks with all the other towers open circuited at the ATU output jacks, agree within +/- 2 ohms and +/- 4 percent for resistance and reactance, as required by the Rules.

BASE REGION MODEL



The ACU stray capacitances are modeled at node 0-2. The base insulator & Isocoupler capacitances at Towers 1 & 2 capacitances are lumped at Node-0-3.

KTSA NON-DIRECTIONAL BASE REGION MODEL TABULATION

TWR	BASE SHUNT C (pF)	ACU SHUNT C (pF)	FEEDER INDUCTANCE (uHy)	BASE IMPEDANCE FROM MOM MODEL (OHMS)	BASE IMPEDANCE @ TCT FROM WCAP MODEL (OHMS)	MEASURED ACU IMPEDANCE Zb @ TCT (OHMS)
1	90	36	5.175	30.72-j21.19	30.45-j2.84	30.3-j2.95
2	115	36	5.890	29.93-j20.95	29.45-j0.18	28.9-j0.00
3	50	36	4.915	30.20-j19.15	30.08-j1.65	29.2-j1.75
4	50	36	5.120	30.12-j21.16	30.03-j2.94	29.6-j3.00
5	50	36	4.240	30.90-j16.76	30.80-j1.58	30.2-j1.51
NOTES: BASES SHORTED EXCEPT FOR MEASURED TOWER; Zb MEASURED AT TCT/ACU OUTPUT JACK						

WCAP CIRCUIT ANALYSIS FILES APPEAR ON THE FOLLOWING PAGES

WCAP - KTSA TWR-1 ND

WCAP OUTPUT AT FREQUENCY: 0.550 MHz

NODE VOLTAGES

Node: 1 83.4525 ∠ -117.4816° V
Node: 2 80.8205 ∠ -117.6499° V
Node: 3 98.1982 ∠ -146.2882° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	2.64 ∠ -112.330° V	2.64 ∠ -112.330° A
L	2→3	5.17500000	47.37 ∠ -21.147° V	2.65 ∠ -111.147° A
C	3→0	0.00009000	98.20 ∠ -146.288° V	0.03 ∠ -56.288° A
R	3→0	30.72000000	98.20 ∠ -146.288° V	2.63 ∠ -111.691° A
L	2→0	360.00000000	80.82 ∠ -117.650° V	0.06 ∠ 152.350° A
C	2→0	0.00003600	80.82 ∠ -117.650° V	0.01 ∠ -27.650° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	31.45 - j 2.835	**30.45 - j 2.835**[2]
L	2→3	5.17500000	30.32 - j 3.456	30.32 - j 21.339
C	3→0	0.00009000	0.00 - j 3215.251	0.00 + j 0.000
R	3→0	30.72000000	**30.72 - j 21.190**[1]	0.00 + j 0.000
L	2→0	360.00000000	0.00 + j 1244.071	0.00 + j 0.000
C	2→0	0.00003600	0.00 - j 8038.128	0.00 + j 0.000

WCAP INPUT DATA:

0.5500 0.00000000 0

I	2.64310000	0	1	247.67000000	1: MODELED BASE IMPEDANCE
R	1.00000000	1	2	0.00000000	2: MODELED ACU IMPEDANCE
L	5.17500000	2	3	0.00000000	
C	0.00009000	3	0		
R	30.72000000	3	0	-21.19000000	
L	360.00000000	2	0	0.00000000	
C	0.00003600	2	0		

WCAP - KTSA TWR-2 ND

WCAP OUTPUT AT FREQUENCY: 0.550 MHz

NODE VOLTAGES

Node: 1 80.4910 ∠ -112.6705° V
Node: 2 77.8479 ∠ -112.6820° V
Node: 3 95.7890 ∠ -146.8504° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	2.64 ∠ -112.330° V	2.64 ∠ -112.330° A
L	2→3	5.89000000	53.82 ∠ -21.184° V	2.64 ∠ -111.184° A
C	3→0	0.00011500	95.79 ∠ -146.850° V	0.04 ∠ -56.850° A
R	3→0	29.93000000	95.79 ∠ -146.850° V	2.62 ∠ -111.860° A
L	2→0	360.00000000	77.85 ∠ -112.682° V	0.06 ∠ 157.318° A
C	2→0	0.00003600	77.85 ∠ -112.682° V	0.01 ∠ -22.682° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	30.45 - j 0.181	**29.45 - j 0.181**[2]
L	2→3	5.89000000	29.43 - j 0.770	29.43 - j 21.124
C	3→0	0.00011500	-0.00 - j 2516.284	0.00 + j 0.000
R	3→0	29.93000000	**29.93 - j 20.950**[1]	0.00 + j 0.000
L	2→0	360.00000000	0.01 + j 1244.071	0.00 + j 0.000
C	2→0	0.00003600	0.00 - j 8038.128	0.00 + j 0.000

WCAP INPUT DATA:

	0.5500	0.00000000	0		
I	2.64310000	0	1	247.67000000	1: MODELED BASE IMPEDANCE
R	1.00000000	1	2	0.00000000	2: MODELEED ACU IMPEDANCE
L	5.89000000	2	3	0.00000000	
C	0.00011500	3	0		
R	29.93000000	3	0	-20.95000000	
L	360.00000000	2	0	0.00000000	
C	0.00003600	2	0		

WCAP - KTSA TWR-3 ND

WCAP OUTPUT AT FREQUENCY: 0.550 MHz

NODE VOLTAGES

Node: 1 82.2629 ∠ -115.3639° V

Node: 2 79.6237 ∠ -115.4646° V

Node: 3 94.3288 ∠ -143.8376° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	2.64 ∠ -112.330° V	2.64 ∠ -112.330° A
L	2→3	4.91500000	44.95 ∠ -21.161° V	2.65 ∠ -111.161° A
C	3→0	0.00005000	94.33 ∠ -143.838° V	0.02 ∠ -53.838° A
R	3→0	30.20000000	94.33 ∠ -143.838° V	2.64 ∠ -111.459° A
L	2→0	360.00000000	79.62 ∠ -115.465° V	0.06 ∠ 154.535° A
C	2→0	0.00003600	79.62 ∠ -115.465° V	0.01 ∠ -25.465° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	31.08 - j 1.647	**30.08 - j 1.647**[2]
L	2→3	4.91500000	30.00 - j 2.258	30.00 - j 19.243
C	3→0	0.00005000	0.00 - j 5787.452	0.00 + j 0.000
R	3→0	30.20000000	**30.20 - j 19.150**[1]	0.00 + j 0.000
L	2→0	360.00000000	0.00 + j 1244.071	0.00 + j 0.000
C	2→0	0.00003600	0.00 - j 8038.128	0.00 + j 0.000

WCAP INPUT DATA:

	0.5500	0.00000000	0		
I	2.64310000	0	1	247.67000000	1: MODELED BAE IMPEDANCE
R	1.00000000	1	2	0.00000000	2: MODELED ACU IMPEDANCE
L	4.91500000	2	3	0.00000000	
C	0.00005000	3	0		
R	30.20000000	3	0	-19.15000000	
L	360.00000000	2	0	0.00000000	
C	0.00003600	2	0		

WCAP - KTSA TWR-4 ND

WCAP OUTPUT AT FREQUENCY: 0.550 MHz

NODE VOLTAGES

Node: 1 82.3889 ∠ -117.7448° V

Node: 2 79.7580 ∠ -117.9240° V

Node: 3 97.1501 ∠ -146.5495° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	2.64 ∠ -112.330° V	2.64 ∠ -112.330° A
L	2→3	5.12000000	46.87 ∠ -21.163° V	2.65 ∠ -111.163° A
C	3→0	0.00005000	97.15 ∠ -146.549° V	0.02 ∠ -56.549° A
R	3→0	30.12000000	97.15 ∠ -146.549° V	2.64 ∠ -111.461° A
L	2→0	360.00000000	79.76 ∠ -117.924° V	0.06 ∠ 152.076° A
C	2→0	0.00003600	79.76 ∠ -117.924° V	0.01 ∠ -27.924° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	31.03 - j 2.942	**30.03 - j 2.942**[2]
L	2→3	5.12000000	29.90 - j 3.545	29.90 - j 21.238
C	3→0	0.00005000	0.00 - j 5787.452	0.00 + j 0.000
R	3→0	30.12000000	**30.12 - j 21.160**[1]	0.00 + j 0.000
L	2→0	360.00000000	0.00 + j 1244.071	0.00 + j 0.000
C	2→0	0.00003600	0.00 - j 8038.128	0.00 + j 0.000

WCAP INPUT DATA:

	0.5500	0.00000000	0	
I	2.64310000	0	1	247.67000000
R	1.00000000	1	2	0.00000000
L	5.12000000	2	3	0.00000000
C	0.00005000	3	0	
R	30.12000000	3	0	-21.16000000
L	360.00000000	2	0	0.00000000
C	0.00003600	2	0	

1: MODELED BASE IMPEDANCE

2: MODELED ACU IMPEDANCE

WCAP - KTSA TWR-5 ND

WCAP OUTPUT AT FREQUENCY: 0.550 MHz

NODE VOLTAGES

Node: 1 84.1558 ∠ -115.1785° V
Node: 2 81.5161 ∠ -115.2708° V
Node: 3 92.7622 ∠ -139.9127° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	2.64 ∠ -112.330° V	2.64 ∠ -112.330° A
L	2→3	4.24000000	38.78 ∠ -21.132° V	2.65 ∠ -111.132° A
C	3→0	0.00005000	92.76 ∠ -139.913° V	0.02 ∠ -49.913° A
R	3→0	30.90000000	92.76 ∠ -139.913° V	2.64 ∠ -111.438° A
L	2→0	360.00000000	81.52 ∠ -115.271° V	0.07 ∠ 154.729° A
C	2→0	0.00003600	81.52 ∠ -115.271° V	0.01 ∠ -25.271° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	31.80 - j 1.582	**30.80 - j 1.582**[2]
L	2→3	4.24000000	30.72 - j 2.223	30.72 - j 16.875
C	3→0	0.00005000	0.00 - j 5787.452	0.00 + j 0.000
R	3→0	30.90000000	**30.90 - j 16.760**[1]	0.00 + j 0.000
L	2→0	360.00000000	0.00 + j 1244.071	0.00 + j 0.000
C	2→0	0.00003600	-0.01 - j 8038.128	0.00 + j 0.000

WCAP INPUT DATA:

	0.5500	0.00000000	0		
I	2.64310000	0	1	247.67000000	1: MODELED BASE IMPEDANCE
R	1.00000000	1	2	0.00000000	2: MODELED ACU IMPEDANCE
L	4.24000000	2	3	0.00000000	
C	0.00005000	3	0		
R	30.90000000	3	0	-16.76000000	
L	360.00000000	2	0	0.00000000	
C	0.00003600	2	0		

METHOD OF MOMENTS MODEL DETAILS FOR TOWERS DRIVEN INDIVIDUALLY

The KTSA array was modeled using ACSModel, (Mininec 3.1 Core). One wire was used to represent each tower. The top and bottom wire end points were specified in meters in the Cartesian coordinate system, as converted from the theoretical directional antenna specifications taking into account the carrier frequency wavelength, Each tower was modeled using 20 wire segments. As the towers are physically 80.5° in electrical height, each segment represents 4.025 electrical degrees.

The individual tower's physical characteristics were adjusted to provide a match of the modeled and measured impedances, when the stray capacitances, ACU tower lighting choke inductances and RF feed line hookup inductances that were measured at the output RF test jack in the TCT and antenna coupler enclosures while all of the other towers were short circuited across their bases. The method of moments model assumed loads at ground level having high reactances while open circuited. The modeled reactances of the WCAP network analyses were used to match the modeled base impedances to the measured values on an individual bases leaving all other grounded. The individual tower models, thus generated, were used to determine the antenna monitor parameters from the MOM Directive Array modeled parameters.

Each tower's modeled height relative to its physical height falls within the range of 75 to 125 percent of the physical height and each tower's modeled equivalent radius falls within the required range of 80 percent to 150 percent of the radius of a circle having a circumference equal to the sum of the widths of the tower faces. The array consists of five uniform cross section towers having a face width of 36 inches.

TABLE OF MODELED TOWER HEIGHTS

TOWER	Electrical Height (Degrees)	Physical Height (meters)	Modeled Height (meters)	Modeled Percent of Height	Modeled Radius (meters)	Percent Equivalent Radius
1	80.5	121.92	124.3110	101.96	0.4366	100.0
2	80.5	121.92	124.3110	101.96	0.4366	100.0
3	80.5	121.92	124.9167	102.46	0.4366	100.0
4	80.5	121.92	124.3110	101.96	0.4366	100.0
5	80.5	121.92	125.5223	102.95	0.4366	100.0

The modeled heights of the KTSA towers are within 75 to 125 percent of the physical heights. The modeled equivalent radius is 100 percent of the physical radius.

METHOD OF MOMENTS MODELS

****
ACSModel
(MININEC 3.1 Core)
03-18-2013 10:07:19
****

KTSA
NON-DIRECTIONAL TWR-1

Frequency = 0.550 MHz Wavelength = 545.09090 Meters

No. of Wires: 5

Wire No. 1	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
0	0	0		-1	
0	0	124.311	0.4366	0	20

Wire No. 2	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
129.7403	-27.57715	0		-2	
129.7403	-27.57715	124.311	0.4366	0	20

Wire No. 3	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
231.3532	-112.8385	0		-3	
231.3532	-112.8385	124.9167	0.4366	0	20

Wire No. 4	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
361.2464	-140.1182	0		-4	
361.2464	-140.1182	124.311	0.4366	0	20

Wire No. 5	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
313.2587	-3.280557	0		-5	
313.2587	-3.280557	125.5223	0.4366	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
0	0	0	0.4366	-1	1	1
0	0	6.21555	0.4366	1	1	2
0	0	12.4311	0.4366	1	1	3
0	0	18.64665	0.4366	1	1	4
0	0	24.8622	0.4366	1	1	5
0	0	31.07775	0.4366	1	1	6
0	0	37.2933	0.4366	1	1	7
0	0	43.50885	0.4366	1	1	8
0	0	49.7244	0.4366	1	1	9
0	0	55.93995	0.4366	1	1	10
0	0	62.15551	0.4366	1	1	11
0	0	68.37105	0.4366	1	1	12
0	0	74.5866	0.4366	1	1	13
0	0	80.80215	0.4366	1	1	14
0	0	87.0177	0.4366	1	1	15
0	0	93.23325	0.4366	1	1	16
0	0	99.44881	0.4366	1	1	17
0	0	105.6644	0.4366	1	1	18
0	0	111.8799	0.4366	1	1	19
0	0	118.0955	0.4366	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
129.7403	-27.57715	0	0.4366	-2	2	21
129.7403	-27.57715	6.21555	0.4366	2	2	22
129.7403	-27.57715	12.4311	0.4366	2	2	23
129.7403	-27.57715	18.64665	0.4366	2	2	24
129.7403	-27.57715	24.8622	0.4366	2	2	25
129.7403	-27.57715	31.07775	0.4366	2	2	26
129.7403	-27.57715	37.2933	0.4366	2	2	27
129.7403	-27.57715	43.50885	0.4366	2	2	28
129.7403	-27.57715	49.7244	0.4366	2	2	29
129.7403	-27.57715	55.93995	0.4366	2	2	30
129.7403	-27.57715	62.15551	0.4366	2	2	31
129.7403	-27.57715	68.37105	0.4366	2	2	32
129.7403	-27.57715	74.5866	0.4366	2	2	33
129.7403	-27.57715	80.80215	0.4366	2	2	34
129.7403	-27.57715	87.0177	0.4366	2	2	35
129.7403	-27.57715	93.23325	0.4366	2	2	36
129.7403	-27.57715	99.44881	0.4366	2	2	37
129.7403	-27.57715	105.6644	0.4366	2	2	38
129.7403	-27.57715	111.8799	0.4366	2	2	39
129.7403	-27.57715	118.0955	0.4366	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
231.3532	-112.8385	0	0.4366	-3	3	41
231.3532	-112.8385	6.245833	0.4366	3	3	42
231.3532	-112.8385	12.49167	0.4366	3	3	43
231.3532	-112.8385	18.7375	0.4366	3	3	44
231.3532	-112.8385	24.98333	0.4366	3	3	45
231.3532	-112.8385	31.22917	0.4366	3	3	46
231.3532	-112.8385	37.475	0.4366	3	3	47
231.3532	-112.8385	43.72083	0.4366	3	3	48
231.3532	-112.8385	49.96667	0.4366	3	3	49
231.3532	-112.8385	56.2125	0.4366	3	3	50
231.3532	-112.8385	62.45833	0.4366	3	3	51
231.3532	-112.8385	68.70416	0.4366	3	3	52
231.3532	-112.8385	74.95	0.4366	3	3	53
231.3532	-112.8385	81.19583	0.4366	3	3	54
231.3532	-112.8385	87.44167	0.4366	3	3	55
231.3532	-112.8385	93.6875	0.4366	3	3	56
231.3532	-112.8385	99.93333	0.4366	3	3	57
231.3532	-112.8385	106.1792	0.4366	3	3	58
231.3532	-112.8385	112.425	0.4366	3	3	59
231.3532	-112.8385	118.6708	0.4366	3	0	60

Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
361.2464	-140.1182	0	0.4366	-4	4	61
361.2464	-140.1182	6.21555	0.4366	4	4	62
361.2464	-140.1182	12.4311	0.4366	4	4	63
361.2464	-140.1182	18.64665	0.4366	4	4	64
361.2464	-140.1182	24.8622	0.4366	4	4	65
361.2464	-140.1182	31.07775	0.4366	4	4	66
361.2464	-140.1182	37.2933	0.4366	4	4	67
361.2464	-140.1182	43.50885	0.4366	4	4	68
361.2464	-140.1182	49.7244	0.4366	4	4	69
361.2464	-140.1182	55.93995	0.4366	4	4	70
361.2464	-140.1182	62.15551	0.4366	4	4	71
361.2464	-140.1182	68.37105	0.4366	4	4	72
361.2464	-140.1182	74.5866	0.4366	4	4	73
361.2464	-140.1182	80.80215	0.4366	4	4	74
361.2464	-140.1182	87.0177	0.4366	4	4	75
361.2464	-140.1182	93.23325	0.4366	4	4	76
361.2464	-140.1182	99.44881	0.4366	4	4	77
361.2464	-140.1182	105.6644	0.4366	4	4	78
361.2464	-140.1182	111.8799	0.4366	4	4	79
361.2464	-140.1182	118.0955	0.4366	4	0	80

Wire No. 5 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
313.2587	-3.280557	0	0.4366	-5	5	81
313.2587	-3.280557	6.276116	0.4366	5	5	82
313.2587	-3.280557	12.55223	0.4366	5	5	83
313.2587	-3.280557	18.82835	0.4366	5	5	84
313.2587	-3.280557	25.10447	0.4366	5	5	85
313.2587	-3.280557	31.38058	0.4366	5	5	86
313.2587	-3.280557	37.6567	0.4366	5	5	87
313.2587	-3.280557	43.93281	0.4366	5	5	88
313.2587	-3.280557	50.20893	0.4366	5	5	89
313.2587	-3.280557	56.48505	0.4366	5	5	90
313.2587	-3.280557	62.76116	0.4366	5	5	91
313.2587	-3.280557	69.03728	0.4366	5	5	92
313.2587	-3.280557	75.31339	0.4366	5	5	93
313.2587	-3.280557	81.58951	0.4366	5	5	94
313.2587	-3.280557	87.86562	0.4366	5	5	95
313.2587	-3.280557	94.14174	0.4366	5	5	96
313.2587	-3.280557	100.4179	0.4366	5	5	97
313.2587	-3.280557	106.694	0.4366	5	5	98
313.2587	-3.280557	112.9701	0.4366	5	5	99
313.2587	-3.280557	119.2462	0.4366	5	0	100

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 416.2, -73.7

Number of Loads: 4
Pulse No., Resistance, Reactance: 21 , 0 , 1492.2
Pulse No., Resistance, Reactance: 41 , 0 , 1488.9
Pulse No., Resistance, Reactance: 61 , 0 , 1489.6
Pulse No., Resistance, Reactance: 81 , 0 , 1486.5

********** SOURCE DATA **********
Pulse 1 Voltage = (116.8023, -399.4326j)
Current = (8.6537, -7.0332j)
Impedance = (30.72, -21.19j) MODELED TWR-1 BASE IMPEDANCE
Power = 1910.03 Watts

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

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	8.6537	-7.0332	11.1513	-39.1019
2	8.4383	-7.0701	11.0086	-39.9583
3	8.2503	-7.0468	10.8501	-40.5015
4	8.0386	-6.9787	10.6452	-40.9632
5	7.7976	-6.868	10.391	-41.3728
6	7.5257	-6.7158	10.0865	-41.7448
7	7.2225	-6.5232	9.7322	-42.0877
8	6.8882	-6.2913	9.3289	-42.4067
9	6.5238	-6.0212	8.8778	-42.7059
10	6.1301	-5.714	8.3802	-42.9882
11	5.7084	-5.371	7.8379	-43.256
12	5.2599	-4.9934	7.2527	-43.5111
13	4.7861	-4.5826	6.6262	-43.7553
14	4.2883	-4.1396	5.9604	-43.9898
15	3.7675	-3.6658	5.2566	-44.2159
16	3.2247	-3.1617	4.5161	-44.4348
17	2.66	-2.6275	3.7389	-44.6474
18	2.0724	-2.062	2.9235	-44.8548
19	1.4577	-1.4607	2.0636	-45.0584
20	0.8039	-0.8112	1.1421	-45.2619
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	0.1573	0.0376	0.1617	13.4317
22	0.0443	0.0104	0.0455	13.2645
23	-0.0254	-0.0066	0.0263	-165.4207
24	-0.0822	-0.0208	0.0848	-165.7802
25	-0.1294	-0.033	0.1335	-165.6982
26	-0.1686	-0.0434	0.1741	-165.555
27	-0.2005	-0.0523	0.2072	-165.3854
28	-0.2257	-0.0596	0.2334	-165.1991
29	-0.2443	-0.0654	0.2529	-165.0001
30	-0.2565	-0.0697	0.2658	-164.791
31	-0.2627	-0.0725	0.2725	-164.5734
32	-0.2628	-0.0736	0.273	-164.3488
33	-0.2572	-0.0732	0.2674	-164.1184
34	-0.2459	-0.0711	0.256	-163.8835
35	-0.2291	-0.0672	0.2387	-163.6453
36	-0.2068	-0.0616	0.2158	-163.4052
37	-0.1791	-0.0542	0.1871	-163.1641
38	-0.146	-0.0449	0.1527	-162.9233
39	-0.1071	-0.0334	0.1122	-162.6833
40	-0.0615	-0.0195	0.0645	-162.442
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	0.0559	-0.0923	0.1079	-58.8092
42	0.0157	-0.0259	0.0302	-58.7377
43	-0.0091	0.0154	0.0179	120.7106
44	-0.0294	0.0492	0.0573	120.8578
45	-0.0463	0.0775	0.0903	120.8221
46	-0.0603	0.1013	0.1179	120.7604
47	-0.0718	0.121	0.1406	120.6868
48	-0.0808	0.1366	0.1587	120.6052
49	-0.0875	0.1485	0.1724	120.517
50	-0.092	0.1566	0.1816	120.4229
51	-0.0942	0.1611	0.1866	120.3231
52	-0.0943	0.162	0.1874	120.218
53	-0.0923	0.1593	0.1841	120.1074
54	-0.0883	0.153	0.1767	119.9915
55	-0.0823	0.1433	0.1652	119.8701
56	-0.0743	0.13	0.1497	119.7431
57	-0.0643	0.1132	0.1302	119.6104
58	-0.0524	0.0928	0.1066	119.4715
59	-0.0384	0.0684	0.0785	119.3256
60	-0.0221	0.0395	0.0452	119.1701
E	0.0	0.0	0.0	0.0

Wire No. 4 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
61	-0.0634	-0.052	0.082	-140.6529
62	-0.0178	-0.0147	0.0231	-140.5632
63	0.0105	0.0084	0.0135	38.7362
64	0.0338	0.0273	0.0434	38.9272
65	0.0534	0.0431	0.0686	38.8839
66	0.07	0.0563	0.0898	38.8082
67	0.0837	0.0671	0.1073	38.7183
68	0.0947	0.0757	0.1212	38.6192
69	0.1032	0.0821	0.1319	38.5129
70	0.1091	0.0865	0.1392	38.4004
71	0.1125	0.0888	0.1433	38.2821
72	0.1134	0.0891	0.1442	38.1585
73	0.1118	0.0874	0.1419	38.0296
74	0.1077	0.0838	0.1364	37.8955
75	0.1011	0.0783	0.1278	37.7562
76	0.092	0.0709	0.1161	37.6115
77	0.0803	0.0615	0.1012	37.4611
78	0.066	0.0503	0.083	37.3047
79	0.0489	0.037	0.0613	37.1414
80	0.0283	0.0213	0.0354	36.9679
E	0.0	0.0	0.0	0.0

Wire No. 5 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
81	-0.0065	-0.0947	0.095	-93.9062
82	-0.0018	-0.0265	0.0265	-93.8183
83	0.0013	0.0159	0.016	85.5156
84	0.0038	0.0507	0.0508	85.6899
85	0.0061	0.0798	0.0801	85.6465
86	0.0081	0.1043	0.1046	85.5717
87	0.0098	0.1244	0.1248	85.4828
88	0.0113	0.1405	0.1409	85.3844
89	0.0126	0.1526	0.1531	85.2782
90	0.0136	0.1609	0.1615	85.1651
91	0.0143	0.1654	0.1661	85.0455
92	0.0148	0.1663	0.1669	84.9197
93	0.0149	0.1634	0.1641	84.7877
94	0.0147	0.1569	0.1576	84.6495
95	0.0141	0.1469	0.1475	84.5052
96	0.0132	0.1332	0.1338	84.3546
97	0.0118	0.1159	0.1165	84.1974
98	0.0099	0.0949	0.0955	84.0333
99	0.0075	0.07	0.0704	83.8615
100	0.0045	0.0404	0.0406	83.6786
E	0.0	0.0	0.0	0.0

********** BASE OPERATING PARAMETERS **********

Twr.	Ratio	Phase
1	68.970	-52.5
2	1.000	0.0
3	0.668	-72.2
4	0.507	-154.1
5	0.587	-107.3

****
ACSModel
(MININEC 3.1 Core)
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KTSA
NON-DIRECTIONAL TWR-2

Frequency = 0.550 MHz Wavelength = 545.09090 Meters

No. of Wires: 5

Wire No. 1 Coordinates				End	No. of
X	Y	Z	Radius	Connection	Segments
0	0	0		-1	
0	0	124.311	0.4366	0	20

Wire No. 2 Coordinates				End	No. of
X	Y	Z	Radius	Connection	Segments
129.7403	-27.57715	0		-2	
129.7403	-27.57715	124.311	0.4366	0	20

Wire No. 3 Coordinates				End	No. of
X	Y	Z	Radius	Connection	Segments
231.3532	-112.8385	0		-3	
231.3532	-112.8385	124.9167	0.4366	0	20

Wire No. 4 Coordinates				End	No. of
X	Y	Z	Radius	Connection	Segments
361.2464	-140.1182	0		-4	
361.2464	-140.1182	124.311	0.4366	0	20

Wire No. 5 Coordinates				End	No. of
X	Y	Z	Radius	Connection	Segments
313.2587	-3.280557	0		-5	
313.2587	-3.280557	125.5223	0.4366	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
0	0	0	0.4366	-1	1	1
0	0	6.21555	0.4366	1	1	2
0	0	12.4311	0.4366	1	1	3
0	0	18.64665	0.4366	1	1	4
0	0	24.8622	0.4366	1	1	5
0	0	31.07775	0.4366	1	1	6
0	0	37.2933	0.4366	1	1	7
0	0	43.50885	0.4366	1	1	8
0	0	49.7244	0.4366	1	1	9
0	0	55.93995	0.4366	1	1	10
0	0	62.15551	0.4366	1	1	11
0	0	68.37105	0.4366	1	1	12
0	0	74.5866	0.4366	1	1	13
0	0	80.80215	0.4366	1	1	14
0	0	87.0177	0.4366	1	1	15
0	0	93.23325	0.4366	1	1	16
0	0	99.44881	0.4366	1	1	17
0	0	105.6644	0.4366	1	1	18
0	0	111.8799	0.4366	1	1	19
0	0	118.0955	0.4366	1	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
129.7403	-27.57715	0	0.4366	-2	2	21
129.7403	-27.57715	6.21555	0.4366	2	2	22
129.7403	-27.57715	12.4311	0.4366	2	2	23
129.7403	-27.57715	18.64665	0.4366	2	2	24
129.7403	-27.57715	24.8622	0.4366	2	2	25
129.7403	-27.57715	31.07775	0.4366	2	2	26
129.7403	-27.57715	37.2933	0.4366	2	2	27
129.7403	-27.57715	43.50885	0.4366	2	2	28
129.7403	-27.57715	49.7244	0.4366	2	2	29
129.7403	-27.57715	55.93995	0.4366	2	2	30
129.7403	-27.57715	62.15551	0.4366	2	2	31
129.7403	-27.57715	68.37105	0.4366	2	2	32
129.7403	-27.57715	74.5866	0.4366	2	2	33
129.7403	-27.57715	80.80215	0.4366	2	2	34
129.7403	-27.57715	87.0177	0.4366	2	2	35
129.7403	-27.57715	93.23325	0.4366	2	2	36
129.7403	-27.57715	99.44881	0.4366	2	2	37
129.7403	-27.57715	105.6644	0.4366	2	2	38
129.7403	-27.57715	111.8799	0.4366	2	2	39
129.7403	-27.57715	118.0955	0.4366	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
231.3532	-112.8385	0	0.4366	-3	3	41
231.3532	-112.8385	6.245833	0.4366	3	3	42
231.3532	-112.8385	12.49167	0.4366	3	3	43
231.3532	-112.8385	18.7375	0.4366	3	3	44
231.3532	-112.8385	24.98333	0.4366	3	3	45
231.3532	-112.8385	31.22917	0.4366	3	3	46
231.3532	-112.8385	37.475	0.4366	3	3	47
231.3532	-112.8385	43.72083	0.4366	3	3	48
231.3532	-112.8385	49.96667	0.4366	3	3	49
231.3532	-112.8385	56.2125	0.4366	3	3	50
231.3532	-112.8385	62.45833	0.4366	3	3	51
231.3532	-112.8385	68.70416	0.4366	3	3	52
231.3532	-112.8385	74.95	0.4366	3	3	53
231.3532	-112.8385	81.19583	0.4366	3	3	54
231.3532	-112.8385	87.44167	0.4366	3	3	55
231.3532	-112.8385	93.6875	0.4366	3	3	56
231.3532	-112.8385	99.93333	0.4366	3	3	57
231.3532	-112.8385	106.1792	0.4366	3	3	58
231.3532	-112.8385	112.425	0.4366	3	3	59
231.3532	-112.8385	118.6708	0.4366	3	0	60

Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
361.2464	-140.1182	0	0.4366	-4	4	61
361.2464	-140.1182	6.21555	0.4366	4	4	62
361.2464	-140.1182	12.4311	0.4366	4	4	63
361.2464	-140.1182	18.64665	0.4366	4	4	64
361.2464	-140.1182	24.8622	0.4366	4	4	65
361.2464	-140.1182	31.07775	0.4366	4	4	66
361.2464	-140.1182	37.2933	0.4366	4	4	67
361.2464	-140.1182	43.50885	0.4366	4	4	68
361.2464	-140.1182	49.7244	0.4366	4	4	69
361.2464	-140.1182	55.93995	0.4366	4	4	70
361.2464	-140.1182	62.15551	0.4366	4	4	71
361.2464	-140.1182	68.37105	0.4366	4	4	72
361.2464	-140.1182	74.5866	0.4366	4	4	73
361.2464	-140.1182	80.80215	0.4366	4	4	74
361.2464	-140.1182	87.0177	0.4366	4	4	75
361.2464	-140.1182	93.23325	0.4366	4	4	76
361.2464	-140.1182	99.44881	0.4366	4	4	77
361.2464	-140.1182	105.6644	0.4366	4	4	78
361.2464	-140.1182	111.8799	0.4366	4	4	79
361.2464	-140.1182	118.0955	0.4366	4	0	80

Wire No. 5 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
313.2587	-3.280557	0	0.4366	-5	5	81
313.2587	-3.280557	6.276116	0.4366	5	5	82
313.2587	-3.280557	12.55223	0.4366	5	5	83
313.2587	-3.280557	18.82835	0.4366	5	5	84
313.2587	-3.280557	25.10447	0.4366	5	5	85
313.2587	-3.280557	31.38058	0.4366	5	5	86
313.2587	-3.280557	37.6567	0.4366	5	5	87
313.2587	-3.280557	43.93281	0.4366	5	5	88
313.2587	-3.280557	50.20893	0.4366	5	5	89
313.2587	-3.280557	56.48505	0.4366	5	5	90
313.2587	-3.280557	62.76116	0.4366	5	5	91
313.2587	-3.280557	69.03728	0.4366	5	5	92
313.2587	-3.280557	75.31339	0.4366	5	5	93
313.2587	-3.280557	81.58951	0.4366	5	5	94
313.2587	-3.280557	87.86562	0.4366	5	5	95
313.2587	-3.280557	94.14174	0.4366	5	5	96
313.2587	-3.280557	100.4179	0.4366	5	5	97
313.2587	-3.280557	106.694	0.4366	5	5	98
313.2587	-3.280557	112.9701	0.4366	5	5	99
313.2587	-3.280557	119.2462	0.4366	5	0	100

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 416.2, -73.7

Number of Loads: 4
Pulse No., Resistance, Reactance: 1 , 0 , 1489.8
Pulse No., Resistance, Reactance: 41 , 0 , 1488.9
Pulse No., Resistance, Reactance: 61 , 0 , 1489.6
Pulse No., Resistance, Reactance: 81 , 0 , 1486.5

********** SOURCE DATA **********
Pulse 21 Voltage = (116.8023, -399.4326j)
Current = (8.8888, -7.1223j)
Impedance = (**29.93, -20.954j**) **TWR-2 MODELED BASE IMPEDANCE**
Power = 1941.55 Watts

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

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	0.1606	0.0396	0.1654	13.8625
2	0.0454	0.0111	0.0467	13.6981
3	-0.0257	-0.0069	0.0266	-164.9917
4	-0.0835	-0.0218	0.0863	-165.3558
5	-0.1317	-0.0346	0.1362	-165.2751
6	-0.1717	-0.0456	0.1776	-165.1332
7	-0.2043	-0.0549	0.2115	-164.9648
8	-0.2299	-0.0626	0.2383	-164.7795
9	-0.2489	-0.0686	0.2582	-164.5813
10	-0.2614	-0.0731	0.2714	-164.3727
11	-0.2677	-0.076	0.2783	-164.1551
12	-0.2679	-0.0772	0.2788	-163.9302
13	-0.2621	-0.0767	0.2731	-163.699
14	-0.2506	-0.0744	0.2614	-163.4628
15	-0.2335	-0.0704	0.2438	-163.2228
16	-0.2108	-0.0645	0.2204	-162.9804
17	-0.1826	-0.0567	0.1912	-162.7365
18	-0.1488	-0.0469	0.1561	-162.4923
19	-0.1092	-0.035	0.1147	-162.2484
20	-0.0627	-0.0204	0.0659	-162.0026
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	8.8888	-7.1223	11.3902	-38.704
22	8.6727	-7.1589	11.2457	-39.5383
23	8.4828	-7.135	11.0845	-40.0674
24	8.2679	-7.0657	10.8757	-40.517
25	8.0225	-6.9532	10.6164	-40.9158
26	7.745	-6.7989	10.3058	-41.278
27	7.4348	-6.6037	9.9441	-41.6117
28	7.0925	-6.3687	9.5323	-41.9223
29	6.7188	-6.0951	9.0715	-42.2135
30	6.3147	-5.784	8.5633	-42.4882
31	5.8816	-5.4367	8.0094	-42.7488
32	5.4207	-5.0543	7.4115	-42.9971
33	4.9334	-4.6384	6.7714	-43.2348
34	4.421	-4.19	6.0911	-43.4631
35	3.8849	-3.7103	5.372	-43.6832
36	3.3257	-3.2	4.6153	-43.8963
37	2.7439	-2.6593	3.8211	-44.1034
38	2.1381	-2.0869	2.9878	-44.3054
39	1.5042	-1.4783	2.109	-44.5038
40	0.8296	-0.821	1.1672	-44.7022
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	0.1563	0.036	0.1604	12.9618
42	0.0439	0.01	0.045	12.7859
43	-0.0254	-0.0064	0.0262	-165.839
44	-0.0818	-0.0201	0.0843	-166.2122
45	-0.1288	-0.0318	0.1326	-166.1258
46	-0.1677	-0.0419	0.1729	-165.9755
47	-0.1995	-0.0505	0.2058	-165.7976
48	-0.2244	-0.0576	0.2317	-165.6022
49	-0.2428	-0.0633	0.2509	-165.3936
50	-0.2549	-0.0675	0.2637	-165.1745
51	-0.261	-0.0702	0.2702	-164.9465
52	-0.261	-0.0714	0.2706	-164.7112
53	-0.2554	-0.071	0.265	-164.4701
54	-0.2441	-0.069	0.2536	-164.2243
55	-0.2273	-0.0653	0.2365	-163.9752
56	-0.2051	-0.0599	0.2137	-163.7242
57	-0.1776	-0.0527	0.1853	-163.4723
58	-0.1447	-0.0436	0.1512	-163.2208
59	-0.1062	-0.0325	0.111	-162.9703
60	-0.0609	-0.019	0.0638	-162.7185
E	0.0	0.0	0.0	0.0

Wire No. 4 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
61	0.0567	-0.0962	0.1117	-59.5123
62	0.016	-0.0271	0.0315	-59.437
63	-0.0091	0.0157	0.0182	119.9706
64	-0.0295	0.0509	0.0588	120.1334
65	-0.0466	0.0803	0.0928	120.0969
66	-0.0607	0.105	0.1213	120.033
67	-0.0723	0.1254	0.1448	119.9571
68	-0.0814	0.1417	0.1634	119.8735
69	-0.0882	0.154	0.1775	119.7838
70	-0.0927	0.1625	0.1871	119.689
71	-0.0949	0.1672	0.1923	119.5894
72	-0.095	0.1681	0.1931	119.4855
73	-0.0931	0.1653	0.1897	119.3772
74	-0.089	0.1588	0.1821	119.2647
75	-0.0829	0.1487	0.1703	119.148
76	-0.0749	0.135	0.1543	119.027
77	-0.0649	0.1175	0.1342	118.9014
78	-0.0529	0.0963	0.1099	118.7708
79	-0.0388	0.0711	0.081	118.6346
80	-0.0223	0.041	0.0467	118.4902
E	0.0	0.0	0.0	0.0

Wire No. 5 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
81	0.1304	-0.0389	0.136	-16.6161
82	0.0365	-0.0109	0.0381	-16.6202
83	-0.0217	0.0065	0.0226	163.4113
84	-0.0691	0.0206	0.0721	163.4026
85	-0.1088	0.0324	0.1135	163.404
86	-0.1419	0.0423	0.148	163.4065
87	-0.169	0.0503	0.1763	163.4091
88	-0.1904	0.0567	0.1987	163.4115
89	-0.2064	0.0615	0.2154	163.4133
90	-0.2171	0.0647	0.2266	163.4144
91	-0.2227	0.0663	0.2324	163.4145
92	-0.2233	0.0665	0.233	163.4133
93	-0.2189	0.0652	0.2284	163.4106
94	-0.2097	0.0625	0.2188	163.4061
95	-0.1957	0.0583	0.2042	163.3995
96	-0.177	0.0528	0.1847	163.3904
97	-0.1536	0.0458	0.1603	163.3785
98	-0.1254	0.0375	0.1309	163.3634
99	-0.0922	0.0276	0.0962	163.3446
100	-0.053	0.0159	0.0553	163.3211
E	0.0	0.0	0.0	0.0

********** BASE OPERATING PARAMETERS **********

Twr.	Ratio	Phase
1	1.032	0.9
2	71.032	-51.7
3	1.000	0.0
4	0.696	-72.5
5	0.848	-29.6

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ACSModel
(MININEC 3.1 Core)
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KTSA
NON-DIRECTIONAL TWR-3

Frequency = 0.550 MHz Wavelength = 545.09090 Meters

No. of Wires: 5

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-1	
0	0	124.311	0.4366	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
129.7403	-27.57715	0		-2	
129.7403	-27.57715	124.311	0.4366	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
231.3532	-112.8385	0		-3	
231.3532	-112.8385	124.9167	0.4366	0	20

Wire No. 4 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
361.2464	-140.1182	0		-4	
361.2464	-140.1182	124.311	0.4366	0	20

Wire No. 5 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
313.2587	-3.280557	0		-5	
313.2587	-3.280557	125.5223	0.4366	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
0	0	0	0.4366	-1	1	1
0	0	6.21555	0.4366	1	1	2
0	0	12.4311	0.4366	1	1	3
0	0	18.64665	0.4366	1	1	4
0	0	24.8622	0.4366	1	1	5
0	0	31.07775	0.4366	1	1	6
0	0	37.2933	0.4366	1	1	7
0	0	43.50885	0.4366	1	1	8
0	0	49.7244	0.4366	1	1	9
0	0	55.93995	0.4366	1	1	10
0	0	62.15551	0.4366	1	1	11
0	0	68.37105	0.4366	1	1	12
0	0	74.5866	0.4366	1	1	13
0	0	80.80215	0.4366	1	1	14
0	0	87.0177	0.4366	1	1	15
0	0	93.23325	0.4366	1	1	16
0	0	99.44881	0.4366	1	1	17
0	0	105.6644	0.4366	1	1	18
0	0	111.8799	0.4366	1	1	19
0	0	118.0955	0.4366	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
129.7403	-27.57715	0	0.4366	-2	2	21
129.7403	-27.57715	6.21555	0.4366	2	2	22
129.7403	-27.57715	12.4311	0.4366	2	2	23
129.7403	-27.57715	18.64665	0.4366	2	2	24
129.7403	-27.57715	24.8622	0.4366	2	2	25
129.7403	-27.57715	31.07775	0.4366	2	2	26
129.7403	-27.57715	37.2933	0.4366	2	2	27
129.7403	-27.57715	43.50885	0.4366	2	2	28
129.7403	-27.57715	49.7244	0.4366	2	2	29
129.7403	-27.57715	55.93995	0.4366	2	2	30
129.7403	-27.57715	62.15551	0.4366	2	2	31
129.7403	-27.57715	68.37105	0.4366	2	2	32
129.7403	-27.57715	74.5866	0.4366	2	2	33
129.7403	-27.57715	80.80215	0.4366	2	2	34
129.7403	-27.57715	87.0177	0.4366	2	2	35
129.7403	-27.57715	93.23325	0.4366	2	2	36
129.7403	-27.57715	99.44881	0.4366	2	2	37
129.7403	-27.57715	105.6644	0.4366	2	2	38
129.7403	-27.57715	111.8799	0.4366	2	2	39
129.7403	-27.57715	118.0955	0.4366	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
231.3532	-112.8385	0	0.4366	-3	3	41
231.3532	-112.8385	6.245833	0.4366	3	3	42
231.3532	-112.8385	12.49167	0.4366	3	3	43
231.3532	-112.8385	18.7375	0.4366	3	3	44
231.3532	-112.8385	24.98333	0.4366	3	3	45
231.3532	-112.8385	31.22917	0.4366	3	3	46
231.3532	-112.8385	37.475	0.4366	3	3	47
231.3532	-112.8385	43.72083	0.4366	3	3	48
231.3532	-112.8385	49.96667	0.4366	3	3	49
231.3532	-112.8385	56.2125	0.4366	3	3	50
231.3532	-112.8385	62.45833	0.4366	3	3	51
231.3532	-112.8385	68.70416	0.4366	3	3	52
231.3532	-112.8385	74.95	0.4366	3	3	53
231.3532	-112.8385	81.19583	0.4366	3	3	54
231.3532	-112.8385	87.44167	0.4366	3	3	55
231.3532	-112.8385	93.6875	0.4366	3	3	56
231.3532	-112.8385	99.93333	0.4366	3	3	57
231.3532	-112.8385	106.1792	0.4366	3	3	58
231.3532	-112.8385	112.425	0.4366	3	3	59
231.3532	-112.8385	118.6708	0.4366	3	0	60

Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
361.2464	-140.1182	0	0.4366	-4	4	61
361.2464	-140.1182	6.21555	0.4366	4	4	62
361.2464	-140.1182	12.4311	0.4366	4	4	63
361.2464	-140.1182	18.64665	0.4366	4	4	64
361.2464	-140.1182	24.8622	0.4366	4	4	65
361.2464	-140.1182	31.07775	0.4366	4	4	66
361.2464	-140.1182	37.2933	0.4366	4	4	67
361.2464	-140.1182	43.50885	0.4366	4	4	68
361.2464	-140.1182	49.7244	0.4366	4	4	69
361.2464	-140.1182	55.93995	0.4366	4	4	70
361.2464	-140.1182	62.15551	0.4366	4	4	71
361.2464	-140.1182	68.37105	0.4366	4	4	72
361.2464	-140.1182	74.5866	0.4366	4	4	73
361.2464	-140.1182	80.80215	0.4366	4	4	74
361.2464	-140.1182	87.0177	0.4366	4	4	75
361.2464	-140.1182	93.23325	0.4366	4	4	76
361.2464	-140.1182	99.44881	0.4366	4	4	77
361.2464	-140.1182	105.6644	0.4366	4	4	78
361.2464	-140.1182	111.8799	0.4366	4	4	79
361.2464	-140.1182	118.0955	0.4366	4	0	80

Wire No. 5 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
313.2587	-3.280557	0	0.4366	-5	5	81
313.2587	-3.280557	6.276116	0.4366	5	5	82
313.2587	-3.280557	12.55223	0.4366	5	5	83
313.2587	-3.280557	18.82835	0.4366	5	5	84
313.2587	-3.280557	25.10447	0.4366	5	5	85
313.2587	-3.280557	31.38058	0.4366	5	5	86
313.2587	-3.280557	37.6567	0.4366	5	5	87
313.2587	-3.280557	43.93281	0.4366	5	5	88
313.2587	-3.280557	50.20893	0.4366	5	5	89
313.2587	-3.280557	56.48505	0.4366	5	5	90
313.2587	-3.280557	62.76116	0.4366	5	5	91
313.2587	-3.280557	69.03728	0.4366	5	5	92
313.2587	-3.280557	75.31339	0.4366	5	5	93
313.2587	-3.280557	81.58951	0.4366	5	5	94
313.2587	-3.280557	87.86562	0.4366	5	5	95
313.2587	-3.280557	94.14174	0.4366	5	5	96
313.2587	-3.280557	100.4179	0.4366	5	5	97
313.2587	-3.280557	106.694	0.4366	5	5	98
313.2587	-3.280557	112.9701	0.4366	5	5	99
313.2587	-3.280557	119.2462	0.4366	5	0	100

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 416.2, -73.7

Number of Loads: 4
Pulse No., Resistance, Reactance: 1 , 0 , 1489.8
Pulse No., Resistance, Reactance: 21 , 0 , 1488.9
Pulse No., Resistance, Reactance: 61 , 0 , 1489.6
Pulse No., Resistance, Reactance: 81 , 0 , 1486.5

********** SOURCE DATA **********
Pulse 41 Voltage = (116.8023, -399.4326j)
Current = (8.7412, -7.6859j)
Impedance = (**30.196, -19.145j**) **MODELED TWR-3 BASE IMPEDANCE**
Power = 2045.51 Watts

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

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	0.0546	-0.0986	0.1127	-61.0082
2	0.0154	-0.0278	0.0318	-60.9353
3	-0.0088	0.0161	0.0184	118.4918
4	-0.0285	0.0521	0.0594	118.6489
5	-0.0449	0.0823	0.0938	118.6134
6	-0.0586	0.1076	0.1225	118.5511
7	-0.0697	0.1285	0.1462	118.4771
8	-0.0785	0.1452	0.165	118.3953
9	-0.085	0.1578	0.1792	118.3075
10	-0.0893	0.1665	0.1889	118.2144
11	-0.0915	0.1712	0.1941	118.1163
12	-0.0916	0.1721	0.195	118.0136
13	-0.0896	0.1693	0.1915	117.9063
14	-0.0857	0.1626	0.1838	117.7945
15	-0.0798	0.1522	0.1719	117.6782
16	-0.0721	0.1381	0.1558	117.5572
17	-0.0624	0.1203	0.1355	117.4313
18	-0.0509	0.0986	0.1109	117.3001
19	-0.0373	0.0727	0.0817	117.1629
20	-0.0214	0.042	0.0471	117.0171
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	0.1614	0.0294	0.1641	10.3326
22	0.0457	0.0082	0.0464	10.1639
23	-0.0257	-0.0052	0.0262	-168.4835
24	-0.0838	-0.0165	0.0854	-168.8622
25	-0.1322	-0.0262	0.1348	-168.7796
26	-0.1724	-0.0346	0.1758	-168.6338
27	-0.2051	-0.0419	0.2093	-168.4609
28	-0.2309	-0.0479	0.2358	-168.2706
29	-0.2499	-0.0528	0.2554	-168.0672
30	-0.2625	-0.0565	0.2685	-167.8532
31	-0.2688	-0.059	0.2752	-167.6302
32	-0.2691	-0.0601	0.2757	-167.3996
33	-0.2633	-0.06	0.2701	-167.1629
34	-0.2518	-0.0585	0.2585	-166.9211
35	-0.2345	-0.0555	0.241	-166.6756
36	-0.2117	-0.0511	0.2178	-166.4276
37	-0.1834	-0.0451	0.1889	-166.1783
38	-0.1495	-0.0375	0.1542	-165.9287
39	-0.1097	-0.028	0.1133	-165.6794
40	-0.063	-0.0164	0.0651	-165.4283
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	8.7412	-7.6859	11.6397	-41.3243
42	8.5249	-7.7212	11.5018	-42.1677
43	8.3357	-7.6926	11.3429	-42.7023
44	8.1222	-7.6156	11.1341	-43.1561
45	7.8791	-7.4923	10.8726	-43.5584
46	7.6045	-7.324	10.5579	-43.9236
47	7.2981	-7.112	10.1903	-44.2599
48	6.9603	-6.8572	9.7707	-44.5727
49	6.5918	-6.561	9.3005	-44.8658
50	6.1938	-6.2246	8.7811	-45.1422
51	5.7674	-5.8493	8.2144	-45.4044
52	5.3139	-5.4366	7.6023	-45.6541
53	4.8348	-4.9879	6.9466	-45.893
54	4.3314	-4.5046	6.2492	-46.1224
55	3.805	-3.9877	5.5118	-46.3437
56	3.2563	-3.4384	4.7356	-46.5578
57	2.6857	-2.8565	3.9208	-46.7659
58	2.092	-2.2409	3.0656	-46.9689
59	1.4711	-1.5869	2.1638	-47.1682
60	0.8109	-0.8809	1.1973	-47.3674
E	0.0	0.0	0.0	0.0

Wire No. 4 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
61	0.1658	0.0283	0.1682	9.6766
62	0.0469	0.0079	0.0475	9.5173
63	-0.0265	-0.005	0.027	-169.2113
64	-0.0862	-0.0159	0.0877	-169.5653
65	-0.136	-0.0252	0.1383	-169.487
66	-0.1773	-0.0333	0.1804	-169.3492
67	-0.2109	-0.0403	0.2148	-169.1856
68	-0.2374	-0.0461	0.2419	-169.0055
69	-0.2571	-0.0508	0.2621	-168.8127
70	-0.2701	-0.0544	0.2755	-168.6096
71	-0.2766	-0.0568	0.2824	-168.3977
72	-0.2768	-0.0579	0.2828	-168.1784
73	-0.271	-0.0578	0.2771	-167.9529
74	-0.2591	-0.0564	0.2652	-167.7223
75	-0.2414	-0.0536	0.2473	-167.4879
76	-0.218	-0.0493	0.2235	-167.2509
77	-0.1889	-0.0436	0.1938	-167.0123
78	-0.154	-0.0362	0.1582	-166.7732
79	-0.113	-0.0271	0.1162	-166.5343
80	-0.0649	-0.0158	0.0668	-166.2934
E	0.0	0.0	0.0	0.0

Wire No. 5 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
81	0.1662	0.0207	0.1675	7.1105
82	0.0466	0.0057	0.0469	6.9656
83	-0.0274	-0.0039	0.0277	-171.9166
84	-0.0877	-0.012	0.0885	-172.2151
85	-0.1379	-0.019	0.1392	-172.1435
86	-0.1796	-0.0252	0.1814	-172.0199
87	-0.2137	-0.0305	0.2159	-171.8736
88	-0.2405	-0.035	0.243	-171.7128
89	-0.2604	-0.0387	0.2632	-171.5409
90	-0.2735	-0.0416	0.2766	-171.3601
91	-0.2801	-0.0435	0.2835	-171.1716
92	-0.2804	-0.0445	0.2839	-170.9769
93	-0.2745	-0.0446	0.278	-170.7769
94	-0.2625	-0.0436	0.2661	-170.5728
95	-0.2445	-0.0415	0.248	-170.3657
96	-0.2208	-0.0383	0.2241	-170.1566
97	-0.1913	-0.0339	0.1943	-169.9467
98	-0.156	-0.0282	0.1585	-169.7369
99	-0.1145	-0.0212	0.1164	-169.5278
100	-0.0657	-0.0124	0.0669	-169.3176
E	0.0	0.0	0.0	0.0

********** BASE OPERATING PARAMETERS **********

Twr.	Ratio	Phase
1	0.673	-68.1
2	0.979	3.2
3	69.478	-48.4
4	1.004	2.6
5	1.000	0.0

****
ACSModel
(MININEC 3.1 Core)
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KTSA
NON-DIRECTIONAL TWR-4

Frequency = 0.550 MHz Wavelength = 545.09090 Meters

No. of Wires: 5

Wire No. 1	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
0	0	0		-1	
0	0	124.311	0.4366	0	20

Wire No. 2	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
129.7403	-27.57715	0		-2	
129.7403	-27.57715	124.311	0.4366	0	20

Wire No. 3	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
231.3532	-112.8385	0		-3	
231.3532	-112.8385	124.9167	0.4366	0	20

Wire No. 4	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
361.2464	-140.1182	0		-4	
361.2464	-140.1182	124.311	0.4366	0	20

Wire No. 5	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
313.2587	-3.280557	0		-5	
313.2587	-3.280557	125.5223	0.4366	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
0	0	0	0.4366	-1	1	1
0	0	6.21555	0.4366	1	1	2
0	0	12.4311	0.4366	1	1	3
0	0	18.64665	0.4366	1	1	4
0	0	24.8622	0.4366	1	1	5
0	0	31.07775	0.4366	1	1	6
0	0	37.2933	0.4366	1	1	7
0	0	43.50885	0.4366	1	1	8
0	0	49.7244	0.4366	1	1	9
0	0	55.93995	0.4366	1	1	10
0	0	62.15551	0.4366	1	1	11
0	0	68.37105	0.4366	1	1	12
0	0	74.5866	0.4366	1	1	13
0	0	80.80215	0.4366	1	1	14
0	0	87.0177	0.4366	1	1	15
0	0	93.23325	0.4366	1	1	16
0	0	99.44881	0.4366	1	1	17
0	0	105.6644	0.4366	1	1	18
0	0	111.8799	0.4366	1	1	19
0	0	118.0955	0.4366	1	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
129.7403	-27.57715	0	0.4366	-2	2	21
129.7403	-27.57715	6.21555	0.4366	2	2	22
129.7403	-27.57715	12.4311	0.4366	2	2	23
129.7403	-27.57715	18.64665	0.4366	2	2	24
129.7403	-27.57715	24.8622	0.4366	2	2	25
129.7403	-27.57715	31.07775	0.4366	2	2	26
129.7403	-27.57715	37.2933	0.4366	2	2	27
129.7403	-27.57715	43.50885	0.4366	2	2	28
129.7403	-27.57715	49.7244	0.4366	2	2	29
129.7403	-27.57715	55.93995	0.4366	2	2	30
129.7403	-27.57715	62.15551	0.4366	2	2	31
129.7403	-27.57715	68.37105	0.4366	2	2	32
129.7403	-27.57715	74.5866	0.4366	2	2	33
129.7403	-27.57715	80.80215	0.4366	2	2	34
129.7403	-27.57715	87.0177	0.4366	2	2	35
129.7403	-27.57715	93.23325	0.4366	2	2	36
129.7403	-27.57715	99.44881	0.4366	2	2	37
129.7403	-27.57715	105.6644	0.4366	2	2	38
129.7403	-27.57715	111.8799	0.4366	2	2	39
129.7403	-27.57715	118.0955	0.4366	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
231.3532	-112.8385	0	0.4366	-3	3	41
231.3532	-112.8385	6.245833	0.4366	3	3	42
231.3532	-112.8385	12.49167	0.4366	3	3	43
231.3532	-112.8385	18.7375	0.4366	3	3	44
231.3532	-112.8385	24.98333	0.4366	3	3	45
231.3532	-112.8385	31.22917	0.4366	3	3	46
231.3532	-112.8385	37.475	0.4366	3	3	47
231.3532	-112.8385	43.72083	0.4366	3	3	48
231.3532	-112.8385	49.96667	0.4366	3	3	49
231.3532	-112.8385	56.2125	0.4366	3	3	50
231.3532	-112.8385	62.45833	0.4366	3	3	51
231.3532	-112.8385	68.70416	0.4366	3	3	52
231.3532	-112.8385	74.95	0.4366	3	3	53
231.3532	-112.8385	81.19583	0.4366	3	3	54
231.3532	-112.8385	87.44167	0.4366	3	3	55
231.3532	-112.8385	93.6875	0.4366	3	3	56
231.3532	-112.8385	99.93333	0.4366	3	3	57
231.3532	-112.8385	106.1792	0.4366	3	3	58
231.3532	-112.8385	112.425	0.4366	3	3	59
231.3532	-112.8385	118.6708	0.4366	3	0	60

Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
361.2464	-140.1182	0	0.4366	-4	4	61
361.2464	-140.1182	6.21555	0.4366	4	4	62
361.2464	-140.1182	12.4311	0.4366	4	4	63
361.2464	-140.1182	18.64665	0.4366	4	4	64
361.2464	-140.1182	24.8622	0.4366	4	4	65
361.2464	-140.1182	31.07775	0.4366	4	4	66
361.2464	-140.1182	37.2933	0.4366	4	4	67
361.2464	-140.1182	43.50885	0.4366	4	4	68
361.2464	-140.1182	49.7244	0.4366	4	4	69
361.2464	-140.1182	55.93995	0.4366	4	4	70
361.2464	-140.1182	62.15551	0.4366	4	4	71
361.2464	-140.1182	68.37105	0.4366	4	4	72
361.2464	-140.1182	74.5866	0.4366	4	4	73
361.2464	-140.1182	80.80215	0.4366	4	4	74
361.2464	-140.1182	87.0177	0.4366	4	4	75
361.2464	-140.1182	93.23325	0.4366	4	4	76
361.2464	-140.1182	99.44881	0.4366	4	4	77
361.2464	-140.1182	105.6644	0.4366	4	4	78
361.2464	-140.1182	111.8799	0.4366	4	4	79
361.2464	-140.1182	118.0955	0.4366	4	0	80

Wire No. 5 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
313.2587	-3.280557	0	0.4366	-5	5	81
313.2587	-3.280557	6.276116	0.4366	5	5	82
313.2587	-3.280557	12.55223	0.4366	5	5	83
313.2587	-3.280557	18.82835	0.4366	5	5	84
313.2587	-3.280557	25.10447	0.4366	5	5	85
313.2587	-3.280557	31.38058	0.4366	5	5	86
313.2587	-3.280557	37.6567	0.4366	5	5	87
313.2587	-3.280557	43.93281	0.4366	5	5	88
313.2587	-3.280557	50.20893	0.4366	5	5	89
313.2587	-3.280557	56.48505	0.4366	5	5	90
313.2587	-3.280557	62.76116	0.4366	5	5	91
313.2587	-3.280557	69.03728	0.4366	5	5	92
313.2587	-3.280557	75.31339	0.4366	5	5	93
313.2587	-3.280557	81.58951	0.4366	5	5	94
313.2587	-3.280557	87.86562	0.4366	5	5	95
313.2587	-3.280557	94.14174	0.4366	5	5	96
313.2587	-3.280557	100.4179	0.4366	5	5	97
313.2587	-3.280557	106.694	0.4366	5	5	98
313.2587	-3.280557	112.9701	0.4366	5	5	99
313.2587	-3.280557	119.2462	0.4366	5	0	100

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 61, 416.2, -73.7

Number of Loads: 4
Pulse No., Resistance, Reactance: 1 , 0 , 1489.8
Pulse No., Resistance, Reactance: 21 , 0 , 1488.9
Pulse No., Resistance, Reactance: 41 , 0 , 1488.9
Pulse No., Resistance, Reactance: 81 , 0 , 1486.5

********** SOURCE DATA **********
Pulse 61 Voltage = (116.802,-399.433j)
Current = (8.8345, -7.054j)
Impedance = (**30.12, -21.163j**) **MODELED TWR-4 BASE IMPEDANCE**
Power = 1924.75 Watts

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

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	-0.0638	-0.0533	0.0831	-140.1323
2	-0.0179	-0.015	0.0234	-140.0439
3	0.0106	0.0086	0.0137	39.2663
4	0.034	0.028	0.0441	39.454
5	0.0538	0.0442	0.0696	39.4111
6	0.0704	0.0577	0.091	39.336
7	0.0842	0.0688	0.1087	39.2469
8	0.0953	0.0776	0.1229	39.1484
9	0.1038	0.0842	0.1337	39.0426
10	0.1098	0.0887	0.1411	38.9303
11	0.1132	0.0911	0.1453	38.812
12	0.1141	0.0914	0.1462	38.688
13	0.1125	0.0897	0.1438	38.5584
14	0.1084	0.086	0.1383	38.4233
15	0.1017	0.0803	0.1296	38.2825
16	0.0926	0.0727	0.1177	38.136
17	0.0808	0.0631	0.1026	37.9835
18	0.0665	0.0516	0.0841	37.8245
19	0.0492	0.038	0.0621	37.6582
20	0.0285	0.0218	0.0359	37.4812
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	0.0564	-0.0955	0.1109	-59.4216
22	0.016	-0.0269	0.0313	-59.3497
23	-0.009	0.0156	0.018	120.0822
24	-0.0294	0.0504	0.0583	120.2388
25	-0.0463	0.0796	0.0921	120.2035
26	-0.0604	0.1041	0.1204	120.1415
27	-0.072	0.1243	0.1436	120.0677
28	-0.0811	0.1405	0.1622	119.9859
29	-0.0878	0.1527	0.1761	119.8978
30	-0.0923	0.1611	0.1856	119.8041
31	-0.0945	0.1657	0.1908	119.7051
32	-0.0947	0.1666	0.1916	119.601
33	-0.0927	0.1639	0.1883	119.4921
34	-0.0886	0.1575	0.1807	119.3782
35	-0.0826	0.1474	0.169	119.2594
36	-0.0746	0.1338	0.1532	119.1354
37	-0.0646	0.1165	0.1332	119.0062
38	-0.0527	0.0955	0.1091	118.8714
39	-0.0386	0.0705	0.0804	118.7302
40	-0.0222	0.0407	0.0463	118.5798
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	0.1594	0.035	0.1632	12.3965
42	0.0448	0.0097	0.0458	12.2295
43	-0.0259	-0.0062	0.0267	-166.4654
44	-0.0835	-0.0196	0.0857	-166.8195
45	-0.1314	-0.031	0.135	-166.7375
46	-0.1712	-0.0408	0.176	-166.5946
47	-0.2036	-0.0491	0.2094	-166.4256
48	-0.229	-0.0561	0.2358	-166.2399
49	-0.2478	-0.0616	0.2554	-166.0416
50	-0.2602	-0.0657	0.2684	-165.8332
51	-0.2664	-0.0683	0.275	-165.6164
52	-0.2666	-0.0695	0.2755	-165.3926
53	-0.2608	-0.0691	0.2698	-165.163
54	-0.2493	-0.0671	0.2582	-164.9291
55	-0.2322	-0.0635	0.2407	-164.692
56	-0.2095	-0.0583	0.2175	-164.4529
57	-0.1815	-0.0513	0.1886	-164.2132
58	-0.1479	-0.0425	0.1539	-163.9737
59	-0.1085	-0.0317	0.113	-163.7353
60	-0.0623	-0.0185	0.065	-163.4959
E	0.0	0.0	0.0	0.0

Wire No. 4 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
61	8.8345	-7.054	11.3052	-38.6063
62	8.6185	-7.0909	11.1606	-39.4459
63	8.4291	-7.0675	10.9999	-39.9786
64	8.2149	-6.9991	10.7922	-40.4311
65	7.9705	-6.8879	10.5344	-40.8327
66	7.6943	-6.7352	10.2257	-41.1974
67	7.3857	-6.5421	9.8665	-41.5335
68	7.0453	-6.3095	9.4575	-41.8463
69	6.6737	-6.0385	9.0001	-42.1396
70	6.272	-5.7304	8.4957	-42.4163
71	5.8415	-5.3864	7.9459	-42.6788
72	5.3835	-5.0077	7.3525	-42.9289
73	4.8993	-4.5957	6.7174	-43.1682
74	4.3903	-4.1515	6.0423	-43.3982
75	3.8577	-3.6762	5.3289	-43.6199
76	3.3024	-3.1707	4.5781	-43.8345
77	2.7245	-2.635	3.7903	-44.043
78	2.123	-2.0678	2.9636	-44.2464
79	1.4934	-1.4648	2.0919	-44.4461
80	0.8237	-0.8135	1.1577	-44.6457
E	0.0	0.0	0.0	0.0

Wire No. 5 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
81	0.1575	0.016	0.1584	5.7844
82	0.0441	0.0044	0.0443	5.6719
83	-0.026	-0.003	0.0262	-173.461
84	-0.0832	-0.0092	0.0837	-173.6925
85	-0.1309	-0.0146	0.1317	-173.6373
86	-0.1705	-0.0193	0.1716	-173.5418
87	-0.2029	-0.0234	0.2042	-173.429
88	-0.2284	-0.0268	0.2299	-173.3053
89	-0.2473	-0.0296	0.2491	-173.1733
90	-0.2599	-0.0317	0.2618	-173.0347
91	-0.2663	-0.0332	0.2683	-172.8907
92	-0.2666	-0.034	0.2687	-172.7422
93	-0.261	-0.0339	0.2632	-172.5903
94	-0.2497	-0.0332	0.2519	-172.4358
95	-0.2328	-0.0316	0.2349	-172.2796
96	-0.2103	-0.0291	0.2123	-172.1226
97	-0.1822	-0.0257	0.184	-171.9656
98	-0.1486	-0.0214	0.1502	-171.8095
99	-0.1091	-0.016	0.1103	-171.6548
100	-0.0627	-0.0094	0.0634	-171.5003
E	0.0	0.0	0.0	0.0

********** BASE OPERATING PARAMETERS **********

Twr.	Ratio	Phase
1	0.525	-145.9
2	0.700	-65.2
3	1.030	6.6
4	71.392	-44.4
5	1.000	0.0

****
ACSModel
(MININEC 3.1 Core)
03-18-2013 10:33:06
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KTSA
NON-DIRECTIONAL TWR-5

Frequency = 0.550 MHz Wavelength = 545.09090 Meters

No. of Wires: 5

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-1	
0	0	124.311	0.4366	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
129.7403	-27.57715	0		-2	
129.7403	-27.57715	124.311	0.4366	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
231.3532	-112.8385	0		-3	
231.3532	-112.8385	124.9167	0.4366	0	20

Wire No. 4 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
361.2464	-140.1182	0		-4	
361.2464	-140.1182	124.311	0.4366	0	20

Wire No. 5 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
313.2587	-3.280557	0		-5	
313.2587	-3.280557	125.5223	0.4366	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
0	0	0	0.4366	-1	1	1
0	0	6.21555	0.4366	1	1	2
0	0	12.4311	0.4366	1	1	3
0	0	18.64665	0.4366	1	1	4
0	0	24.8622	0.4366	1	1	5
0	0	31.07775	0.4366	1	1	6
0	0	37.2933	0.4366	1	1	7
0	0	43.50885	0.4366	1	1	8
0	0	49.7244	0.4366	1	1	9
0	0	55.93995	0.4366	1	1	10
0	0	62.15551	0.4366	1	1	11
0	0	68.37105	0.4366	1	1	12
0	0	74.5866	0.4366	1	1	13
0	0	80.80215	0.4366	1	1	14
0	0	87.0177	0.4366	1	1	15
0	0	93.23325	0.4366	1	1	16
0	0	99.44881	0.4366	1	1	17
0	0	105.6644	0.4366	1	1	18
0	0	111.8799	0.4366	1	1	19
0	0	118.0955	0.4366	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
129.7403	-27.57715	0	0.4366	-2	2	21
129.7403	-27.57715	6.21555	0.4366	2	2	22
129.7403	-27.57715	12.4311	0.4366	2	2	23
129.7403	-27.57715	18.64665	0.4366	2	2	24
129.7403	-27.57715	24.8622	0.4366	2	2	25
129.7403	-27.57715	31.07775	0.4366	2	2	26
129.7403	-27.57715	37.2933	0.4366	2	2	27
129.7403	-27.57715	43.50885	0.4366	2	2	28
129.7403	-27.57715	49.7244	0.4366	2	2	29
129.7403	-27.57715	55.93995	0.4366	2	2	30
129.7403	-27.57715	62.15551	0.4366	2	2	31
129.7403	-27.57715	68.37105	0.4366	2	2	32
129.7403	-27.57715	74.5866	0.4366	2	2	33
129.7403	-27.57715	80.80215	0.4366	2	2	34
129.7403	-27.57715	87.0177	0.4366	2	2	35
129.7403	-27.57715	93.23325	0.4366	2	2	36
129.7403	-27.57715	99.44881	0.4366	2	2	37
129.7403	-27.57715	105.6644	0.4366	2	2	38
129.7403	-27.57715	111.8799	0.4366	2	2	39
129.7403	-27.57715	118.0955	0.4366	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
231.3532	-112.8385	0	0.4366	-3	3	41
231.3532	-112.8385	6.245833	0.4366	3	3	42
231.3532	-112.8385	12.49167	0.4366	3	3	43
231.3532	-112.8385	18.7375	0.4366	3	3	44
231.3532	-112.8385	24.98333	0.4366	3	3	45
231.3532	-112.8385	31.22917	0.4366	3	3	46
231.3532	-112.8385	37.475	0.4366	3	3	47
231.3532	-112.8385	43.72083	0.4366	3	3	48
231.3532	-112.8385	49.96667	0.4366	3	3	49
231.3532	-112.8385	56.2125	0.4366	3	3	50
231.3532	-112.8385	62.45833	0.4366	3	3	51
231.3532	-112.8385	68.70416	0.4366	3	3	52
231.3532	-112.8385	74.95	0.4366	3	3	53
231.3532	-112.8385	81.19583	0.4366	3	3	54
231.3532	-112.8385	87.44167	0.4366	3	3	55
231.3532	-112.8385	93.6875	0.4366	3	3	56
231.3532	-112.8385	99.93333	0.4366	3	3	57
231.3532	-112.8385	106.1792	0.4366	3	3	58
231.3532	-112.8385	112.425	0.4366	3	3	59
231.3532	-112.8385	118.6708	0.4366	3	0	60

Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
361.2464	-140.1182	0	0.4366	-4	4	61
361.2464	-140.1182	6.21555	0.4366	4	4	62
361.2464	-140.1182	12.4311	0.4366	4	4	63
361.2464	-140.1182	18.64665	0.4366	4	4	64
361.2464	-140.1182	24.8622	0.4366	4	4	65
361.2464	-140.1182	31.07775	0.4366	4	4	66
361.2464	-140.1182	37.2933	0.4366	4	4	67
361.2464	-140.1182	43.50885	0.4366	4	4	68
361.2464	-140.1182	49.7244	0.4366	4	4	69
361.2464	-140.1182	55.93995	0.4366	4	4	70
361.2464	-140.1182	62.15551	0.4366	4	4	71
361.2464	-140.1182	68.37105	0.4366	4	4	72
361.2464	-140.1182	74.5866	0.4366	4	4	73
361.2464	-140.1182	80.80215	0.4366	4	4	74
361.2464	-140.1182	87.0177	0.4366	4	4	75
361.2464	-140.1182	93.23325	0.4366	4	4	76
361.2464	-140.1182	99.44881	0.4366	4	4	77
361.2464	-140.1182	105.6644	0.4366	4	4	78
361.2464	-140.1182	111.8799	0.4366	4	4	79
361.2464	-140.1182	118.0955	0.4366	4	0	80

Wire No. 5 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
313.2587	-3.280557	0	0.4366	-5	5	81
313.2587	-3.280557	6.276116	0.4366	5	5	82
313.2587	-3.280557	12.55223	0.4366	5	5	83
313.2587	-3.280557	18.82835	0.4366	5	5	84
313.2587	-3.280557	25.10447	0.4366	5	5	85
313.2587	-3.280557	31.38058	0.4366	5	5	86
313.2587	-3.280557	37.6567	0.4366	5	5	87
313.2587	-3.280557	43.93281	0.4366	5	5	88
313.2587	-3.280557	50.20893	0.4366	5	5	89
313.2587	-3.280557	56.48505	0.4366	5	5	90
313.2587	-3.280557	62.76116	0.4366	5	5	91
313.2587	-3.280557	69.03728	0.4366	5	5	92
313.2587	-3.280557	75.31339	0.4366	5	5	93
313.2587	-3.280557	81.58951	0.4366	5	5	94
313.2587	-3.280557	87.86562	0.4366	5	5	95
313.2587	-3.280557	94.14174	0.4366	5	5	96
313.2587	-3.280557	100.4179	0.4366	5	5	97
313.2587	-3.280557	106.694	0.4366	5	5	98
313.2587	-3.280557	112.9701	0.4366	5	5	99
313.2587	-3.280557	119.2462	0.4366	5	0	100

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 81, 416.2, -73.7

Number of Loads: 4
Pulse No., Resistance, Reactance: 1 , 0 , 1489.8
Pulse No., Resistance, Reactance: 21 , 0 , 1488.9
Pulse No., Resistance, Reactance: 41 , 0 , 1488.9
Pulse No., Resistance, Reactance: 61 , 0 , 1489.6

********** SOURCE DATA **********
Pulse 81 Voltage = (116.8023, -399.4326j)
Current = (8.3383, -8.4031j)
Impedance = (30.901, -16.762j) MODELED TWR-5 BASE IMPEDANCE
Power = 2165.21 Watts

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

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	-0.0176	-0.0993	0.1009	-100.0303
2	-0.0049	-0.028	0.0284	-99.9423
3	0.003	0.0162	0.0165	79.3692
4	0.0097	0.0524	0.0533	79.5572
5	0.0153	0.0828	0.0842	79.5144
6	0.0202	0.1082	0.1101	79.4395
7	0.0243	0.1292	0.1314	79.3506
8	0.0277	0.1459	0.1485	79.2524
9	0.0304	0.1585	0.1614	79.1468
10	0.0324	0.1671	0.1702	79.0349
11	0.0337	0.1718	0.1751	78.917
12	0.0342	0.1727	0.176	78.7935
13	0.034	0.1697	0.1731	78.6646
14	0.0331	0.163	0.1663	78.5303
15	0.0313	0.1525	0.1557	78.3905
16	0.0288	0.1383	0.1412	78.2451
17	0.0254	0.1203	0.123	78.094
18	0.0211	0.0985	0.1008	77.9366
19	0.0157	0.0726	0.0743	77.7722
20	0.0092	0.0419	0.0429	77.5975
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	0.1301	-0.0557	0.1416	-23.1703
22	0.0368	-0.0157	0.04	-23.1746
23	-0.0209	0.0089	0.0228	156.859
24	-0.068	0.0291	0.074	156.8493
25	-0.1074	0.0459	0.1168	156.8506
26	-0.1402	0.06	0.1525	156.8531
27	-0.1671	0.0714	0.1818	156.8556
28	-0.1884	0.0805	0.2049	156.8578
29	-0.2043	0.0873	0.2222	156.8594
30	-0.215	0.0919	0.2339	156.86
31	-0.2206	0.0943	0.2399	156.8596
32	-0.2212	0.0946	0.2406	156.8578
33	-0.2169	0.0927	0.2359	156.8543
34	-0.2078	0.0889	0.2261	156.8489
35	-0.194	0.083	0.211	156.8413
36	-0.1755	0.0751	0.1909	156.8311
37	-0.1524	0.0652	0.1657	156.8181
38	-0.1245	0.0533	0.1354	156.8018
39	-0.0915	0.0393	0.0996	156.7817
40	-0.0526	0.0226	0.0573	156.7569
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	0.1701	0.0095	0.1704	3.1855
42	0.0478	0.0025	0.0479	3.0436
43	-0.0278	-0.002	0.0278	-175.8478
44	-0.0894	-0.006	0.0896	-176.1484
45	-0.1407	-0.0096	0.141	-176.0786
46	-0.1833	-0.013	0.1838	-175.9571
47	-0.2182	-0.016	0.2187	-175.8133
48	-0.2456	-0.0187	0.2463	-175.6551
49	-0.266	-0.021	0.2668	-175.4863
50	-0.2795	-0.0229	0.2804	-175.3086
51	-0.2864	-0.0244	0.2874	-175.1237
52	-0.2867	-0.0254	0.2878	-174.9326
53	-0.2807	-0.0259	0.2819	-174.7366
54	-0.2686	-0.0257	0.2698	-174.5366
55	-0.2503	-0.0248	0.2516	-174.3338
56	-0.2262	-0.0233	0.2273	-174.1292
57	-0.196	-0.0209	0.1971	-173.9239
58	-0.1599	-0.0176	0.1609	-173.7188
59	-0.1174	-0.0133	0.1182	-173.5144
60	-0.0675	-0.0079	0.0679	-173.309
E	0.0	0.0	0.0	0.0

Wire No. 4 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
61	0.1659	-0.0025	0.166	-0.8605
62	0.0469	-0.0008	0.0469	-0.9661
63	-0.0266	0.0001	0.0267	179.8761
64	-0.0866	0.0005	0.0866	179.6418
65	-0.1366	0.0007	0.1366	179.6934
66	-0.1782	0.0007	0.1782	179.7844
67	-0.2123	0.0004	0.2123	179.8922
68	-0.2391	0.0	0.2391	-179.9892
69	-0.2591	-0.0006	0.2591	-179.8626
70	-0.2724	-0.0013	0.2724	-179.7294
71	-0.2793	-0.002	0.2793	-179.5908
72	-0.2798	-0.0027	0.2798	-179.4476
73	-0.2742	-0.0033	0.2742	-179.3008
74	-0.2624	-0.0039	0.2625	-179.1512
75	-0.2448	-0.0043	0.2448	-178.9995
76	-0.2212	-0.0045	0.2213	-178.8467
77	-0.1919	-0.0044	0.1919	-178.6935
78	-0.1566	-0.004	0.1567	-178.5406
79	-0.1151	-0.0032	0.1151	-178.3886
80	-0.0662	-0.002	0.0662	-178.2362
E	0.0	0.0	0.0	0.0

Wire No. 5 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
81	8.3383	-8.4031	11.8381	-45.2218
82	8.1225	-8.4365	11.7111	-46.0863
83	7.936	-8.4021	11.5575	-46.6339
84	7.7274	-8.3152	11.3514	-47.0982
85	7.4913	-8.1781	11.0906	-47.5096
86	7.2259	-7.9921	10.7744	-47.8827
87	6.9307	-7.7586	10.4034	-48.226
88	6.6062	-7.4788	9.9786	-48.5451
89	6.253	-7.1538	9.5014	-48.8441
90	5.8722	-6.7853	8.9735	-49.1259
91	5.465	-6.3745	8.3965	-49.393
92	5.0326	-5.9232	7.7725	-49.6473
93	4.5765	-5.4329	7.1035	-49.8904
94	4.0978	-4.9051	6.3915	-50.1239
95	3.5978	-4.3411	5.6382	-50.3489
96	3.0773	-3.7419	4.8447	-50.5665
97	2.5366	-3.1077	4.0115	-50.7778
98	1.9747	-2.4372	3.1368	-50.9839
99	1.3877	-1.7252	2.2141	-51.1862
100	0.7644	-0.9572	1.225	-51.3883
E	0.0	0.0	0.0	0.0

********** BASE OPERATING PARAMETERS **********

Twr.	Ratio	Phase
1	0.608	-99.2
2	0.853	-22.3
3	1.027	4.0
4	1.000	0.0
5	71.328	-44.4

SELLMEYER ENGINEERING
BROADCAST & COMMUNICATIONS CONSULTING ENGINEERS
2 Pecan Grove Circle
Lucas, Texas, 75002
MEMBER AFCCE

SECTION-2
DETERMINATION OF OPERATING PARAMETERS
FOR KTSA NIGHTTIME DIRECTIONAL ANTENNA
REV-1

The calibrated Method of Moments model used for the individual KTSA towers was run with all four towers driven and with Tower-5 detuned to obtain the proper operating parameters for the nighttime directional antenna. All towers were modeled at the same heights and equivalent radii as the non-directional models. The complex currents required at the sources located at ground level at the base of each tower to produce the current moment sums, when normalized, are equal to the theoretical field parameters calculated by the DA Model. The tower drive currents and phases were calculated from these base currents.

The currents which are sampled by the antenna monitor system at the antenna coupling units Toroidal Current Transformers ("TCT's") were calculated from the Method of Moments directional antenna model. The sampling lines are electrically identical in composition and length within the tolerances permitted by the Rules. Therefore, the antenna monitor parameters required to produce the theoretical parameters can be calculated from the modeled currents and phases which correspond to the location of the TCT's inside the Antenna Coupling Units (ACU's) at the bases of the four towers. Method of Moments model and circuit calculation details are included in this report.

TABLE OF MODELED PARAMETERS AT TOWER BASES

TWR	MODEL CURRENT PULSE	MODEL CURRENT MAGNITUDE (AMPERES)	MODEL CURRENT PHASE (DEGREES)	MODEL DRIVE IMPEDANCE (OHMS)	MODEL DRIVE POWER (WATTS)
1	1	15.1769	0.7428	7.56-j16.83	871.2
2	21	11.3847	116.5551	-44.77-j17.43	-2901.8
3	41	19.6416	-58.9173	31.46,-j2.96	6067.5
4	61	15.5311	+59.9402	7.98-j29.74	962.8

The Ratio and Phase parameters were derived from the same set of Base Region Circuit Models used in the Non-Directional Model Calibration with the exception that the modeled input data was taken from the Directional Antenna Model. The modeled base current magnitudes and phases appearing at Node-3 ($R_{3\text{-}0}$) for each of the four towers of the array were matched in Magnitude and Phase to the Base Driving Current Magnitudes and Phases of the Mininec DA Model by adjustment of the magnitude and phase of the current source, Node-1, for each WCAP tower model. The resulting Magnitude and Phase of the Node-2 currents at the ACU output terminals are the exact operating parameters for each tower. When normalized to tower-3, they represent the operating parameters for the array subject to any variations in the Antenna Monitoring System. The tables below, in conjunction with the following individual tower printouts clearly show the derivation of the Operating Parameters. See the table on page-3 of Section-3 for the Antenna Monitor parameters which include the Sampling System Deviations.

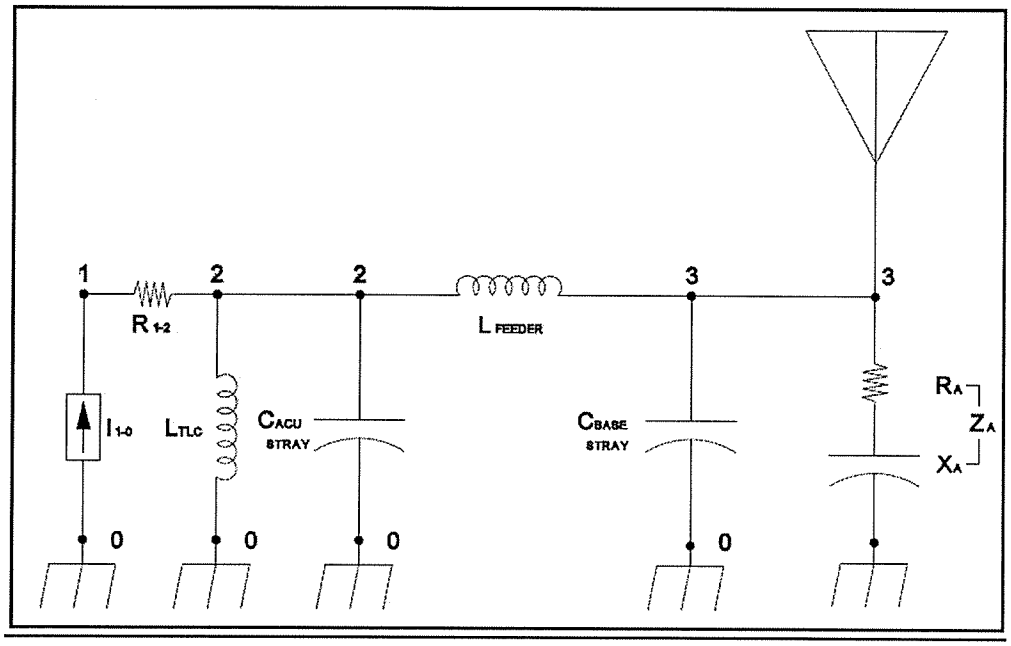
TABLE OF MODELED PARAMETERS AT TCT'S

TWR	MODEL CURRENT PULSE	CURRENT MAGNITUDE AT ACU (AMPERES)	CURRENT PHASE AT ACU (DEGREES)	DRIVE IMPEDANCE AT ACU (OHMS)	NORMALIZED RATIO/PHASE PARAMETERS
1	1	15.27	+0.586°	7.47+j1.164	0.770/+60.4°
2	21	11.49	+117.258°	-43.97+j3.575	0.579/+177.1°
3	41	19.84	-59.817°	30.82+j14.377	1.000/00.0°
4	61	15.48	+59.710°	8.03-j11.956	0.780/+119.5°

The KTSA Directive array is adjusted to within +/-5 percent and +/-3 degrees of the Normalized Ratio and Phase Parameters.

The individual WCAP circuit files appear on the following pages.

BASE REGION MODEL



WCAP - KTSA TWR-1 DA-N
WCAP OUTPUT AT FREQUENCY: 0.550 MHz

NODE VOLTAGES

Node:	1	130.5832 ∠	8.4056° V
Node:	2	115.4769 ∠	9.4363° V
Node:	3	279.9743 ∠	-65.0523° V

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	1→2	1.00000000	15.27 ∠	0.586° V	15.27 ∠	0.586° A[4]
L	2→3	5.17500000	272.82 ∠	90.877° V	15.26 ∠	0.877° A
C	3→0	0.00009000	279.97 ∠	-65.052° V	0.09 ∠	24.948° A
R	3→0	7.56400000	279.97 ∠	-65.052° V	15.18 ∠	0.743° A[3]
L	2→0	360.00000000	115.48 ∠	9.436° V	0.09 ∠	-80.564° A
C	2→0	0.00003600	115.48 ∠	9.436° V	0.01 ∠	99.436° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	1→2	1.00000000	8.47 + j	1.164	7.47 + j	1.1642[2]
L	2→3	5.17500000	7.49 + j	1.127	7.49 - j	16.757
C	3→0	0.00009000	0.00 - j	3215.251	0.00 + j	0.000
R	3→0	7.56400000	7.56 - j	16.827[1]	0.00 + j	0.000
L	2→0	360.00000000	0.00 + j	1244.071	0.00 + j	0.000
C	2→0	0.00003600	-0.00 - j	8038.128	0.00 + j	0.000

WCAP INPUT DATA:

	0.5500	0.00000000	0		
I	15.26700000	0	1	0.58600000	1: Modeled Base Impedance
R	1.00000000	1	2	0.00000000	2: Modeled ACU Impedance
L	5.17500000	2	3	0.00000000	3: Modeled Base Current
C	0.00009000	3	0		4: Modeled ACU Current
R	7.56400000	3	0	-16.82700000[1]	
L	360.00000000	2	0	0.00000000	
C	0.00003600	2	0		

WCAP - KTSA TWR-2 DA-N
WCAP OUTPUT AT FREQUENCY: 0.550 MHz

NODE VOLTAGES

Node:	1	495.4684 ∠	-67.4986° V
Node:	2	506.9208 ∠	-67.3909° V
Node:	3	547.1246 ∠	-42.1714° V

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	1→2	1.00000000	11.49 ∠	117.258° V	11.49 ∠	117.258° A[4]
L	2→3	5.89000000	233.43 ∠	-154.457° V	11.47 ∠	115.543° A
C	3→0	0.00011500	547.12 ∠	-42.171° V	0.22 ∠	47.829° A
R	3→0	-44.77200000	547.12 ∠	-42.171° V	11.39 ∠	116.555° A[3]
L	2→0	360.00000000	506.92 ∠	-67.391° V	0.41 ∠	-157.391° A
C	2→0	0.00003600	506.92 ∠	-67.391° V	0.06 ∠	22.609° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	1→2	1.00000000	-42.97 + j	3.575	-43.97 + j	3.575[2]
L	2→3	5.89000000	-44.14 + j	2.262	-44.14 - j	18.092
C	3→0	0.00011500	0.00 - j	2516.284	0.00 + j	0.000
R	3→0	-44.77200000	-44.77 - j	17.432[1]	0.00 + j	0.000
L	2→0	360.00000000	0.01 + j	1244.071	0.00 + j	0.000
C	2→0	0.00003600	-0.00 - j	8038.128	0.00 + j	0.000

WCAP INPUT DATA:

	0.5500	0.00000000	0		
I	11.49100000	0	1	117.25800000	1: Modeled Base Impedance
R	1.00000000	1	2	0.00000000	2: Modeled ACU Impedance
L	5.89000000	2	3	0.00000000	3: Modeled Base Current
C	0.00011500	3	0		4: Modeled ACU Current
R	-44.77200000	3	0	-17.43200000[1]	
L	360.00000000	2	0	0.00000000	
C	0.00003600	2	0		

WCAP - KTSA TWR-3 DA-N

WCAP OUTPUT AT FREQUENCY: 0.550 MHz

NODE VOLTAGES

Node: 1 692.9462 ∠ -35.5064° V
Node: 2 674.9122 ∠ -34.8129° V
Node: 3 620.6113 ∠ -64.2961° V

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	19.84 ∠ -59.817° V	**19.84 ∠ -59.817° A**[4]
L	2→3	4.91500000	333.82 ∠ 31.395° V	19.65 ∠ -58.605° A
C	3→0	0.00005000	620.61 ∠ -64.296° V	0.11 ∠ 25.704° A
R	3→0	31.45500000	620.61 ∠ -64.296° V	**19.64 ∠ -58.917° A**[3]
L	2→0	360.00000000	674.91 ∠ -34.813° V	0.54 ∠ -124.813° A
C	2→0	0.00003600	674.91 ∠ -34.813° V	0.08 ∠ 55.187° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	31.82 + j 14.377	**30.82 + j 14.377**[2]
L	2→3	4.91500000	31.42 + j 13.854	31.42 - j 3.131
C	3→0	0.00005000	0.00 - j 5787.452	0.00 + j 0.000
R	3→0	31.45500000	**31.46 - j 2.962**[1]	0.00 + j 0.000
L	2→0	360.00000000	0.00 + j 1244.071	0.00 + j 0.000
C	2→0	0.00003600	-0.01 - j 8038.128	0.00 + j 0.000

WCAP INPUT DATA:

0.5500 0.00000000 0

I	19.84300000	0	1	-59.81700000	1: Modeled Base Impedance
R	1.00000000	1	2	0.00000000	2: Modeled ACU Impedance
L	4.91500000	2	3	0.00000000	3: Modeled Base Current
C	0.00005000	3	0		4: Modeled ACU Current
R	**31.45500000**	**3**	**0**	**-2.96200000**[1]	
L	360.00000000	2	0	0.00000000	
C	0.00003600	2	0		

WCAP - KTSA TWR-4 DA-N

WCAP OUTPUT AT FREQUENCY: 0.550 MHz

NODE VOLTAGES

Node: 1 231.9410 ∠ 6.7749° V
Node: 2 222.9533 ∠ 3.5989° V
Node: 3 478.0494 ∠ -15.0316° V

	WCAP PART		BRANCH VOLTAGE		BRANCH CURRENT	
R	1→2	1.00000000	15.48 ∠	59.710° V	**15.48 ∠**	**59.710° A[4]**
L	2→3	5.12000000	276.12 ∠	150.020° V	15.61 ∠	60.020° A
C	3→0	0.00005000	478.05 ∠	-15.032° V	0.08 ∠	74.968° A
R	3→0	7.98300000	478.05 ∠	-15.032° V	**15.53 ∠**	**59.941° A[3]**
L	2→0	360.00000000	222.95 ∠	3.599° V	0.18 ∠	-86.401° A
C	2→0	0.00003600	222.95 ∠	3.599° V	0.03 ∠	93.599° A

	WCAP PART		FROM IMPEDANCE		TO IMPEDANCE	
R	1→2	1.00000000	9.03 - j	11.956	**8.03 - j**	**11.956[2]**
L	2→3	5.12000000	7.90 - j	11.902	7.90 - j	29.596
C	3→0	0.00005000	-0.00 - j	5787.452	0.00 + j	0.000
R	3→0	7.98300000	**7.98 - j**	**29.737[1]**	0.00 + j	0.000
L	2→0	360.00000000	0.00 + j	1244.071	0.00 + j	0.000
C	2→0	0.00003600	0.00 - j	8038.128	0.00 + j	0.000

WCAP INPUT DATA:

0.5500 0.00000000 0

I	15.48000000	0	1	59.71000000	**1:** Modeled Base Impedance
R	1.00000000	1	2	0.00000000	**2:** Modeled ACU Impedance
L	5.12000000	2	3	0.00000000	**3:** Modeled Base Current
C	0.00005000	3	0		**4:** Modeled ACU Current
R	**7.98300000**	**3**	**0**	**-29.73700000[1]**	
L	360.00000000	2	0	0.00000000	
C	0.00003600	2	0		

METHOD OF MOMENTS MODELS FOR KTSA DIRECTIVE ARRAY

****
ACSModel
(MININEC 3.1 Core)
01-21-2013 11:12:52
****

KTSA
DA-NIGHT MODEL

Frequency = 0.550 MHz Wavelength = 545.09090 Meters

No. of Wires: 5

Wire No. 1	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
0	0	0		-1	
0	0	124.311	0.4366	0	20

Wire No. 2	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
129.7403	-27.57715	0		-2	
129.7403	-27.57715	124.311	0.4366	0	20

Wire No. 3	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
231.3532	-112.8385	0		-3	
231.3532	-112.8385	124.9167	0.4366	0	20

Wire No. 4	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
361.2464	-140.1182	0		-4	
361.2464	-140.1182	124.311	0.4366	0	20

Wire No. 5	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
313.2587	-3.280557	0		-5	
313.2587	-3.280557	125.5223	0.4366	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
0	0	0	0.4366	-1	1	1
0	0	6.21555	0.4366	1	1	2
0	0	12.4311	0.4366	1	1	3
0	0	18.64665	0.4366	1	1	4
0	0	24.8622	0.4366	1	1	5
0	0	31.07775	0.4366	1	1	6
0	0	37.2933	0.4366	1	1	7
0	0	43.50885	0.4366	1	1	8
0	0	49.7244	0.4366	1	1	9
0	0	55.93995	0.4366	1	1	10
0	0	62.15551	0.4366	1	1	11
0	0	68.37105	0.4366	1	1	12
0	0	74.5866	0.4366	1	1	13
0	0	80.80215	0.4366	1	1	14
0	0	87.0177	0.4366	1	1	15
0	0	93.23325	0.4366	1	1	16
0	0	99.44881	0.4366	1	1	17
0	0	105.6644	0.4366	1	1	18
0	0	111.8799	0.4366	1	1	19
0	0	118.0955	0.4366	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
129.7403	-27.57715	0	0.4366	-2	2	21
129.7403	-27.57715	6.21555	0.4366	2	2	22
129.7403	-27.57715	12.4311	0.4366	2	2	23
129.7403	-27.57715	18.64665	0.4366	2	2	24
129.7403	-27.57715	24.8622	0.4366	2	2	25
129.7403	-27.57715	31.07775	0.4366	2	2	26
129.7403	-27.57715	37.2933	0.4366	2	2	27
129.7403	-27.57715	43.50885	0.4366	2	2	28
129.7403	-27.57715	49.7244	0.4366	2	2	29
129.7403	-27.57715	55.93995	0.4366	2	2	30
129.7403	-27.57715	62.15551	0.4366	2	2	31
129.7403	-27.57715	68.37105	0.4366	2	2	32
129.7403	-27.57715	74.5866	0.4366	2	2	33
129.7403	-27.57715	80.80215	0.4366	2	2	34
129.7403	-27.57715	87.0177	0.4366	2	2	35
129.7403	-27.57715	93.23325	0.4366	2	2	36
129.7403	-27.57715	99.44881	0.4366	2	2	37
129.7403	-27.57715	105.6644	0.4366	2	2	38
129.7403	-27.57715	111.8799	0.4366	2	2	39
129.7403	-27.57715	118.0955	0.4366	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
231.3532	-112.8385	0	0.4366	-3	3	41
231.3532	-112.8385	6.245833	0.4366	3	3	42
231.3532	-112.8385	12.49167	0.4366	3	3	43
231.3532	-112.8385	18.7375	0.4366	3	3	44
231.3532	-112.8385	24.98333	0.4366	3	3	45
231.3532	-112.8385	31.22917	0.4366	3	3	46
231.3532	-112.8385	37.475	0.4366	3	3	47
231.3532	-112.8385	43.72083	0.4366	3	3	48
231.3532	-112.8385	49.96667	0.4366	3	3	49
231.3532	-112.8385	56.2125	0.4366	3	3	50
231.3532	-112.8385	62.45833	0.4366	3	3	51
231.3532	-112.8385	68.70416	0.4366	3	3	52
231.3532	-112.8385	74.95	0.4366	3	3	53
231.3532	-112.8385	81.19583	0.4366	3	3	54
231.3532	-112.8385	87.44167	0.4366	3	3	55
231.3532	-112.8385	93.6875	0.4366	3	3	56
231.3532	-112.8385	99.93333	0.4366	3	3	57
231.3532	-112.8385	106.1792	0.4366	3	3	58
231.3532	-112.8385	112.425	0.4366	3	3	59
231.3532	-112.8385	118.6708	0.4366	3	0	60

Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
361.2464	-140.1182	0	0.4366	-4	4	61
361.2464	-140.1182	6.21555	0.4366	4	4	62
361.2464	-140.1182	12.4311	0.4366	4	4	63
361.2464	-140.1182	18.64665	0.4366	4	4	64
361.2464	-140.1182	24.8622	0.4366	4	4	65
361.2464	-140.1182	31.07775	0.4366	4	4	66
361.2464	-140.1182	37.2933	0.4366	4	4	67
361.2464	-140.1182	43.50885	0.4366	4	4	68
361.2464	-140.1182	49.7244	0.4366	4	4	69
361.2464	-140.1182	55.93995	0.4366	4	4	70
361.2464	-140.1182	62.15551	0.4366	4	4	71
361.2464	-140.1182	68.37105	0.4366	4	4	72
361.2464	-140.1182	74.5866	0.4366	4	4	73
361.2464	-140.1182	80.80215	0.4366	4	4	74
361.2464	-140.1182	87.0177	0.4366	4	4	75
361.2464	-140.1182	93.23325	0.4366	4	4	76
361.2464	-140.1182	99.44881	0.4366	4	4	77
361.2464	-140.1182	105.6644	0.4366	4	4	78
361.2464	-140.1182	111.8799	0.4366	4	4	79
361.2464	-140.1182	118.0955	0.4366	4	0	80

Wire No. 5 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
313.2587	-3.280557	0	0.4366	-5	5	81
313.2587	-3.280557	6.276116	0.4366	5	5	82
313.2587	-3.280557	12.55223	0.4366	5	5	83
313.2587	-3.280557	18.82835	0.4366	5	5	84
313.2587	-3.280557	25.10447	0.4366	5	5	85
313.2587	-3.280557	31.38058	0.4366	5	5	86
313.2587	-3.280557	37.6567	0.4366	5	5	87
313.2587	-3.280557	43.93281	0.4366	5	5	88
313.2587	-3.280557	50.20893	0.4366	5	5	89
313.2587	-3.280557	56.48505	0.4366	5	5	90
313.2587	-3.280557	62.76116	0.4366	5	5	91
313.2587	-3.280557	69.03728	0.4366	5	5	92
313.2587	-3.280557	75.31339	0.4366	5	5	93
313.2587	-3.280557	81.58951	0.4366	5	5	94
313.2587	-3.280557	87.86562	0.4366	5	5	95
313.2587	-3.280557	94.14174	0.4366	5	5	96
313.2587	-3.280557	100.4179	0.4366	5	5	97
313.2587	-3.280557	106.694	0.4366	5	5	98
313.2587	-3.280557	112.9701	0.4366	5	5	99
313.2587	-3.280557	119.2462	0.4366	5	0	100

Sources: 4
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 280.0, -65.1
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 547.0, -42.2
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 620.6, -64.3
Pulse No., Voltage Magnitude, Phase (Degrees): 61, 478.2, -15.0

Number of Loads: 1
Pulse No., Resistance, Reactance: 81 , 0 , +j561.2 T-5 DETUNING REACTANCE

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

Pulse 1
Voltage = (118.1035, -253.8774j)
Current = (15.1757, 0.1968j)
Impedance = (7.564, -16.827j) TWR-1 MODELED IMPEDANCE
Power = 871.17 Watts

Pulse 21
Voltage = (405.4013, -367.223j)
Current = (-5.0896, 10.1837j)
Impedance = (-44.772, -17.432j) TWR-2 MODELED IMPEDANCE
Power = -2901.509263 Watts

Pulse 41
Voltage = (269.1438, -559.1521j)
Current = (10.1405, -16.8215j)
Impedance = (31.455, -2.962j) TWR-3 MODELED IMPEDANCE
Power = 6067.52 Watts

Pulse 61
Voltage = (461.8384, -124.0325j)
Current = (7.7796, 13.4422j)
Impedance = (7.983, -29.737j) TWR-4 MODELED IMPEDANCE
Power = 962.82 Watts

Total Power = 5000.000 Watts

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

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)	
1	15.1757	0.1968	15.1769	0.7428	T-1 CUR/PHS
2	15.0123	0.1397	15.0129	0.5331	
3	14.8137	0.104	14.814	0.4022	
4	14.5475	0.0744	14.5477	0.2929	
5	14.211	0.0491	14.211	0.198	
6	13.8036	0.0274	13.8037	0.1139	
7	13.3263	0.0089	13.3263	0.0384	
8	12.7803	-0.0066	12.7803	-0.0298	
9	12.1675	-0.0195	12.1675	-0.0917	
10	11.4899	-0.0297	11.49	-0.148	
11	10.75	-0.0374	10.7501	-0.1993	
12	9.9503	-0.0427	9.9504	-0.2462	
13	9.0933	-0.0459	9.0935	-0.289	
14	8.1816	-0.0469	8.1817	-0.3282	
15	7.2172	-0.0458	7.2173	-0.364	
16	6.2017	-0.0429	6.2019	-0.3968	
17	5.1355	-0.0383	5.1356	-0.4268	
18	4.0161	-0.0318	4.0163	-0.4543	
19	2.8354	-0.0237	2.8355	-0.4796	
20	1.5694	-0.0138	1.5695	-0.5032	
E	0.0	0.0	0.0	0.0	

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)	
21	-5.0896	10.1837	11.3847	116.5551	T-2 CUR/PHS
22	-5.2517	9.961	11.2606	117.7995	
23	-5.3166	9.7582	11.1126	118.5829	
24	-5.332	9.5235	10.9145	119.2436	
25	-5.3036	9.2513	10.6637	119.8251	
26	-5.2343	8.94	10.3596	120.3487	
27	-5.1258	8.5895	10.0026	120.8268	
28	-4.9795	8.2003	9.5937	121.2675	
29	-4.7966	7.7735	9.1342	121.6767	
30	-4.5784	7.3103	8.6257	122.0588	
31	-4.3262	6.8124	8.07	122.4174	
32	-4.0412	6.2814	7.4691	122.7556	
33	-3.7247	5.719	6.825	123.0756	
34	-3.3779	5.1269	6.1396	123.3798	
35	-3.002	4.5064	5.4148	123.6698	
36	-2.5977	3.8589	4.6518	123.9476	
37	-2.1653	3.1844	3.8509	124.2146	
38	-1.704	2.4819	3.0106	124.4724	
39	-1.2103	1.7463	2.1247	124.723	
40	-0.6738	0.9633	1.1756	124.9711	
E	0.0	0.0	0.0	0.0	

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)	
41	10.1405	-16.8215	19.6416	-58.9173	T-3 CUR/PHS
42	9.8435	-16.9047	19.5618	-59.7882	
43	9.5959	-16.8449	19.3864	-60.3314	
44	9.3258	-16.6774	19.1078	-60.7867	
45	9.0255	-16.4073	18.7259	-61.1853	
46	8.6923	-16.0378	18.2419	-61.5428	
47	8.3255	-15.5714	17.6574	-61.868	
48	7.9254	-15.0109	16.9747	-62.1669	
49	7.4928	-14.359	16.1964	-62.4438	
50	7.0287	-13.6188	15.3256	-62.7018	
51	6.5345	-12.7934	14.3656	-62.9436	
52	6.0117	-11.8862	13.32	-63.1712	
53	5.4618	-10.9005	12.1923	-63.3864	
54	4.8864	-9.8395	10.986	-63.5907	
55	4.2867	-8.7062	9.7043	-63.7855	
56	3.6638	-7.5026	8.3494	-63.972	
57	3.018	-6.2294	6.9219	-64.1512	
58	2.3479	-4.8839	5.419	-64.3243	
59	1.649	-3.4562	3.8294	-64.4927	
60	0.9079	-1.9172	2.1213	-64.6595	
E	0.0	0.0	0.0	0.0	

Wire No. 4 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)	
61	7.7796	13.4422	15.5311	59.9402	T-4 CUR/PHS
62	7.699	13.1835	15.2669	59.7157	
63	7.5995	12.9374	15.0043	59.5697	
64	7.4655	12.6448	14.6842	59.4423	
65	7.2955	12.2997	14.3006	59.3258	
66	7.0893	11.9002	13.8518	59.2167	
67	6.8471	11.4465	13.3381	59.1128	
68	6.5698	10.9394	12.7606	59.0127	
69	6.258	10.3804	12.1209	58.9155	
70	5.9129	9.7712	11.421	58.8203	
71	5.5355	9.1139	10.6633	58.7268	
72	5.127	8.4108	9.8503	58.6343	
73	4.6887	7.6641	8.9845	58.5427	
74	4.2216	6.876	8.0685	58.4515	
75	3.7268	6.0485	7.1045	58.3606	
76	3.205	5.1832	6.0941	58.2697	
77	2.6562	4.2804	5.0376	58.1786	
78	2.079	3.3384	3.9328	58.0871	
79	1.4691	2.3505	2.7718	57.9949	
80	0.8139	1.2975	1.5317	57.9003	
E	0.0	0.0	0.0	0.0	

Wire No. 5 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
81	0.5129	0.3894	0.6439	37.2061
82	0.3727	0.2828	0.4678	37.191
83	0.2841	0.2151	0.3564	37.1278
84	0.2099	0.158	0.2627	36.9707
85	0.1458	0.1084	0.1817	36.6142
86	0.0901	0.0648	0.1109	35.7341
87	0.0417	0.0267	0.0494	32.6138
88	0.0001	-0.0064	0.0064	-88.8799
89	-0.0349	-0.0345	0.0491	-135.2993
90	-0.0636	-0.0578	0.0859	-137.7082
91	-0.0862	-0.0764	0.1152	-138.4343
92	-0.1029	-0.0904	0.1369	-138.7116
93	-0.1139	-0.0997	0.1513	-138.8049
94	-0.1192	-0.1044	0.1584	-138.8057
95	-0.1192	-0.1045	0.1585	-138.7546
96	-0.1138	-0.1001	0.1515	-138.6728
97	-0.1032	-0.0911	0.1376	-138.5729
98	-0.0874	-0.0774	0.1168	-138.4629
99	-0.0663	-0.0589	0.0887	-138.3483
100	-0.0391	-0.035	0.0525	-138.2321
E	0.0	0.0	0.0	0.0

********** BASE OPERATING PARAMETERS **********

Twr.	Ratio	Phase
1	1.000	0.0
2	0.750	115.8
3	1.294	-59.7
4	1.023	59.2
5	0.042	36.5

DESCRIPTION OF DETUNING SYSTEM AT KTSA TOWER-5

A sample loop is located at the detuning point (Pulse 28 on the tower) on Tower-5. The loop is connected to a test jack located in a weatherproof box at the tower base. The interconnecting cable is Andrew LDF-4-50A Heliax cable which is terminated in a Type N Female Bulkhead connector at the tower base. The loop faces due east to minimize pickup from the other towers in the array.

CALCULATED DETUNING REACTANCE: +j561.2 OHMS

The above listed value is the value calculated at the tower base. The adjusted value at the KTSA TWR-5 ACU output test jack is +jJ575 Ohms. The value differs slightly from the calculated value due to the series reactance of the RF Feeder Pipe to the tower base and the associated stray capacitance in the base region. The value is within 2.5 percent of the calculated value and was measured following adjustment of the associated detuning network for a sharp null at the sample loop jack at the tower base.

The adjustment procedure uses a Potomac Instruments model FIM-41 field intensity meter strapped to the tower structure with a BNC TEE connector attached to the External Input Jack of the instrument. One side of the adaptor is terminated in a 50 ohm resistance and the other side is connected to the sample line jack located in a weatherproof box at the base of the tower. The J-PLUG output is first shorted to ground and the instrument is tuned to 550 kilohertz, the GAIN is adjusted to calibrate the instrument to 0 dB. The J-PLUG is then restored to the normal operating position and the 550 KHZ detuning Inductor is adjusted for the best null. The resulting reactance is then measured at the output terminal of the network at the J-PLUG.

MINNEC MODEL OF DETUNED TOWER-5

****
ACSModel
(MININEC 3.1 Core)
01-20-2013 19:01:38
****

KTSA
TOWER-5 DETUNING STUDY
BASE REACTANCE = +j561 OHMS

Frequency = 0.550 MHz Wavelength = 545.09090 Meters

No. of Wires: 2

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-1	
0	0	124.311	0.4366	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
129.7403	-27.57715	0		-2	
129.7403	-27.57715	125.5223	0.4366	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
0	0	0	0.4366	-1	1	1
0	0	6.21555	0.4366	1	1	2
0	0	12.4311	0.4366	1	1	3
0	0	18.64665	0.4366	1	1	4
0	0	24.8622	0.4366	1	1	5
0	0	31.07775	0.4366	1	1	6
0	0	37.2933	0.4366	1	1	7
0	0	43.50885	0.4366	1	1	8
0	0	49.7244	0.4366	1	1	9
0	0	55.93995	0.4366	1	1	10
0	0	62.15551	0.4366	1	1	11
0	0	68.37105	0.4366	1	1	12
0	0	74.5866	0.4366	1	1	13
0	0	80.80215	0.4366	1	1	14
0	0	87.0177	0.4366	1	1	15
0	0	93.23325	0.4366	1	1	16
0	0	99.44881	0.4366	1	1	17
0	0	105.6644	0.4366	1	1	18
0	0	111.8799	0.4366	1	1	19
0	0	118.0955	0.4366	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
129.7403	-27.57715	0	0.4366	-2	2	21
129.7403	-27.57715	6.276116	0.4366	2	2	22
129.7403	-27.57715	12.55223	0.4366	2	2	23
129.7403	-27.57715	18.82835	0.4366	2	2	24
129.7403	-27.57715	25.10447	0.4366	2	2	25
129.7403	-27.57715	31.38058	0.4366	2	2	26
129.7403	-27.57715	37.6567	0.4366	2	2	27
129.7403	-27.57715	43.93281	0.4366	2	2	28
129.7403	-27.57715	50.20893	0.4366	2	2	29
129.7403	-27.57715	56.48505	0.4366	2	2	30
129.7403	-27.57715	62.76116	0.4366	2	2	31
129.7403	-27.57715	69.03728	0.4366	2	2	32
129.7403	-27.57715	75.31339	0.4366	2	2	33
129.7403	-27.57715	81.58951	0.4366	2	2	34
129.7403	-27.57715	87.86562	0.4366	2	2	35
129.7403	-27.57715	94.14174	0.4366	2	2	36
129.7403	-27.57715	100.4179	0.4366	2	2	37
129.7403	-27.57715	106.694	0.4366	2	2	38
129.7403	-27.57715	112.9701	0.4366	2	2	39
129.7403	-27.57715	119.2462	0.4366	2	0	40

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 36.3, 142.5

Number of Loads: 1
Pulse No., Resistance, Reactance: 21 , 0 , 561.2 BASE DETUNING REACTANCE

********** SOURCE DATA **********
Pulse 1 Voltage = (-28.8241, 22.1175j)
Current = (-0.9685, 0.0558j)
Impedance = (30.974, -21.05j)
Power = 14.58 Watts

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

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	-0.9685	0.0558	0.9701	176.7001
2	-0.9553	0.0695	0.9578	175.8367
3	-0.9409	0.0775	0.944	175.2891
4	-0.9225	0.0836	0.9263	174.8239
5	-0.8999	0.0881	0.9042	174.4112
6	-0.873	0.0912	0.8777	174.0364
7	-0.8418	0.0931	0.8469	173.6911
8	-0.8064	0.0937	0.8118	173.3699
9	-0.767	0.0932	0.7726	173.0687
10	-0.7236	0.0916	0.7293	172.7846
11	-0.6763	0.0889	0.6822	172.5152
12	-0.6255	0.085	0.6312	172.2586
13	-0.5711	0.0801	0.5767	172.0131
14	-0.5135	0.0742	0.5188	171.7774
15	-0.4526	0.0672	0.4576	171.5502
16	-0.3886	0.0593	0.3931	171.3303
17	-0.3216	0.0503	0.3255	171.1168
18	-0.2513	0.0402	0.2545	170.9086
19	-0.1773	0.029	0.1796	170.7042
20	-0.0981	0.0164	0.0994	170.5
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)	
21	-0.0248	-0.0299	0.0389	-129.6328	
22	-0.018	-0.0217	0.0282	-129.6571	
23	-0.0137	-0.0165	0.0215	-129.7594	
24	-0.0102	-0.0121	0.0158	-130.0137	
25	-0.0071	-0.0083	0.0109	-130.5929	
26	-0.0045	-0.0049	0.0066	-132.0312	
27	-0.0022	-0.002	0.0029	-137.2123	
28	-0.0002	0.0006	0.0006	108.4146	DETUNE HT
29	0.0015	0.0027	0.0031	61.9917	
30	0.0028	0.0046	0.0053	58.3896	
31	0.0039	0.006	0.0071	57.284	
32	0.0046	0.0071	0.0085	56.8646	
33	0.0051	0.0078	0.0093	56.7308	
34	0.0054	0.0082	0.0098	56.7426	
35	0.0054	0.0082	0.0098	56.8376	
36	0.0051	0.0079	0.0094	56.9835	
37	0.0046	0.0072	0.0085	57.1612	
38	0.0039	0.0061	0.0072	57.3588	
39	0.003	0.0046	0.0055	57.5685	
40	0.0017	0.0028	0.0033	57.7871	
E	0.0	0.0	0.0	0.0	

********** BASE OPERATING PARAMETERS **********

Twr.	Ratio	Phase
1	24.970	306.3
2	1.000	0.0

SELLMEYER ENGINEERING
BROADCAST & COMMUNICATIONS CONSULTING ENGINEERS
2 Pecan Grove Circle
Lucas, Texas, 75002
MEMBER AFCCE

SECTION-3

ANTENNA MONITORING AND SAMPLING SYSTEM

REV-1

The Antenna Monitoring System uses a Potomac Instruments model 1901 Antenna Monitor. The monitor was in use at KTSA prior to beginning this project and is in good condition. Prior to adjustment of the KTSA array, the monitor was tested through its "Self Test" function and through a fixed length of RG-223 transmission of known phase shift at 550 kilohertz. The Reference input (#3) was fed directly from the 550 kilohertz signal source while the other channels were sequentially fed from the delay line. The monitor passed all of these tests.

Station KTSA is diplexed into the original four towers (1-4) on the site. Station KZDC is diplexed into towers 2-5 of the array. Tower-5 was constructed specifically for station KZDC.

The antenna monitor is connected to Delta Electronics Toroidal Current Transformers ("TCT's") located at the outputs of each of the four Antenna Coupling Units ("ACU's"). The ACU's are connected to the Antenna Monitor by underground runs of Andrew LDF-4-50A foam filled solid outer conductor coaxial cables of equal electrical length within the tolerances permitted by the Rules. The cables have factory installed connectors on each end of the run where they terminate at the TCT connectors at the towers and on a bulkhead panel in the transmitter room. In the transmitter room, a short length of RG-214/U cable is used to connect the cables to the Antenna Monitor. The sample lines are buried in carefully prepared trenches at a depth of approximately thirty inches below grade level atop a washed sand base, six inches in depth with the associated transmission, control and power lines. An additional six inches of washed sand was placed atop the lines prior to backfilling with excavated dirt from the site. Where the lines traverse Eisenhauer Road, they do so at a depth of ten feet below grade level in separate PVC conduits by function. The conduits are installed inside a fourteen inch steel pipe beneath the roadbed and extend to a distance of ten feet either side of the road for protection. The pipes then taper upward to the trench level over a distance of thirty feet from the end of each pipe.

The cables as a system were individually measured with the distant end open circuited at the TCT's to determine the electrical length and impedance using an Array Solutions model PA-120 Vector Impedance Analyzer. The system was set to sweep from 100 kilohertz to 2.5 megahertz allowing inspection of the line characteristics to determine the relevant odd multiples of ninety electrical degrees, the series resonant zero crossings, nearest the operating frequency of 550 kilohertz. The 270 degree series resonant zero crossing was determined to be the nearest frequency to the carrier frequency.

The following tables tabulate the electrical length and impedance of each of the Sampling Lines used in the system.

SAMPLE LINE LENGTH MEASUREMENTS

TOWER	RESONANCE BELOW 550 KHZ (F-1) (270°)	RESONANCE ABOVE 550 KHZ (F-2) (450°)	RATIO 550/F-1 X 270°	CALCULATED ELECTRICAL LENGTH (DEG)	DEVIATION REFERENCE: TOWER-3 (DEG)
1	510.685	852.324	1. 0770	290.790	-0.324
2	510.359	851.688	1.0777	290.979	-0.135
3	510.120	851.092	1.0782	291.114	+0.000
4	509.935	850.988	1.0786	291.222	+0.108

SAMPLE LINE IMPEDANCE MEASUREMENTS

Tower	-45 Degree Offset Frequency (KHZ)	-45 Degree Measured Impedance (OHMS)	+45 Degree Offset Frequency (KHZ)	+45 Degree Measured Impedance (OHMS)	Calculated Characteristic Impedance (OHMS)
1	425.820	4.71-j48.27	595.90	8.19+j50.75	49.93
2	425.820	4.86-j49.72	595.90	8.18+j50.90	50.75
3	425.820	4.78-j49.42	595.85	7.88+j50.40	50.23
4	425.820	4.80-j49.29	595.85	7.86+j50.40	51.00

The sample lines comply with the requirements of the Rule with respect to differential lengths and impedance.

The Delta Electronics TCT's were set up in pairs at the input test Jack of the KTSA Switching Cabinet in the transmitter room. The two TCT outputs were connected to the Antenna Monitor through equal length cables made with RG-223/U double shielded cable. The reference TCT was fed to input 3 of the monitor and the "Unknown" TCT was connected to Input-1 of the monitor. The toroid pair was fed with a jumper cable run through the center of each unit and connected to the input and output terminals of the test jack.

The test setup was driven from the KTSA transmitter.

TCT CALIBRATION VERIFICATION

TOWER	ACU S/N	TCT RATIO	TCT PHASE (DEGREES)	SAMPLE LINE - Z TERMINATED BY ACU
1	18021	1.000	0.1	49.9+j0.1
2	18071	1.001	0.0	49.9+j0.1
3	18066	1.000	0.0	50.0+j0.1
4	18084	1.000	0.0	50.1+j0.1

The TCT's are within the Delta Electronics specified ratings of +/- 1 percent magnitude and +/-2 degrees phase.

The Antenna Monitoring System, including the ACU's, the sample lines and the flexible pigtails at the Antenna Monitor end of the sample lines are listed in the table below to determine the total monitoring system ratio and phase deviations:

SAMPLE SYSTEM PERFORMANCE

TOWER	TCT RATIO DEVIATION (RATIO)	TCT DEVIATION (DEGREES)	SAMPLE LINE DEVIATION (DEGREES)	SYSTEM DEVIATION (RATIO/PHASE)
1	1.000	+0.10	-0.32	1.000/-0.22°
2	1.001	0.0	-0.14	1.001/-0.14°
3	1.000	00.0	00.0	1.000/-0.00°
4	1.000	0.00	+0.11	1.000/+0.11°

The Sample System is constructed in compliance with the requirements of Sections 73.68 and 73.151(c) of the Rules with the system magnitude deviations within 1.0 percent and phase deviations within 1.0 degree.

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SECTION-4

DIRECT MEASUREMENT OF POWER – NIGHTTIME DIRECTIVE ARRAY

CENTER OF ARRAY: N.L.: 29° 29′ 46″/ W.L.: 98°-24′ 54″

Common Point Impedance measurements were made at the input terminals to the Delta Electronics Common Point Impedance Bridge in the phasing cabinet. An RF test Jack is located adjacent to the current transformer for the Common Point Ammeter at this location. The impedance was measured using a Hewlett Packard model 8253C network analyzer which was utilized for all of the system impedance measurements.

The input impedance was adjusted to 50 ohms +j0 at this location. The shunt reject network is located in the associated switching cabinet which also contains the phase rotation networks for the Directional and Non- Directional antennae. The inputs of those networks are adjusted to provide the proper loads to the transmitters.

The Common Point power for the authorized nighttime directional antenna system is 5000 watts plus the eight percent adjustment factor for system losses of the phasing and coupling equipment.

The Operating Power is 5,400 watts plus the power dissipated in the dummy load at tower-2 used to stabilize the pattern bandwidth of the system. The input resistance of the dummy load connected to the Tower-2 network was measured with network analyzer system and found to be 50.0 ohms at the input test jack for the Tower-2 Network. The current transformer for the Tower-2 Meter is physically located adjacent to this jack. The load is connected to the network via a short length of 7/8 inch solid dielectric transmission line. The load is enclosed in a weatherproof enclosure mounted on the north side of the coupler building.

The ratio of the Common Point Current and the current into the load at tower-2 was determined directly from the meters, both of which are extended to the transmitter room and displayed on a panel adjacent to the phasing cabinet. With the

nighttime directional array adjusted to the antenna monitor parameters shown herein, the Tower-2 Load Current was found to be 0.5283 times the Common Point Current.

As the Common Point Resistance was set to 50.0 ohms:

$$(Icp)^2\ (50.0) - (0.5306)^2\ (Icp)^2\ (50.0) = 5{,}400 \text{ Watts}$$

$$(Icp)^2\ [1-(0.5306)^2](50.0) = 5{,}400 \text{ Watts}$$

$$(Icp)^2 = 5{,}400/[1-(0.5306)^2] \times 50.0$$

$$(Icp)^2 = 5{,}400/35.9497 = 150.2099$$

Therefore:

$$Icp = 12.26 \text{ A}$$

NIGHTTIME ANTENNA INPUT POWER = $(12.26)^2$ X 50.0 = 7,515 Watts

Dissipated Power= 7,515 W – 5,400 W = 2,115 Watts

DIRECT MEASUREMENT OF POWER – DAYTIME NON-DIRECTIONAL

NON-DIR COORDINATES: N.L.: 29° 29′ 41″/ W.L.: 98°-24′ 52″

Two towers in the KTSA array are equipped for non-directional operation to allow maintenance of full service when maintenance is required on Tower-1, the normal non-directional tower. The base impedance of the tower was measured at the output jack of the antenna coupling unit. The current transformer for the RF Ammeter is located in the line to this jack.

Tower-3 is equipped with a non-directional antenna coupler to permit normal operation during maintenance periods on Tower-1. The base impedance of the tower was measured at the output jack of the antenna coupling unit. The current transformer for the RF Ammeter is located in the line to this jack.

The measured impedances appear in the table below together with the Antenna Current for 5,000 watt non-directional operation from each tower.

NON-DIRECTIONAL IMPEDANCES & CURRENTS

TOWER	RESISTANCE (OHMS)	REACTANCE (OHMS)	CURRENT (AMPERES)	NOTES
1	32.8	+j4.26	12.35	MAIN
3	31.7	+j0.11	12.55	ALTERNATE

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SECTION-5

SPURIOUS & HARMONIC RADIATION
RADIO STATIONS KTSA & KZDC NIGHTTIME SITE

The nighttime transmitting site of Station KZDC is diplexed with Station KTSA 550 kilohertz. The KTSA nighttime directional antenna uses the four original towers on this site, numbered as Physical Towers 1 through 4. Physical Tower-5, the new tower, is detuned at the KTSA frequency. Three of the four towers of the KTSA nighttime directive array are also used by KZDC as is Physical Tower-5, which was constructed forthe exclusive use of KZDC during nighttime hours. Tower-1 of the KTSA array is detuned at the KZDC frequency. Filters are installed in all five sets of Antenna Couplers and shunt reject filters are installed in the input circuitry of the two transmission systems to prevent entry of radio frequency energy from the other station into the output circuitry of the final amplifiers of the transmitters.

Two Nautel XR-12 transmitters are installed in the KTSA transmitter room for alternate main use by the station. These transmitters feed shunt reject filters tuned to 1250 kHz in the KTSA antenna system input circuitry.

Two Nautel J-1000 transmitters are installed in the KZDC transmitter shelter for alternate main use by the station. These transmitters feed shunt reject filters tuned to 550 kHz in the KZDC antenna system input circuitry.

Preliminary measurements were made at the transmitter site using a spectrum analyzer for observation of potential two station intermodulation and other spurious products which could be generated in the KTSA and KZDC transmitters. None exceeding -80 dBc were observed. Field measurements were made at two locations within the main lobes of the KTSA and KZDC directive arrays. The locations are described below for each station along with tables of related Harmonic Levels and potential spurious frequencies and their levels generated by intermodulation products of the two stations. In most instances the harmonic and spurious levels were at the noise floor of the Potomac Instruments Field Intensity Meter used for the measurements. The specific frequencies could be identified by a slight change in the audible character of the noise. In no case, other than the on frequency measurement was clearly discernable audio heard from either station. No spurious products were heard on frequencies other than the calculated harmonic and intermodulation frequencies identified in the attached tables.

The measurements were made on October 31, 2012 by Lyndon H. Willoughby, a reputable Technical Consultant whose qualifications are a matter of record with the Federal Communications Commission, on October 31, 2012 at the locations noted for each station.

All measurements were made with a Potomac Instruments model FIM-4100 Field Intensity Meter, last calibrated by the manufacturer on May 11, 2011.

KZDC HARMONIC STUDY

FREQUENCY (kHz)	MEASURED LEVEL (mV/m)	ATENUATION RELATIVE TO CARRIER (dB)	OBSERVED ADUIO
1250	704	REF	KZDC PGM
2500	0.0306	-87.2 dBc	NOISE
3750	0.0045	-103.9 dBc	NOISE
5000	0.0047	-103.5 dBc	NOISE
Notes: Measured with Potomac Instruments FIM-4100, Calibrated May 5, 2011; Req'd Attenuation: -73.2 dBc			
Location: 0.745 kM on Bearing of 318 Degrees True on Ira Lee Drive at NAD-83 Coordinates: NL: 29-30-07.2/WL: 98/25/15.4			

KZDC INTERMODUALTION STUDY

All potential intermodulation frequencies between KTSA (550 kHz) and KZDC (1250 kHz) within the range of the Potomac Instruments FIM-4100 Field Intensity Meter were studied in the field at the location chosen for the Harmonic measurements. These frequencies take the form of $2F_1 +/- F_2$.. The spectrum from 520 kHz through 5.0 mHz was carefully scanned for other products which might appear with none found. The spectrum had been scanned in the transmitter room with both stations on the nighttime pattern, the worst case due to common use of three of the five towers using a spectrum analyzer scanning from 200 kHz through 10 mHz. No significant attributable products were found. The following table lists the frequencies which were identified and their levels recorded in the field.

FREQUENCY (kHz)	MEASURED LEVEL (mV/m)	ATENUATION RELATIVE TO CARRIER (dB)	OBSERVED ADUIO
1250	704	REF	KZDC PGM
1950	0.0933	-78.0 dBc	NOISE
3050	0.0822	-79.1 dBc	NOISE
3200	0.0055	-102.6 dBc	NOISE
4300	0.0048	-103.3 dBc	NOISE
4450	0.0048	-103.3 dBc	NOISE
Notes: Measured with Potomac Instruments FIM-4100, Calibrated May 50, 2011; Req'd Attenuation: 73.2 dBc			
Location: 0.745 kM on Bearing of 318 Degrees True on Ira Lee Drive at NAD-83 Coordinates: NL: 29-30-07.2/WL: 98/25/15.4			

KTSA HARMONIC RADIATION STUDY

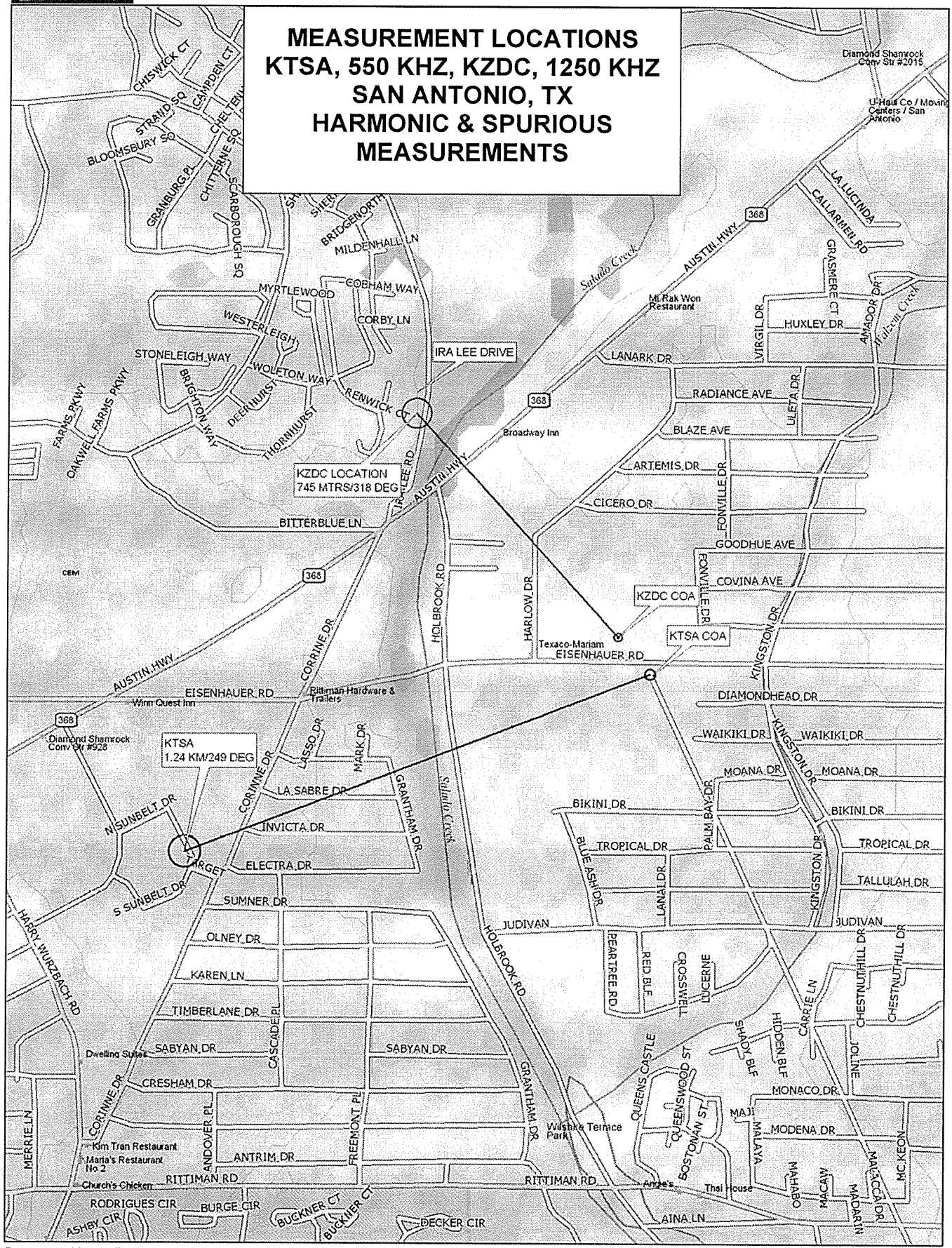
FREQUENCY (kHz)	MEASURED LEVEL (mV/m)	ATENUATION RELATIVE TO CARRIER (dB)	OBSERVED ADUIO
550	1190.0	REF	KTSA PGM
1100	117.0	KDRY Fundamental	KDRY PGM (KTSA 2ND Harmonic)
1650	0.0373	-90.08 dBc	NOISE
2200	0.0089	-102.5 dBc	NOISE
2750	0.0350	-90.6 dBc	NOISE
3300	0.0060	-105.9 dBc	NOISE
3850	0.0053	-107.0 dBc	NOISE
4400	0.0053	-107.0 dBc	NOISE
4950	0.0053	-107.0 dBc	NOISE
Notes: Measured with Potomac Instruments FIM-4100, Calibrated May 5, 2011; Required Attenuation: -80 dBc			
Location: 1.24 kM on Bearing of 249 Degrees True; NAD-83 Coordinates: NL: 29-29-32.5/WL: 98/25/38.1			

KTSA INTERMODULATION STUDY

All potential intermodulation frequencies between KTSA (550 kHz) and KZDC (1250 kHz) within the range of the Potomac Instruments FIM-4100 Field Intensity Meter were studied in the field at the location chosen for the Harmonic measurements. These frequencies take the form of $2F_1 +/- F_2$.. The spectrum from 520 kHz through 5.0 mHz was carefully scanned for other products which might appear with none found. The spectrum had been scanned in the transmitter room with both stations on the nighttime pattern, the worst case due to common use of three of the five towers using a spectrum analyzer scanning from 200 kHz through 10 mHz. No significant attributable products were found. The following table lists the frequencies which were identified and their levels recorded in the field.

FREQUENCY (kHz)	MEASURED LEVEL (mV/m)	ATENUATION RELATIVE TO CARRIER (dB)	OBSERVED ADUIO
550	1190.0	REF	KTSA PGM
400	0.0116	-100.2 dBc	NOISE
950	0.0370	-90.1 dBc	NOISE
2350	0.0083	-103.1 dBc	NOISE
2900	0.0350	-90.6 dBc	NOISE
3450	0.0171	-96.9 dBc	NOISE
Notes: Measured with Potomac Instruments FIM-4100, Calibrated May 5, 2011; Required Attenuation: -80 dBc			
Location: 1.24 kM on Bearing of 249 Degrees True; NAD-83 Coordinates: NL: 29-29-32.5/WL: 98/25/38.1			

MEASUREMENT LOCATIONS
KTSA, 550 KHZ, KZDC, 1250 KHZ
SAN ANTONIO, TX
HARMONIC & SPURIOUS MEASUREMENTS



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TN

MN (4.7°E)

Scale 1 : 12,800

0 200 400 600 800 1000 ft

0 100 200 300 400 500 m

1 cm = 128.0 m

Data Zoom 14-0

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SECTION-6
SUMMARY OF CERTIFIED ARRAY GEOMETRY

The tower locations based on the relative distances in meters and azimuths (referenced to true north) provided on the certified survey drawing attached to this document were compared to the relative distances and azimuths relative to true north of the array of elements specified on the KTSA license.

The tabulation below shows the relevant distances rounded to the nearest 0.01 meter and 0.1 degree.

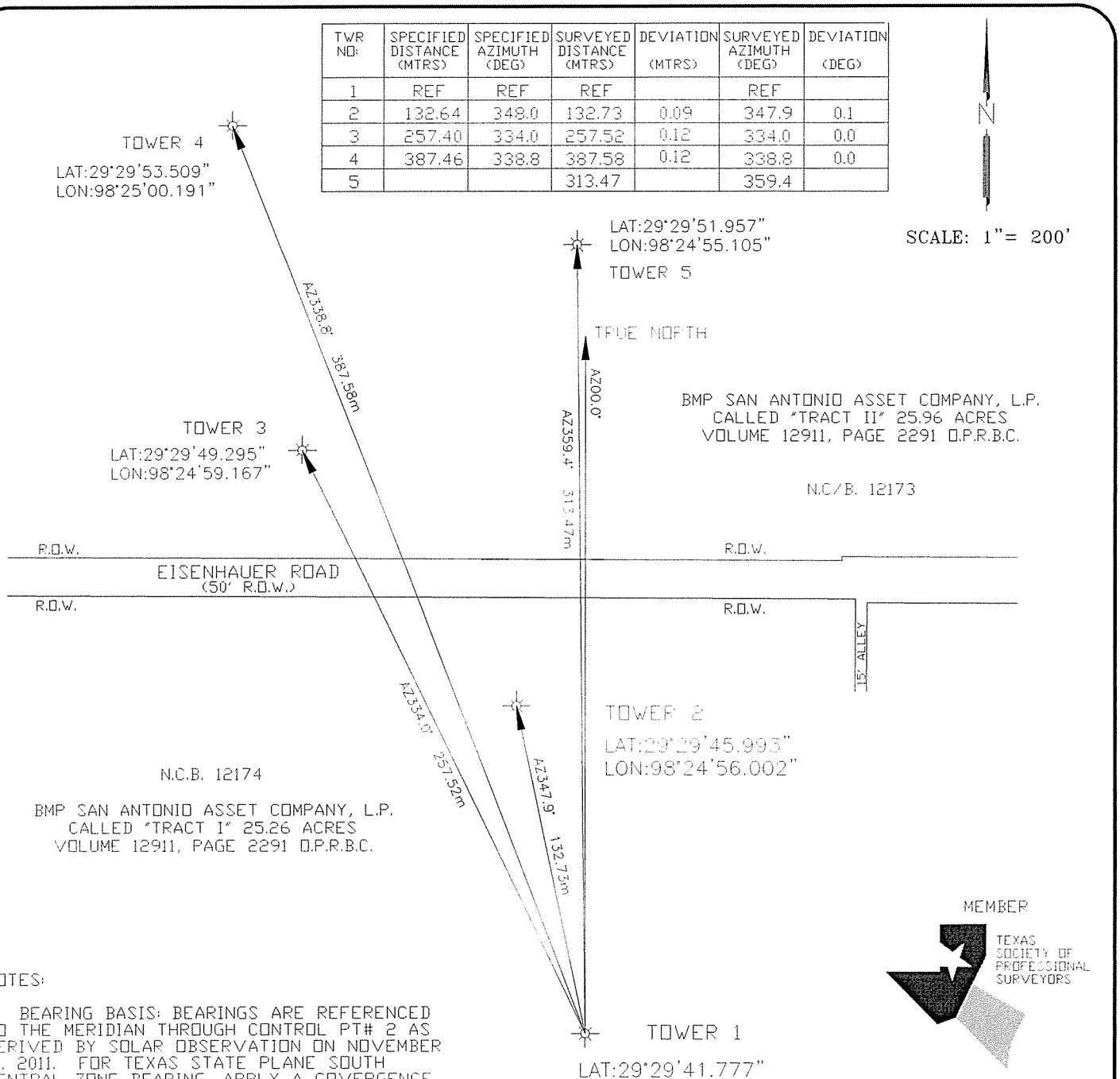
Tower-5 is a new tower constructed for co-located Station KZDC. It is not used in the KTSA array and is detuned at 550 kilohertz.

Tower	Specified Array Geometry			Certification[1]		Distance From Specified Base Location	
	Spacing (Deg)	Spacing Meters	Azimuth (Deg. T.)	Spacing (Meters)	Azimuth (Deg. T.)	(Deg.)	(Deg.)
1	REF	REF	REF	REF	REF	REF	REF
2	87.6	132.64	348.0	132.73	347.9	0.136°	0.1°
3	170.0	257.40	334.0	257.52	334.0	0.182°	0.0°
4	255.9	387.46	338.8	387.58	338.8	0.182°	0.0°
5	[2]	[2]	[2]	313.47	359.4	[2]	[2]

1: From Survey Dated: October 4, 2012, Rods Surveying, Inc.
2: Tower-5 is not used in the KTSA Array and is detuned at 550 KHZ

The referenced survey was conducted to determine the location of the new Tower-5 which is used in conjunction with KTSA towers 2-4 for the KZDC Nighttime directive array. The tower displacements for the four KTSA towers from their specified locations are listed in electrical degrees at the carrier frequency, which correspond to space phasing locations differences in the far field radiation pattern of the array, are well within the +/- 3 degree operating phase range specified for the antenna monitor parameters by the FCC Rules.

TWR NO:	SPECIFIED DISTANCE (MTRS)	SPECIFIED AZIMUTH (DEG)	SURVEYED DISTANCE (MTRS)	DEVIATION (MTRS)	SURVEYED AZIMUTH (DEG)	DEVIATION (DEG)
1	REF	REF	REF		REF	
2	132.64	348.0	132.73	0.09	347.9	0.1
3	257.40	334.0	257.52	0.12	334.0	0.0
4	387.46	338.8	387.58	0.12	338.8	0.0
5			313.47		359.4	



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NOTES:

1. BEARING BASIS: BEARINGS ARE REFERENCED TO THE MERIDIAN THROUGH CONTROL PT# 2 AS DERIVED BY SOLAR OBSERVATION ON NOVEMBER 11, 2011. FOR TEXAS STATE PLANE SOUTH CENTRAL ZONE BEARING, APPLY A COVERGENCE OF 00° 17' 13".

2. LATITUDES AND LONGITUDES SHOWN ARE BASED ON NAD83 PROJECTIONS.

STATE OF TEXAS
REGISTERED
JOHN DAVID KENNEY
2080
PROFESSIONAL LAND SURVEYOR

SURVEY PLAT OF:

A DISTANCE AND BEARING SURVEY RESULTS, RADION STATION KTSA, 550 KHZ, 5.0 KW, DA-N, UNL, FACILITY ID: 71087, BMP SAN ANTONIO LICENSE COMPANY, LP.

STATE OF TEXAS
COUNTY OF BEXAR

I HEREBY CERTIFY THAT THIS IS A TRUE AND CORRECT PLAT BASED ON A GROUND SURVEY MADE UNDER MY SUPERVISION ON THIS 11TH DAY OF OCTOBER, 2012.

JOHN DAVID KENNEY, RPLS NO. 2080

RODS Surveying, Inc.
1540 PLEASANTON RD.
SAN ANTONIO, TX 78221
PH. 210-922-9092
FX. 210-922-9095
www.rods.cc

JOB # 433-21104-004

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SECTION-7
RFR PROTECTION INFORMATION
TOWER REGISTRATION & SIGNAGE
RADIO STATIONS KTSA & KZDC NIGHT SITE

The KZDC nighttime transmitting site is co-located with station KTSA (550 kHz) and uses three of the four towers utilized by the KTSA nighttime directive array with one additional tower of the same height and face width. The Power Distribution for each tower with contributions from each station is listed in the table below:

TOWER	ASR NUMBER	KTSA		KZDC	TOTAL POWER (WATTS)	OET[1] MINIMUM (METERS)	FENCE[2] DISTANCE (METERS
		DAY[3] WATTS	NIGHT[3] WATTS	NIGHT[4] WATTS			
1	1022081	5000	850	DETUNED	5000	2 TO 10 KW	2.13
2	1022082	-	-2900	200	3100	2 TO 10 KW	2.13
3	1022083	-	6000	500	6500	2 TO 10 KW	2.13
4	1022084	-	1000	-55	1055	2 TO 10 KW	2.13
5	1278630	-	DETUNED	300	300	2 TO 10 KW	>2.13

NOTES:

1: OET-65, EDITION 97-01, MINIMUM REQUIRED DISTANCE FROM TOWER STEEL TO NEAREST FENCE SURFACE
2: MINIMUM CONSTRUCTED FENCE DISTANCE FROM TOWER STEEL TO NEAREST FENCE SURFACE
3: POWER AT 550 KHZ INTO AN 80.5 DEGREE TOWER
4: POWER AT 1250 KHZ INTO A 183 DEGREE TOWER

The minimum distance from tower steel to the nearest point on the tower fence is 2.13 meters (7 Feet). The minimum required distance for a station operating at 550 kilohertz with up to one kilowatt of power with a one quarter wave tower is 1 meter. The minimum required distance for a station operating at 550 kilohertz with up to ten kilowatts of power with a one quarter wave tower is 2 meters. The minimum required distance for a station operating at 1250 kilohertz with up to ten kilowatts of power with a half wave tower is 2 meters.

It is evident that the worst case condition rests with Tower-3 operating at night with 6000 watts from KTSA and 500 watts from KZDC for a total of 6500 watts. For this condition, the minimum required distance from tower steel to a fence for powers of ten kilowatts is 2 meters. The total operating power of this tower is approximately 65 percent of ten kilowatts and the fence at

this tower and Towers 1 through 4 is 2.13 meters from the nearest tower steel. Further, towers 3, 4 and 5 are also enclosed by a perimeter fence around the entire 25 acre plot of land which has two locked gates to prevent entry of the general public. This fenced area is a Controlled Access area limited to personnel with knowledge of RF Exposure areas. The general public is restricted from the area.

The tower fences have installed on the their faces, bi-lingual signs in English and Spanish warning of high radio frequency fields within the fenced areas. The antenna couplers are enclosed in aluminum housings located within cinderblock buildings with locked access doors for towers 1 through 4 and a locked weatherproof aluminum housing within a secure chain link fence at tower 5.

Tower registration signs are located at eye level on the doors of the antenna coupler buildings at towers 1 through 4 and attached to the door of the antenna coupler at tower 5.

It is the opinion of the undersigned that the KTSA/KZDC Transmitter Plant is in full compliance with the RFR requirements outlined in OET Bulletin 65, Edition 97-01 and the Rules of the Commission.

SECTION-8 RADIO STATION KTSA 550 KHz FIELD REFERENCE POINT MEASUREMENTS, SHEET-1 of 2							
Radial	PT	Distance (km)	Field (mV/m)	Time & Date	Coordinates (NAD-27)		Description
4.0°	1	3.64	103	1137 10/31/12	29-31-43.8	98-24-43.6	4134 Clear Springs Dr mailbox
	2	4.10	120	1130 10/31/12	29-31-58.8	98-24-42.6	S off Perrin Central Blvd on rear part of asphalt lot behind (W of) Valero, opp La Carretas restaurant
	3	4.34	118	1123 10/31/12	29-32-06.5	98-24-41.4	Ebound Wurzbach svc rd, W of Wurbach on S side, on buried traffic signal controls lid
	4	4.73	96.2	1109 10/31/12	29-32-19.2	98-24-40.8	4153 Acorn Hill front of Animal Hospital
	5	7.18	63.0	1030 10/31/12	29-33-38.4	98-24-33.7	4246 Putting Green mailbox
35°	1	4.71	76.1	1332 10/31/12	29-31-50.9	98-23-12.6	Fiplug @ corner of Rhinestone and Moonstone between mboxes 139 & 246
	2	4.94	61.2	1323 10/31	29-31-56.5	98-23-07.5	SW corner Starlight Terrace & Centerway
	3	6.47	42.8	1307 10/31	29-32-37.5	98-22-35.2	E side of Techcommon @ No Trespassing sign
	4	7.44	50.7	1254 10/31	29-33-03.3	98-22-14.3	12202 Valley Forge mailbox
73.5°	1	3.25	218.5	1001 11/2/12	29-30-15.2	98-22-58.1	Castle Knight St mailbox 5554
	2	4.54	139.9	1032 11/2/12	29-30-26.9	98-22-12.5	Dumpster fence behind O'Reilly Auto Parts(S side of Dial Ike Dr)
	3	5.33	139.9	1056 11/2/12	29-30-34.6	98-21-44.0	Corner of solid wood fence SE corner Robin Forest & Deer Forest
	4	6.51	126.8	1107 11/2/12	29-30-45.6	98-21-02.0	Mailbox 8347 Bent Waters
	5	7.73	96.2	1122 11/2/12	29-30-56.0	98-20-18.4	8700 block of Ridge Mile Dr at neighborhood mailboxes
107.5°	1	3.49	67.3	1354 11/2/12	29-29-11.8	98-22-50.4	5622 Castle Prince mailbox
	2	5.28	61.2	1426 11/2/12	29-28-54.5	98-21-47.2	E side Westlake Center Rd 100' N of Rittiman
	3	6.75	33.7	1321 11/2/12	29-28-40.3	98-20-55.0	Driveway 5513 Allbrook
	4	7.55	31.0	1455 11/2/12	29-28-32.7	98-20-26.6	E side Vista Fairway opp mailbox 5123

SECTION-8 RADIO STATION KTSA 550 KHz FIELD REFERENCE POINT MEASUREMENTS, SHEET-2 of 2							
155°	1	4.14	227.3	1448 11/2/12	29-27-44.5	98-23-47.9	4811 Dick Gordon Dr. driveway
	2	4.46	214.2	1517 11/1/12	29-27-35.2	98-23-43.3	Street sign SW corner of Michael Collins St & Alan Sheppard Dr
	3	5.43	182.7	1527 11/1/12	29-27-06.5	98-23-28.0	Neighborhood Watch sign SE of corner of Telegraph Dr & Wheatland Dr
	4	6.74	141.6	1600 11/1/12	29-26-27.8	98-23-07.6	5390 Dietrich down driveway to south
200°	1	4.75	47.2	1434 11/1/12	29-27-20.3	98-25-52.3	On gravel W of big parking lot S side of Binz Engleman Rd 3100 block
	2	6.48	36.7	1334 11/1/12	29-26-28.5	98-26-15.9	Ebound I-10 svc rd (E of AT&T Center Pkwy) at TURNAROUND sign with overpass clearance height on it
	3	8.94	32.8	12:53 11/1/12	29-25-13.0	98-26-46.5	E off N Rio Grande St to end of drive into Lincoln Park @ NO DUMPING sign next to dumpster
244.5°	1	3.47	380	1149 11/1/12	29-28-57.3	98-26-50.3	957 Wilshire 30 paces W of intersection w Exeter
	2	3.98	310	1158 11/1/12	29-28-49.2	98-27-06.7	331 Ridgemont
	3	4.98	253	1040 11/1/12	29-28-35.9	98-27-40.6	Red Fplug 100 blk of Grandview
	4	5.97	223	1103 11/1/12	29-28-21.8	98-28-13.7	15 paces S od red Fplug on Torcido Ln
	5	7.37	184	1001 11/1/12	29-28-02.3	98-29-00.6	126 (?) E. Thelma front of new construction
303°	1	3.82	95.3	1536 10/31/12	29-30-53.0	98-26-53.4	Frost Bank on yellow blocked off pkg spaces
	2	4.46	55.9	1517 10/31/12	29-31-04.6	98-27-13.3	8626 Bldg pkg lot opp Broadway Bank
	3	8.13	22.8	1431 10/31/12	29-32-09.3	98-29-07.5	Warehouse driveway N off Isom Rd to point opposite dumpster

Measurements made by Dick S. Pickens of Microcom, Inc. on the dates indicated using Potomac Instruments model FIM-41 Field Intensity Meter, S/N: 2000, recently compared with FIM-4100 calibrated in 2010 and found to be within manufacturer's specifications.

SECTION-9
COMPLIANCE WITH CONDITION-9
OF KZDC CONSTRUCTION PERMIT
****
ACSModel
(MININEC 3.1 Core)
01-08-2013 08:54:28
****

KTSA
DAYTIME SYMMETERY STUDY, TOWER-1 DRIVEN-LOSSLESS CASE
UNUSED TWRS TERMINATED IN MEASURED LOADS

Frequency = 0.550 MHz Wavelength = 545.09090 Meters

No. of Wires: 5

Wire No. 1	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
0	0	0		-1	
0	0	121.8884	0.3466	0	20

Wire No. 2	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
129.7403	-27.57715	0		-2	
129.7403	-27.57715	121.8884	0.3466	0	20

Wire No. 3	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
231.3532	-112.8385	0		-3	
231.3532	-112.8385	121.8884	0.3466	0	20

Wire No. 4	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
361.2464	-140.1182	0		-4	
361.2464	-140.1182	121.8884	0.3466	0	20

Wire No. 5	Coordinates			End	No. of
X	Y	Z	Radius	Connection	Segments
313.4555	-3.282618	0		-5	
313.4555	-3.282618	121.8884	0.3466	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
0	0	0	0.3466	-1	1	1
0	0	6.094419	0.3466	1	1	2
0	0	12.18884	0.3466	1	1	3
0	0	18.28326	0.3466	1	1	4
0	0	24.37768	0.3466	1	1	5
0	0	30.4721	0.3466	1	1	6
0	0	36.56652	0.3466	1	1	7
0	0	42.66093	0.3466	1	1	8
0	0	48.75535	0.3466	1	1	9
0	0	54.84977	0.3466	1	1	10
0	0	60.94419	0.3466	1	1	11
0	0	67.03861	0.3466	1	1	12
0	0	73.13303	0.3466	1	1	13
0	0	79.22745	0.3466	1	1	14
0	0	85.32187	0.3466	1	1	15
0	0	91.41628	0.3466	1	1	16
0	0	97.5107	0.3466	1	1	17
0	0	103.6051	0.3466	1	1	18
0	0	109.6995	0.3466	1	1	19
0	0	115.794	0.3466	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
129.7403	-27.57715	0	0.3466	-2	2	21
129.7403	-27.57715	6.094419	0.3466	2	2	22
129.7403	-27.57715	12.18884	0.3466	2	2	23
129.7403	-27.57715	18.28326	0.3466	2	2	24
129.7403	-27.57715	24.37768	0.3466	2	2	25
129.7403	-27.57715	30.4721	0.3466	2	2	26
129.7403	-27.57715	36.56652	0.3466	2	2	27
129.7403	-27.57715	42.66093	0.3466	2	2	28
129.7403	-27.57715	48.75535	0.3466	2	2	29
129.7403	-27.57715	54.84977	0.3466	2	2	30
129.7403	-27.57715	60.94419	0.3466	2	2	31
129.7403	-27.57715	67.03861	0.3466	2	2	32
129.7403	-27.57715	73.13303	0.3466	2	2	33
129.7403	-27.57715	79.22745	0.3466	2	2	34
129.7403	-27.57715	85.32187	0.3466	2	2	35
129.7403	-27.57715	91.41628	0.3466	2	2	36
129.7403	-27.57715	97.5107	0.3466	2	2	37
129.7403	-27.57715	103.6051	0.3466	2	2	38
129.7403	-27.57715	109.6995	0.3466	2	2	39
129.7403	-27.57715	115.794	0.3466	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
231.3532	-112.8385	0	0.3466	-3	3	41
231.3532	-112.8385	6.094419	0.3466	3	3	42
231.3532	-112.8385	12.18884	0.3466	3	3	43
231.3532	-112.8385	18.28326	0.3466	3	3	44
231.3532	-112.8385	24.37768	0.3466	3	3	45
231.3532	-112.8385	30.4721	0.3466	3	3	46
231.3532	-112.8385	36.56652	0.3466	3	3	47
231.3532	-112.8385	42.66093	0.3466	3	3	48
231.3532	-112.8385	48.75535	0.3466	3	3	49
231.3532	-112.8385	54.84977	0.3466	3	3	50
231.3532	-112.8385	60.94419	0.3466	3	3	51
231.3532	-112.8385	67.03861	0.3466	3	3	52
231.3532	-112.8385	73.13303	0.3466	3	3	53
231.3532	-112.8385	79.22745	0.3466	3	3	54
231.3532	-112.8385	85.32187	0.3466	3	3	55
231.3532	-112.8385	91.41628	0.3466	3	3	56
231.3532	-112.8385	97.5107	0.3466	3	3	57
231.3532	-112.8385	103.6051	0.3466	3	3	58
231.3532	-112.8385	109.6995	0.3466	3	3	59
231.3532	-112.8385	115.794	0.3466	3	0	60

Wire No. 4 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
361.2464	-140.1182	0	0.3466	-4	4	61
361.2464	-140.1182	6.094419	0.3466	4	4	62
361.2464	-140.1182	12.18884	0.3466	4	4	63
361.2464	-140.1182	18.28326	0.3466	4	4	64
361.2464	-140.1182	24.37768	0.3466	4	4	65
361.2464	-140.1182	30.4721	0.3466	4	4	66
361.2464	-140.1182	36.56652	0.3466	4	4	67
361.2464	-140.1182	42.66093	0.3466	4	4	68
361.2464	-140.1182	48.75535	0.3466	4	4	69
361.2464	-140.1182	54.84977	0.3466	4	4	70
361.2464	-140.1182	60.94419	0.3466	4	4	71
361.2464	-140.1182	67.03861	0.3466	4	4	72
361.2464	-140.1182	73.13303	0.3466	4	4	73
361.2464	-140.1182	79.22745	0.3466	4	4	74
361.2464	-140.1182	85.32187	0.3466	4	4	75
361.2464	-140.1182	91.41628	0.3466	4	4	76
361.2464	-140.1182	97.5107	0.3466	4	4	77
361.2464	-140.1182	103.6051	0.3466	4	4	78
361.2464	-140.1182	109.6995	0.3466	4	4	79
361.2464	-140.1182	115.794	0.3466	4	0	80

Wire No. 5 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
313.4555	-3.282618	0	0.3466	-5	5	81
313.4555	-3.282618	6.094419	0.3466	5	5	82
313.4555	-3.282618	12.18884	0.3466	5	5	83
313.4555	-3.282618	18.28326	0.3466	5	5	84
313.4555	-3.282618	24.37768	0.3466	5	5	85
313.4555	-3.282618	30.4721	0.3466	5	5	86
313.4555	-3.282618	36.56652	0.3466	5	5	87
313.4555	-3.282618	42.66093	0.3466	5	5	88
313.4555	-3.282618	48.75535	0.3466	5	5	89
313.4555	-3.282618	54.84977	0.3466	5	5	90
313.4555	-3.282618	60.94419	0.3466	5	5	91
313.4555	-3.282618	67.03861	0.3466	5	5	92
313.4555	-3.282618	73.13303	0.3466	5	5	93
313.4555	-3.282618	79.22745	0.3466	5	5	94
313.4555	-3.282618	85.32187	0.3466	5	5	95
313.4555	-3.282618	91.41628	0.3466	5	5	96
313.4555	-3.282618	97.5107	0.3466	5	5	97
313.4555	-3.282618	103.6051	0.3466	5	5	98
313.4555	-3.282618	109.6995	0.3466	5	5	99
313.4555	-3.282618	115.794	0.3466	5	0	100

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 799.5, -45.0

Number of Loads: 4
Pulse No., Resistance, Reactance: 21 , 0 , 490
Pulse No., Resistance, Reactance: 41 , 0 , 525
Pulse No., Resistance, Reactance: 61 , 0 , 495
Pulse No., Resistance, Reactance: 81 , 0 , 575

********** SOURCE DATA **********
Pulse 1 Voltage = (565.3481, -565.3481j)
Current = (18.5235, 0.8353j)
Impedance = (29.085, -31.832j)
Power = 4999.99 Watts

********** FAR FIELD **********

Zenith Angle : Initial, Increment, Number: 90.0, 0.0, 1
Azimuth Angle: Initial, Increment, Number: 0.0, 5.0, 72

********** PATTERN DATA **********
Radial Distance = 1000 Meters
Power Level = 4999.989 Watts

Elev. Angle	Azimuth Angle	RMS E(Theta) Mag(mV/m)	Phase (Deg)
0.0	0.0	681.3371	90.5
0.0	5.0	682.0309	90.6
0.0	10.0	683.0119	90.6
0.0	15.0	684.3167	90.7
0.0	20.0	685.9591	90.8
0.0	25.0	687.9165	90.9
0.0	30.0	690.1206	90.9
0.0	35.0	692.4552	90.9
0.0	40.0	694.7642	90.8
0.0	45.0	696.8715	90.7
0.0	50.0	698.6101	90.6
0.0	55.0	699.8526	90.5
0.0	60.0	700.5384	90.3
0.0	65.0	700.6862	90.1
0.0	70.0	700.3900	90.0
0.0	75.0	699.7971	89.9
0.0	80.0	699.0757	89.8
0.0	85.0	698.3794	89.8
0.0	90.0	697.8206	89.8
0.0	95.0	697.4572	89.8
0.0	100.0	697.2945	89.8
0.0	105.0	697.2991	89.8
0.0	110.0	697.4176	89.8
0.0	115.0	697.5939	89.8
0.0	120.0	697.7812	89.7
0.0	125.0	697.9484	89.7
0.0	130.0	698.0797	89.7
0.0	135.0	698.1721	89.7
0.0	140.0	698.2308	89.6
0.0	145.0	698.2652	89.6
0.0	150.0	698.2858	89.6
0.0	155.0	698.3016	89.6
0.0	160.0	698.3186	89.6
0.0	165.0	698.3391	89.6
0.0	170.0	698.3605	89.6
0.0	175.0	698.3755	89.6

Elev. Angle	Azimuth Angle	E(Theta) Mag(mV/m)	Phase (Deg)	
0.0	180.0	698.3727	89.6	
0.0	185.0	698.3381	89.6	
0.0	190.0	698.2593	89.6	
0.0	195.0	698.1301	89.6	
0.0	200.0	697.9570	89.6	
0.0	205.0	697.7648	89.7	
0.0	210.0	697.6001	89.7	
0.0	215.0	697.5281	89.7	
0.0	220.0	697.6235	89.6	
0.0	225.0	697.9523	89.6	
0.0	230.0	698.5499	89.6	
0.0	235.0	699.4000	89.6	
0.0	240.0	700.4219	89.7	
0.0	245.0	701.4739	89.7	
0.0	250.0	702.3727	89.9	
0.0	255.0	702.9269	90.0	
0.0	260.0	**702.9749**	90.2	HIGHEST FIELD
0.0	265.0	702.4185	90.4	
0.0	270.0	701.2407	90.6	
0.0	275.0	699.5075	90.7	
0.0	280.0	697.3509	90.8	
0.0	285.0	694.9423	90.9	
0.0	290.0	692.4612	90.9	
0.0	295.0	690.0684	90.9	
0.0	300.0	687.8876	90.9	
0.0	305.0	685.9969	90.8	
0.0	310.0	684.4304	90.7	
0.0	315.0	683.1857	90.6	
0.0	320.0	682.2353	90.6	
0.0	325.0	681.5385	90.5	
0.0	330.0	681.0516	90.4	
0.0	335.0	680.7360	90.4	
0.0	340.0	680.5650	90.4	
0.0	345.0	**680.5265**	90.4	LOWEST FIELD
0.0	350.0	680.6256	90.4	
0.0	355.0	680.8838	90.4	

HIGHEST FIELD: 702.9749 mV/m +0.14 dB

LOWEST FIELD: 680.5265 mV/m -0.14 dB

MEDIAN FIELD: 691.6596 mV/m

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.
GUYED VERTICAL STEEL	121.9	124	125	Exhibit No. N/A

Excitation ☑ Series ☐ Shunt

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

North Latitude	West Longitude
29 ° 29 ' 46 "	98 ° 24 ' 54 "

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. E-1

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 (Refurbishment of existing plant)

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

Reconstruction of existing plant; Replacement of ground system

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)
J. S. SELLMEYER, P.E.	J. S. Sellmeyer
Address (include ZIP Code) Sellmeyer Engineering 2 Pecan Grove Circle Lucas, TX 75002	Date 8/18/2013 Telephone No. (Include Area Code) 972-542-2056

☐ Technical Director

☑ Registered Professional Engineer

☐ Chief Operator

☐ Technical Consultant

☐ Other (specify)

STATE OF TEXAS J. S. SELLMEYER 38530 REGISTERED PROFESSIONAL ENGINEER