BMMC-20110322 Ann G

Federal Communications Commission
Washington, D. C. 20554

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

FOR FCC USE ONLY

FCC 302-AM
APPLICATION FOR AM BROADCAST STATION LICENSE

(Please read instructions before filling out form.

FOR COMMISSION USE ONLY
FILE NO. BMML-20110322ABY

RECEIVED 2011 MAR 28 P 2:32

SECTION I - APPLICANT FEE INFORMATION

1. PAYOR NAME (Last, First, Middle Initial)
Eagle Communications, Inc.

MAILING ADDRESS (Line 1) (Maximum 35 characters)
2703 Hall Street

MAILING ADDRESS (Line 2) (Maximum 35 characters)
Suite # 15

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Hays	Kansas	67601-1987

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
785-625-4000	KESJ	Facility ID 8767

2. A. Is a fee submitted with this application? ☑ Yes ☐ No

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

☐ Governmental Entity ☐ Noncommercial educational licensee ☐ Other (Please explain):

C. If Yes, provide the following information: #0002336360

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

(A) FEE TYPE CODE	(B) FEE MULTIPLE	(C) FEE DUE FOR FEE TYPE CODE IN COLUMN (A)	FOR FCC USE ONLY
M M R	0 0 0 1	$ 615.00	

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

(A)	(B)	(C)	FOR FCC USE ONLY
M O R	0 0 0 1	$ 705.00	

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

TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
$ 1320.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT Eagle Communications, Inc.		
MAILING ADDRESS 2703 Hall Street, Suite # 15		
CITY Hays	STATE Kansas	ZIP CODE 67601-1987

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
KESJ	St. Joseph, Missouri	BP-20100317AAN	N/A	02/01/2013

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. PTA Requested

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. N/A

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

☐ Yes ☑ No

If Yes, explain in an Exhibit.

Exhibit No. N/A

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

☐ Yes ☐ No

☑ Does not apply

If No, explain in an Exhibit.

Exhibit No. N/A

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

☐ Yes ☑ No

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

Exhibit No. N/A

8. Does the applicant, or any party to the application, have a petition on file to migrate to the expanded band (1605-1705 kHz) or a permit or license either in the existing band or expanded band that is held in combination (pursuant to the 5 year holding period allowed) with the AM facility proposed to be modified herein? ☐ Yes ☑ No

If Yes, provide particulars as an Exhibit. Exhibit No. N/A

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

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

CERTIFICATION

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

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

Name	Signature	
Gary D. Shorman		
Title	Date	Telephone Number
President	3/21/11	(785) 625-4000

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
Eagle COmmunications, Inc.

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
KESJ	BP-20100317AAN	1550	Unlimited	0.5	2.5

2. Station location

State	City or Town
Missouri	St. Joseph

3. Transmitter location

State	County	City or Town	Street address (or other identification)
Missouri	Andrew	St. Joseph	20761 N. Belt Highway

4. Main studio location

State	County	City or Town	Street address (or other identification)
Missouri	Buchanan	St. Joseph	4104 Country Lane

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

State	County	City or Town	Street address (or other identification)
Missouri	Buchanan	St. Joseph	4101 Country Lane

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. Engineering Exhibit

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system	RF common point or antenna current (in amperes) without modulation for day system
3.270	6.482

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
50.5	59.5	-13.3	+80.9

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 - NW	- 89.0	N/A	0.667	N/A	Not Required	Not Required
2 - SE	+ 125.2	N/A	0.519	N/A	Not Required	Not Required
3 - SW	+ 7.7	N/A	0.711	N/A	Not Required	Not Required
4 - NE	0.0	N/A	1.000	N/A	Not Required	Not Required

Manufacturer and type of antenna monitor: Potomac Instruments AM 1901-4

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.
Uniform cross-section	48.4 m (all towers)	49.9 m (all towers)	49.9 m (all towers)	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	39 °	49 '	39 "	West Longitude	94 °	48 '	39 "

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. Engineering Exhibit

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

10. In what respect, if any, does the apparatus constructed differ from that described in the application for construction permit or in the permit?

No difference from that described in CP

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

N/A - New Construction

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)
Garrison C. Cavell	
Address (include ZIP Code)	Date
Cavell, Mertz & Associates, Inc. 7732 Donegan Drive Manassas, VA 20109-2868	March 18, 2011
	Telephone No. (Include Area Code)
	(703) 392-9090

☐ Technical Director

☐ Registered Professional Engineer

☐ Chief Operator

☑ Technical Consultant

☐ Other (specify)

Engineering Exhibit

APPLICATION FOR STATION LICENSE
METHOD OF MOMENTS
PROOF OF PERFORMANCE

prepared for

Eagle Communications, Inc.
Station KESJ St. Joseph, Missouri
1550 kHz DA-N U (2.5 kW ND-D 0.5 kW DA-N)

March 18, 2011

Cavell, Mertz & Associates, Inc.

7732 Donegan Drive
Manassas, Virginia 20109
703.392.9090

Engineering Statement

APPLICATION FOR STATION LICENSE
METHOD OF MOMENTS - PROOF OF PERFORMANCE

prepared for

Eagle Communications, Inc.
Station KESJ St. Joseph, Missouri
1550 kHz DA-N U (2.5 kW ND-D 0.5 kW DA-N)

FCC Form 302-AM, Section III
Engineering Statement – Method of Moments Proof of Performance

Contents

Introduction 1

Antenna System Description 1

Ground System Description 3

Antenna Monitor and Sample System 3

MoM Process 4

Tower Impedance Measurements to Verify Method of Moments Model 5

Representative Open Circuit Tower Base Environment Schematic for all KESJ Towers 8

Summary of Completed Open Circuit Analysis of KESJ Tower Base Environment 8

Representative Open Circuit Tower Base Environment Schematic for all KFEQ Towers 9

Summary of Completed Open Circuit Analysis of KFEQ Tower Base Environment 9

Circuit Analysis Used for Each Tower to Verify Method of Moments Model 10

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 1 (Northwest) 10

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 2 (Southeast) 11

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 3 (Southwest) 12

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 4 (Northeast) 13

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 5 (*KFEQ Tower 1 - East*) 14

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 5 (*KFEQ Tower 1 - East*) (Continued) 15

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 6 (*KFEQ Tower 2 – East Central*) 16

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 6 (*KFEQ Tower 2 – East Central*) (Continued) 17

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 7 (*KFEQ Tower 3 - West Central*) 18

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 7 (KFEQ Tower 3 – *West Central*) (Continued) 19

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 8 (*KFEQ Tower 4 - West*) 20

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 8 (*KFEQ Tower 4 – West*) (Continued) 21

Details of MoM "Open Circuit" Modeling - for Towers Driven Individually 22
MoM Model Details for Towers Driven Individually – KESJ Tower 1 OC Self - (1 of 4).....24
MoM Model Details for Towers Driven Individually – KESJ Tower 1 OC Self - (2 of 4).....25
MoM Model Details for Towers Driven Individually – KESJ Tower 1 OC Self - (3 of 4).....26
MoM Model Details for Towers Driven Individually – KESJ Tower 1 OC Self - (4 of 4).....27
MoM Model Details for Towers Driven Individually - Tower 2 OC Self - (1 of 4) 28
MoM Model Details for Towers Driven Individually - Tower 2 OC Self - (2 of 4) 29
MoM Model Details for Towers Driven Individually - Tower 2 OC Self - (3 of 4) 30
MoM Model Details for Towers Driven Individually - Tower 2 OC Self - (4 of 4) 31
MoM Model Details for Towers Driven Individually - Tower 3 OC Self - (1 of 4) 32
MoM Model Details for Towers Driven Individually - Tower 3 OC Self - (2 of 4) 33
MoM Model Details for Towers Driven Individually - Tower 3 OC Self - (3 of 4) 34
MoM Model Details for Towers Driven Individually - Tower 3 OC Self - (4 of 4) 35
MoM Model Details for Towers Driven Individually - Tower 4 OC Self - (1 of 4) 36
MoM Model Details for Towers Driven Individually - Tower 4 OC Self - (2 of 4) 37
MoM Model Details for Towers Driven Individually - Tower 4 OC Self - (3 of 4) 38
MoM Model Details for Towers Driven Individually - Tower 4 OC Self - (4 of 4) 39
MoM Model Details for Towers Driven Individually - Tower 5 OC Self - (1 of 4) 40
MoM Model Details for Towers Driven Individually - Tower 5 OC Self - (2 of 4) 41
MoM Model Details for Towers Driven Individually - Tower 5 OC Self - (3 of 4) 42
MoM Model Details for Towers Driven Individually - Tower 5 OC Self - (4 of 4) 43
MoM Model Details for Towers Driven Individually - Tower 6 OC Self - (1 of 4) 44
MoM Model Details for Towers Driven Individually - Tower 6 OC Self - (2 of 4) 45
MoM Model Details for Towers Driven Individually - Tower 6 OC Self - (3 of 4) 46
MoM Model Details for Towers Driven Individually - Tower 6 OC Self - (4 of 4) 47
MoM Model Details for Towers Driven Individually - Tower 7 OC Self – (1 of 4).....48
MoM Model Details for Towers Driven Individually - Tower 7 OC Self - (2 of 4) 49
MoM Model Details for Towers Driven Individually - Tower 7 OC Self - (3 of 4) 50
MoM Model Details for Towers Driven Individually - Tower 7 OC Self - (4 of 4) 50
MoM Model Details for Towers Driven Individually - Tower 8 OC Self - (1 of 4) 52
MoM Model Details for Towers Driven Individually - Tower 8 OC Self - (2 of 4) 53
MoM Model Details for Towers Driven Individually - Tower 8 OC Self - (3 of 4) 54
MoM Model Details for Towers Driven Individually - Tower 8 OC Self - (4 of 4) 55

Derivation of Directional Antenna Operating Parameters **56**
MoM Model Details – Directional Antenna Array Synthesis (1 of 8) 57
MoM Model Details – Directional Antenna Array Synthesis (2 of 8) 58
MoM Model Details – Directional Antenna Array Synthesis (3 of 8) 59
MoM Model Details - Directional Antenna Array Synthesis (4 of 8) 60
MoM Model Details - Directional Antenna Array Synthesis (5 of 8) 61
MoM Model Details - Directional Antenna Array Synthesis (6 of 8) 62
MoM Model Details - Directional Antenna Array Synthesis (7 of 8) 63
MoM Model Details - Directional Antenna Array Synthesis (8 of 8) 64
Derivation of Directional Antenna System "Antenna Monitor" Parameters **65**
Directional Antenna Monitor Operating Parameters 65
As-Constructed Certified Array Geometry **66**
"As-Built" Array Geometry Summary 66
"As-Built" Survey of Array 67
Sampling System Measurements **68**
Reference Point Field Strength Measurements **70**
Reference Point Field Strength Measurements – 28.5° (Monitored Minima) 70
Reference Point Field Strength Measurements – 71° (Monitored Minima) 70
Reference Point Field Strength Measurements – 141.5° (Monitored Minima) 71
Reference Point Field Strength Measurements – 220° (Monitored Minima) 71
Reference Point Field Strength Measurements – 300° (Main Lobe) 71
Direct Measurement of Power **71**
RF Exposure Evaluation **72**
Satisfaction of CP Conditions **73**
Request for Program Test Authority **77**
Certification **77**
Attachment I – Copy of Construction Permit **78**
Attachment II – Filter/Trap Tests **84**

Introduction

This Engineering Statement has been prepared on behalf of *Eagle Communications, Inc.* ("*Eagle*"), licensee of radio station KESJ, St. Joseph, Missouri, (Facility ID 8767). It supports *Eagle's* **Application for License** following completion of construction of a new non-directional daytime / directional nighttime antenna system for KESJ at a new location.[1]

A "Method of Moments" ("MoM") Proof-of-Performance has been successfully conducted on the constructed directional antenna system per the provisions of Section 73.151(c) of the Commission's Rules.[2] The information provided in this Statement demonstrates that the directional antenna parameters for the new antenna array have been determined in accordance with the requirements of the above rule.

Further, the antenna system has been adjusted to produce antenna monitor parameters that are within +/- 5 percent in ratio and +/- 3 degrees in phase of the MoM modeled values, as required by the Commission's Rules. Thus, as demonstrated here, the newly constructed antenna system is in compliance with the terms of the underlying Construction Permit ("CP"), as well as all pertinent Commission Rules and Policies.

Antenna System Description

The constructed directional antenna facility consists of four uniform cross-section, guyed, base-insulated, series fed towers, nested between two of the four elements of the co-owned KFEQ (4 tower) antenna system, as shown in the application for CP and documented in the surveyor's drawing supplied later in this document. No tower lighting is installed on the newly constructed KESJ towers since FAA notification was not required, and hence, tower marking and lighting were not specified for these structures under the FCC CP.

---

[1] KESJ is presently licensed to operate at a different site with 5 kW (non-directional daytime, directional nighttime). A change in transmitter site to an existing site used for Eagle's co-owned KFEQ(AM) was requested in an application for CP filed on March 17, 2010. A Construction Permit was granted for the proposed change on June 30, 2010 (BP-20100317AAN). Construction was started immediately thereafter.

[2] The new KESJ day directional antenna array is eligible under the Commission's Rules for licensing under the MoM Rules in that the antenna system consists of series fed, base insulated towers, using a conventional, buried-wire, ground system.

The theoretical antenna array geometry for the new KESJ antenna array, as authorized in the underlying CP, is summarized in the table below. The geometric reference tower is Tower #1 (the Northwestern-most tower in the KESJ array).

As demonstrated in a following section of this Statement, and as evidenced by a local survey, the antenna system was constructed in substantial conformance with these specifications:

FCC ASRN	Tower Number	Relative Tower Location	Distance From Reference Tower	Orientation From Reference Tower	Reference Switch Flag
Not Required	1	Northwest	0.0°	0.0° T	None
Not Required	2	Southeast	121.6°	116.9° T	None
Not Required	3	Southwest	99.9°	171.0° T	None
Nor Required	4	Northeast	95.0°	66.0° T	None

As described previously, the KESJ array is constructed between the two western towers of the existing four tower KFEQ antenna system (between towers having FCC Antenna Structure Registration Numbers ("ASRNs") of 1006055 and 1006056). Although all of the KFEQ towers are detuned at the KESJ operating frequency, they must nevertheless be considered in the KESJ MiniNEC analysis. Accordingly, the locations of the KFEQ towers with respect to KESJ Tower #1 (the Northwest KESJ tower), are provided in the following table. These positions were derived from surveyor provided data (shown on the surveyor's plat provided later in this document). Azimuths were supplied in degrees, with respect to True North. Distances, measured in feet on the survey, were converted to electrical degrees of spacing at the KESJ frequency of 1550 kHz in the table below..

FCC ASRN	"KESJ" Tower Number	KFEQ Corrected Tower Number	KFEQ Relative Tower Location	Distance From KESJ Reference Tower	Orientation From KESJ Reference Tower
1006053	5	1	East	705.8°	93.4° T
1006054	6	2	East-Central	489.1°	93.4° T
1006055	7	3	West-Central	272.4°	93.4° T
1006056	8	4	West	161.3°	273.4° T

The above spacing and orientation descriptions shown for all of the 8 towers on the site were used in the conduct of the method-of-moments proof-of-performance documented herein.

It should be noted that the tower numbering convention for KFEQ in the FCC's CDBS differs from station and Antenna Structure Registration placement. The correct placement and nomenclature for KFEQ is used in the above table. These differences will be addressed with the Commission in a companion Method-of-Moments proof-of-performance for KFEQ, which is being filed essentially simultaneously with this proof for KESJ. (The KFEQ proof will address the construction of the KESJ array, and changes in the KFEQ antenna system, including replacement towers, antenna monitor, and sample system. KFEQ is presently operating under the terms of a Special Temporary Authority pending the filing of the new proof-of-performance.)

Ground System Description

A conventional buried copper wire ground system has been employed in the construction of this antenna array. Specifically, it consists of 120 equally spaced number 10 soft-drawn, copper radial wires buried into the ground and arrayed every 3° around each tower, to a length of 48.4 meters, except where terminated in common, 4-inch transverse copper straps midway between the adjacent KESJ towers.

Further, the new KESJ ground system was tied into the existing KFEQ ground system via transverse and direct copper straps. Additionally, 120 shorter copper radials are interspersed and buried between the longer radials. These short supplemental radials are each 15.2 meters in length and are also number 10 soft-drawn copper wire. Copper straps are also buried between the towers and in the transmission line trench. These straps are also tied to the tower base ground strap as well as to the transmitter building grounding system.

Antenna Monitor and Sample System

A new *Potomac Instruments Inc.* Model AM-1901-4 Antenna Monitor, Serial Number 838, was purchased for this construction. The calibration date for this monitor is September 29, 2010. The calibration was verified at the time of the proof of performance.

Delta Electronics, Inc. "TCT-3" toroidal current transformers ("TCTs") are employed to provide sample currents to the antenna monitor. The operating characteristics of these TCTs

were verified per the requirements of the FCC's Rules prior to antenna array adjustment. (See following separate section of this Statement on Sample System TCT Calibration.)

New phase stabilized, "connectorized", equal length, half-inch *Andrew Corporation* Model 42394-14VA coaxial sample cables were installed at the site under equal environmental conditions, all being buried except where they extend equally to terminating locations. The electrical length and characteristic impedance of these lines were verified prior to array adjustment per the Commission's MoM proof requirements. (See separate section of this Statement on Sample Line Verification.)

This sampling system conforms to the provisions of Section 73.68(a) of the Commission's Rules that were in effect prior to January 1, 1986. Accordingly, if pertinent, approval of this sampling system is being requested pursuant to the FCC's Public Notice of December 9, 1985. Further, as will be demonstrated herein, the installed antenna monitor - sampling system also complies with the requirements of the newly adopted MoM Proof Rules under Section 73.151(c).

MoM Process

The procedure for conducting a MoM proof involves making impedance measurements at each of the towers to serve as benchmarks for calibrating the array model, characterizing the base environment and taking note of any likely sources of stray base reactances. An initial model of the characteristics of each tower as an individual ("self" modeling) is then done. Model tower characteristics (height and width) can then be adjusted to "converge" the modeled resistance of the tower to the measured values. Reactance data are then converged by using conventional circuit analysis techniques to account for the various stray feed reactances encountered at the tower base.

Using the calibrated antenna model, theoretical field parameters can then be introduced into the software to synthesize the desired pattern. Required base currents and driving point impedance conditions are derived along with a set of antenna monitor parameters for the

modeled array. These parameters will be used to achieve the authorized pattern when the system is adjusted accordingly. The following text describes the specific approach taken in the modeling and adjustment of this particular directional antenna system.

Tower Impedance Measurements to Verify Method of Moments Model

In order to calibrate the MoM model, impedance measurements were taken at each of the tower bases. As discussed in the previous section, by relating the individual as-measured antenna conditions to the model ("converging the model"), confidence is achieved for the derivation of system (antenna monitor) parameters. Since there are four "unused" towers involved (the towers of the co-located KFEQ array), measurements also were taken at the bases of these structures and incorporated into the development of the KESJ model.

In particular, impedance measurements were conducted using a precision, calibrated measurement system consisting of a *Hewlett-Packard* model 8753C network analyzer in conjunction with a *Tunwall Radio* directional coupler system and an *Electronic Navigation Industries* (ENI) Model 310 L RF amplifier. Analyzer calibration was field verified prior to each measurement using the procedures specified in the manufacturer's instruction manual employing precision calibration standards and techniques.

After calibration of the system, antenna base impedance measurements were made at each tower at the location of the final output jacks[3] ("J-plugs") within the respective Antenna Tuning Units ("ATUs"). As each tower was being measured, all the other tower bases were "open circuited" at the same J-plug impedance measurement locations.

This J-Plug reference point at each ATU is located immediately adjacent to the sampling transformer of the antenna monitor system at the output of the ATU system enclosure. At each ATU enclosure, it was confirmed that the tower RF current passes directly from that point,

[3] This point is referred to in this report as the tower "reference point" as it is the location where the TCT's samples are taken.

through heavy conductors, through the tuning unit enclosure bowl insulator, and on to the tower attachment point above the base insulators, without any intervening components or devices.

There are no components in shunt with the KESJ ATU outputs following the sampling transformers other than static drain chokes. The presence of the static drain chokes was taken into account using the manufacturer's stated inductive reactances at 1550 kilohertz during the calibration of the MoM model to the measured base impedances. The presence of the tower base insulator's reactances was also taken into account for reactance consequences at the 1550 kHz operating frequency.

With respect to the KFEQ towers, filtering and detuning circuits are located after the sampling transformers, as is a static drain choke for each tower. Therefore their presence was considered in addition to the other existing base reactances (such as the "Austin Ring" lighting transformers and the base insulators) at the KESJ operating frequency of 1550 kHz.

Tower base environment circuit calculations were then performed both manually and by using the "WCAP" network analysis program software provided by *Westberg Consulting.* (The WCAP software performs nodal analysis calculations, similar to "SPICE" and other circuit analysis software.) These calculations were used throughout the proof process to relate the MoM modeled impedances to the ATU output measurement (reference) points.

As shown on the following pages, the Open Circuit Reactance ("X_{OC}") found at each tower was calculated for the assumed base conditions for all towers. This value was then used in the MoM model as a "load" at ground level for the open circuited ("OC") MoM individual model "self" (individual tower) case. Using these assumed lumped loads, base environment, and MoM analysis, initial values were derived and the model converged.

A schematic of the assumed circuit, along with a summary of results and a tabulation of WCAP calculated values, is provided in the following pages. Both the KESJ and the KFEQ cases are individually discussed since the base circuits are different for each station. Values for

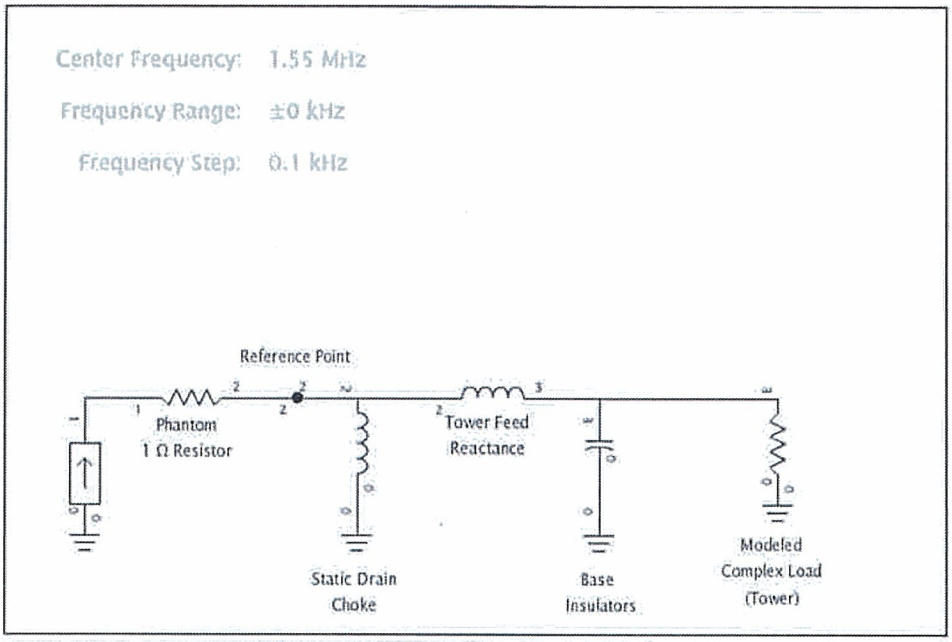
the various shunt stray reactances for base insulators, static drain chokes, and lighting system components (if present) are based upon manufacturer supplied information, and are included below the following representative schematics, along with their combined "lumped load" assumptions.

In each of the WCAP tabulations and the representative schematic shown below for KESJ, "Node 2" represents the ATU output "reference point" (TCT location). "Node 3" represents the tower feed-point. "Node 0" represents ground potential. In the Open Circuit "Tower Self" analysis tabulations for each tower, the calculated ATU output impedances appear under the "TO IMPEDANCE" columns, following the "phantom" 1 ohm resistors (R_{1-2}). This phantom resistor is included in series with the drive current sources (I_{0-1}) to provide defined calculation points in the software. The tower feed-point impedances from the MoM model are represented by "complex loads" from "Node 3" to ground (R_{3-0}).

In each of the WCAP tabulations and the representative schematic shown for KFEQ, "Node 2" represents the ATU output "reference point" (TCT location). "Node 5" represents the tower feed-point. "Node 0" represents ground potential. In the Open Circuit "Tower Self" analysis tabulations for each tower, the calculated ATU output impedances appear under the "TO IMPEDANCE" columns, following the "phantom" 1 ohm resistors (R_{3-2}). This phantom resistor is included in series with the drive current sources (I_{0-3}) to provide defined calculation points in the software. The tower feed-point impedances from the MoM model are represented by "complex loads" from "Node 5" to ground (R_{5-0}).

As shown, the modeled and measured base impedances at the ATU output jacks (with the other towers open circuited at their ATU output jacks) agree with each other within +/- 2 ohms and +/- 4 percent for resistance and reactance, as required under the Commission's MoM Rules.

Representative Open Circuit Tower Base Environment Schematic for all KESJ Towers



Summary of Completed Open Circuit Analysis of KESJ Tower Base Environment

Tower Number And Location	Tower Feed Inductance	Tower Feed Reactance X_L	Complex Load Impedance $Z_{Modeled}$	Reference Point* Z_{ATU} Modeled	Reference Point* Z_{ATU} Measured
1 – Northwest	4.171 µH	40.621 Ω	52.861 +j45.267 Ω	52.93 +j85.307 Ω	54.1 +j85.3 Ω
2 – Southeast	3.656 µH	35.606 Ω	52.517 +j49.688Ω	52.68 +j84.806 Ω	53.2 +j84.8 Ω
3 – Southwest	1.078 µH	10.499 Ω	55.157 +j72.843Ω	55.85 +j83.408 Ω	56.7 +j83.4 Ω
4 – Northeast	1.905 µH	18.553 Ω	51.788 +j69.914Ω	52.33 +j88.404 Ω	51.2 +j88.4 Ω

Notes:

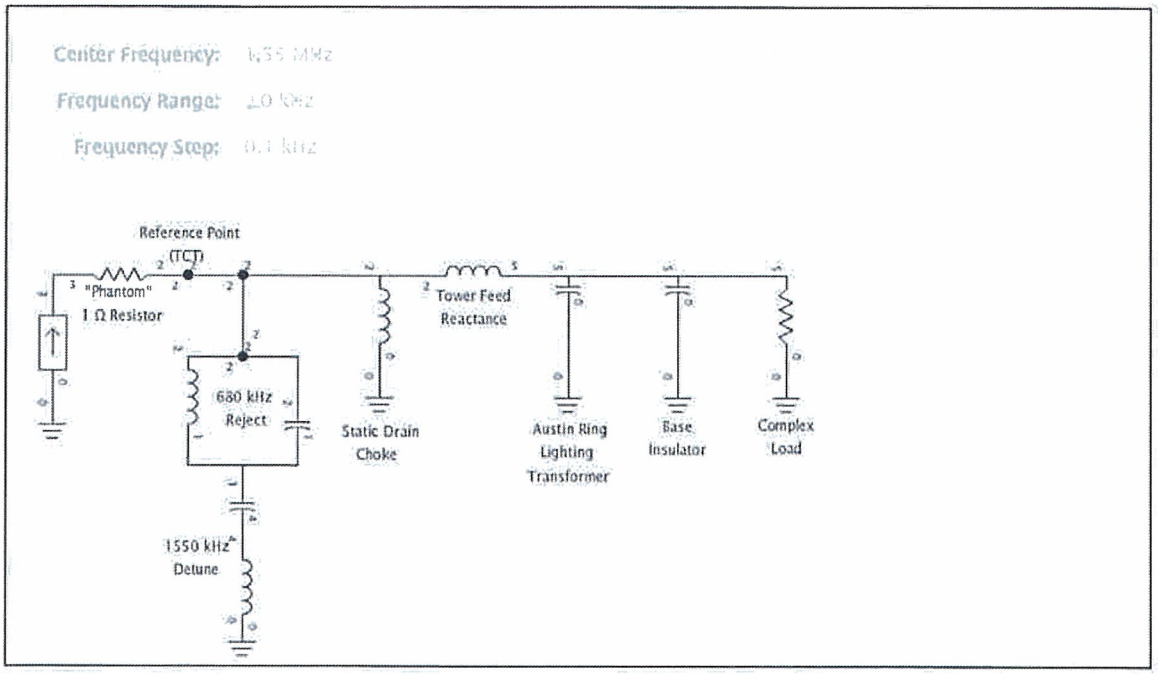
* - At KESJ ATU Output Jack J-Plug (TCT Location); Designated as ATU "Reference Point"

Static Drain Choke Reactance at 1550 kHz: +10,500 Ω Inductance: 1,087.1 µH

Base Insulator Reactance at 1550 kHz: - 5,134.0 Ω Capacitance: ~ 20 pF

Lumped Load Assumption at 1550 kHz: - 10,046.0 Ω
(Base Insulator and Static Drain Choke)

Representative Open Circuit Tower Base Environment Schematic for all KFEQ Towers



Summary of Completed Open Circuit Analysis of KFEQ Tower Base Environment

Tower Number and Location	Tower Feed Inductance	Tower Feed Reactance X_L	Complex Load Impedance $Z_{Modeled}$	Reference Point* Z_{ATU} Modeled	Reference Point* Z_{ATU} Measured
1 – Northwest	0.05 μH	0.5 Ω	281.89 -j509.04 Ω	0.01 –j4.045 Ω	0.436 –j4.11 Ω
2 – Southeast	0.05 μH	0.5 Ω	287.73 –j536.83 Ω	0.00 –j2.195 Ω	0.519 –j2.06 Ω
3 – Southwest	0.05 μH	0.5 Ω	264.26 –j515.32 Ω	0.00 –j1.708 Ω	0.455 –j1.74 Ω
4 - Northeast	0.05 μH	0.5 Ω	270.89 –j472.58 Ω	0.00 –j0.479 Ω	0.572 –j0.42 Ω

Notes:

* - At KFEQ ATU Output Jack J-Plug (TCT Location); Designated as ATU "Reference Point"

Static Drain Choke Reactance at 1550 kHz: +15,500 Ω Inductance: 1,591.5 μH

Base Insulator Reactance at 1550 kHz: - 6,417.5 Ω Capacitance: ~ 16 pF

Austin Ring Lighting Transformer Reactance at 1550 kHz: - 4,464.4 Ω Capacitance: ~ 23 pF

Lumped Load Assumption at 1550 kHz: - 3,171.6 Ω
(Base Insulator, Austin Ring Transformer and Static Drain Choke)

Reject/Detune circuit measured values are included in the following KFEQ Tower WCAP Summaries

Circuit Analysis Used for Each Tower to Verify Method of Moments Model

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 1 (Northwest)

KESJ Tower 1 - Open Circuit – Self **WCAP OUTPUT AT FREQUENCY: 1.550 MHz**

NODE VOLTAGES

Node:	1	100.9242	∡	57.6991°	V
Node:	2	100.3934	∡	58.1815°	V
Node:	3	69.6401	∡	40.2708°	V

WCAP PART			CURRENT IN				CURRENT OUT			
WCAP PART		CURRENT	BRANCH VOLTAGE				BRANCH			
R	3→0	52.86100000	69.64	∡	40.271°	V	1.00	∡	-0.304°	A
C	3→0	0.00002000	69.64	∡	40.271°	V	0.01	∡	130.271°	A
L	2→3	4.17100000	40.29	∡	90.291°	V	0.99	∡	0.291°	A
L	2→0	1078.00000000	100.39	∡	58.181°	V	0.01	∡	-31.819°	A
R	1→2	1.00000000	1.00	∡	0.000°	V	1.00	∡	0.000°	A

WCAP PART			FROM IMPEDANCE				TO IMPEDANCE			
R	3→0	52.86100000	52.86	+	j	45.267	0.00	+	j	0.000
C	3→0	0.00002000	0.00	-	j	5134.030	0.00	+	j	0.000
L	2→3	4.17100000	53.80	+	j	85.732	53.80	+	j	45.111
L	2→0	1078.00000000	0.01	+	j	10498.574	0.00	+	j	0.000
R	**1→2**	1.00000000	53.93	+	j	85.307	**52.93**	+	**j**	**85.307**

Measured: 54.1 + j 85.3
(Difference: 1.17 0.007)

WCAP PART **VSWR**

WCAP INPUT DATA:

	1.5500	0.0001	1	
R	52.86100000	3	0	45.26700000
C	0.00002000	3	0	
L	4.17100000	2	3	0.00000000
L	1078.00000000	2	0	0.00000000
R	1.00000000	1	2	0.00000000
I	1.00000000	0	1	0.00000000

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 2 (Southeast)

KESJ Tower 2 - Open Circuit – Self **WCAP OUTPUT AT FREQUENCY: 1.550 MHz**

NODE VOLTAGES

Node:	1	100.3690	∡	57.6661°	V
Node:	2	99.8377	∡	58.1510°	V
Node:	3	72.4114	∡	43.1125°	V

WCAP PART **CURRENT IN** **CURRENT OUT**

WCAP PART			BRANCH VOLTAGE				BRANCH CURRENT			
R	3→0	52.51700000	72.41	∡	43.113°	V	1.00	∡	-0.302°	A
C	3→0	0.00002000	72.41	∡	43.113°	V	0.01	∡	133.113°	A
L	2→3	3.65600000	35.32	∡	90.290°	V	0.99	∡	0.290°	A
L	2→0	1078.00000000	99.84	∡	58.151°	V	0.01	∡	-31.849°	A
R	1→2	1.00000000	1.00	∡	0.000°	V	1.00	∡	0.000°	A

WCAP PART			FROM IMPEDANCE				TO IMPEDANCE			
R	3→0	52.51700000	52.52	+	j	49.688	0.00	+	j	0.000
C	3→0	0.00002000	0.00	-	j	5134.030	0.00	+	j	0.000
L	2→3	3.65600000	53.54	+	j	85.226	53.54	+	j	49.621
L	2→0	1078.00000000	-0.01	+	j	10498.574	0.00	+	j	0.000
R	**1→2**	1.00000000	53.68	+	j	84.806	**52.68**	**+**	**j**	**84.806**

Measured:	**53.2**	**+**	**j**	**84.8**
(Difference:	0.52			0.006)

WCAP PART **VSWR**

WCAP INPUT DATA:

	1.5500	0.0001	1	
R	52.51700000	3	0	49.68800000
C	0.00002000	3	0	
L	3.65600000	2	3	0.00000000
L	1078.00000000	2	0	0.00000000
R	1.00000000	1	2	0.00000000
I	1.00000000	0	1	0.00000000

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 3 (Southwest)

KESJ Tower 3 - Open Circuit – Self **WCAP OUTPUT AT FREQUENCY: 1.550 MHz**

NODE VOLTAGES

Node:	1	100.9412	∡	55.7207°	V
Node:	2	100.3814	∡	56.1923°	V
Node:	3	91.9441	∡	52.5497°	V

WCAP PART **CURRENT IN** **CURRENT OUT**

WCAP PART			BRANCH VOLTAGE				BRANCH CURRENT			
R	3→0	55.15700000	91.94	∡	52.550°	V	1.01	∡	-0.317°	A
C	3→0	0.00002000	91.94	∡	52.550°	V	0.02	∡	142.550°	A
L	2→3	1.07800000	10.42	∡	90.307°	V	0.99	∡	0.307°	A
L	2→0	1078.00000000	100.38	∡	56.192°	V	0.01	∡	-33.808°	A
R	1→2	1.00000000	1.00	∡	0.000°	V	1.00	∡	0.000°	A

WCAP PART			FROM IMPEDANCE				TO IMPEDANCE			
R	3→0	55.15700000	55.16	+	j	72.843	0.00	+	j	0.000
C	3→0	0.00002000	0.00	-	j	5134.030	0.00	+	j	0.000
L	2→3	1.07800000	56.75	+	j	83.772	56.75	+	j	73.273
L	2→0	1078.00000000	0.00	+	j	10498.574	0.00	+	j	0.000
R	**1→2**	1.00000000	56.85	+	j	83.408	**55.85**	**+**	**j**	**83.408**

Measured: 56.7 + j 83.4
(Difference: 0.85 0.008)

WCAP PART **VSWR**

WCAP INPUT DATA:

	1.5500	0.0001	1	
R	55.15700000	3	0	72.84300000
C	0.00002000	3	0	
L	1.07800000	2	3	0.00000000
L	1078.00000000	2	0	0.00000000
R	1.00000000	1	2	0.00000000
I	1.00000000	0	1	0.00000000

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 4 (Northeast)

KESJ Tower 4 - Open Circuit – Self WCAP OUTPUT AT FREQUENCY: 1.550 MHz

NODE VOLTAGES

Node:	1	103.2450	∡	58.8990°	V
Node:	2	102.7321	∡	59.3766°	V
Node:	3	87.4605	∡	53.1733°	V

WCAP PART **CURRENT IN** **CURRENT OUT**

WCAP PART			BRANCH VOLTAGE				BRANCH CURRENT			
R	3→0	51.78800000	87.46	∡	53.173°	V	1.01	∡	-0.298°	A
C	3→0	0.00002000	87.46	∡	53.173°	V	0.02	∡	143.173°	A
L	2→3	1.90500000	18.40	∡	90.288°	V	0.99	∡	0.288°	A
L	2→0	1078.00000000	102.73	∡	59.377°	V	0.01	∡	-30.623°	A
R	1→2	1.00000000	1.00	∡	0.000°	V	1.00	∡	0.000°	A

WCAP PART			FROM IMPEDANCE				TO IMPEDANCE			
R	3→0	51.78800000	51.79	+	j	69.914	0.00	+	j	0.000
C	3→0	0.00002000	0.00	-	j	5134.030	0.00	+	j	0.000
L	2→3	1.90500000	53.22	+	j	88.888	53.22	+	j	70.335
L	2→0	1078.00000000	0.00	+	j	10498.574	0.00	+	j	0.000
R	**1→2**	1.00000000	53.33	+	j	88.404	**52.33**	**+**	**j**	**88.404**

Measured: 51.2 + j 88.4
(Difference: 1.03 0.004)

WCAP PART **VSWR**

WCAP INPUT DATA:

	1.5500	0.0001	1	
R	51.78800000	3	0	69.91400000
C	0.00002000	3	0	
L	1.90500000	2	3	0.00000000
L	1078.00000000	2	0	0.00000000
R	1.00000000	1	2	0.00000000
I	1.00000000	0	1	0.00000000

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 5 (*KFEQ Tower 1 - East*)

KESJ Tower 5 – KFEQ T1 (E) Open Circuit – Self **WCAP OUTPUT AT FREQUENCY: 1.550 MHz**

NODE VOLTAGES

Node:	1	56.6177	∡	90.1933°	V
Node:	2	4.0449	∡	-89.8067°	V
Node:	3	4.1700	∡	-75.9316°	V
Node:	4	158.5418	∡	90.1933°	V
Node:	5	4.0487	∡	-89.8299°	V

WCAP PART **CURRENT IN** **CURRENT OUT**

WCAP PART			BRANCH VOLTAGE				BRANCH CURRENT			
R	5→0	281.89000000	4.05	∡	-89.830°	V	0.01	∡	-28.806°	A
C	5→0	0.00001600	4.05	∡	-89.830°	V	0.01	∡	0.170°	A
C	5→0	0.00002300	4.05	∡	-89.830°	V	0.01	∡	0.170°	A
L	2→5	0.05000000	0.00	∡	66.321°	V	0.01	∡	-23.679°	A
L	2→0	1591.50000000	4.04	∡	-89.807°	V	0.00	∡	-179.807°	A
C	2→1	0.00208000	60.66	∡	-89.807°	V	1.23	∡	0.193°	A
L	2→1	26.37000000	60.66	∡	-89.807°	V	0.24	∡	-179.807°	A
C	1→4	0.00100000	101.92	∡	-89.807°	V	0.99	∡	0.193°	A
L	4→0	16.40000000	158.54	∡	90.193°	V	0.99	∡	0.193°	A
R	3→2	1.00000000	1.00	∡	0.001°	V	1.00	∡	0.001°	A

WCAP PART			FROM IMPEDANCE				TO IMPEDANCE			
R	5→0	281.89000000	281.89	-	j	509.040	0.00	+	j	0.000
C	5→0	0.00001600	0.00	-	j	6417.538	0.00	+	j	0.000
C	5→0	0.00002300	0.00	-	j	4464.374	0.00	+	j	0.000
L	2→5	0.05000000	196.37	-	j	443.698	196.37	-	j	444.184
L	2→0	1591.50000000	0.01	+	j	15499.519	0.00	+	j	0.000
C	2→1	0.00208000	0.00	-	j	3.292	0.00	+	j	46.074
L	2→1	26.37000000	-0.01	+	j	17.124	0.00	-	j	239.691
C	1→4	0.00100000	0.00	+	j	57.038	0.00	+	j	159.719
L	4→0	16.40000000	0.00	+	j	159.719	0.00	+	j	0.000
R	**3→2**	1.00000000	1.01	-	j	4.045	**0.01**	**-**	**j**	**4.045**

Measured: 0.436 - j 4.11
(Difference: 0.426 0.065)

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 5 (*KFEQ Tower 1 - East*) (Continued)

KESJ Tower 5 – KFEQ T1 (E) Open Circuit – Self WCAP OUTPUT AT FREQUENCY: 1.550 MHz

WCAP PART VSWR

WCAP INPUT DATA:

	1.5500	0.0001	1	
R	51.78800000	3	0	69.91400000
R	281.89000000	5	0	-509.04000000
C	0.00001600	5	0	
C	0.00002300	5	0	
L	0.05000000	2	5	0.00000000
L	1591.50000000	2	0	0.00000000
C	0.00208000	2	1	
L	26.37000000	2	1	0.00000000
C	0.00100000	1	4	
L	16.40000000	4	0	0.00000000
R	1.00000000	3	2	0.00000000
I	1.00000000	0	3	0.00000000

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 6 (*KFEQ Tower 2 – East Central*)

KESJ Tower 6 – KFEQ T2 (E-C) Open Circuit – Self **WCAP OUTPUT AT FREQUENCY: 1.550 MHz**

NODE VOLTAGES

Node:	1	54.8771	∡	90.0976°	V
Node:	2	2.1918	∡	-89.9024°	V
Node:	3	2.4107	∡	-65.3948°	V
Node:	4	157.1607	∡	90.0976°	V
Node:	5	2.1938	∡	-89.9241°	V

WCAP PART			CURRENT IN				CURRENT OUT			
WCAP PART			**BRANCH VOLTAGE**				**BRANCH CURRENT**			
R	5→0	287.73000000	2.19	∡	-89.924°	V	0.00	∡	-28.114°	A
C	5→0	0.00001600	2.19	∡	-89.924°	V	0.00	∡	0.076°	A
C	5→0	0.00002300	2.19	∡	-89.924°	V	0.00	∡	0.076°	A
L	2→5	0.05000000	0.00	∡	67.072°	V	0.00	∡	-22.928°	A
L	2→0	1591.50000000	2.19	∡	-89.902°	V	0.00	∡	-179.902°	A
C	2→1	0.00222000	57.07	∡	-89.902°	V	1.23	∡	0.098°	A
L	2→1	24.65000000	57.07	∡	-89.902°	V	0.24	∡	-179.902°	A
C	1→4	0.00100000	102.28	∡	-89.902°	V	1.00	∡	0.098°	A
L	4→0	16.20000000	157.16	∡	90.098°	V	1.00	∡	0.098°	A
R	3→2	1.00000000	1.00	∡	0.000°	V	1.00	∡	0.000°	A

WCAP PART			**FROM IMPEDANCE**				**TO IMPEDANCE**			
R	5→0	287.73000000	287.73	-	j	536.830	0.00	+	j	0.000
C	5→0	0.00001600	-0.00	-	j	6417.538	0.00	+	j	0.000
C	5→0	0.00002300	-0.01	-	j	4464.374	0.00	+	j	0.000
L	2→5	0.05000000	196.90	-	j	463.297	196.90	-	j	463.784
L	2→0	1591.50000000	0.00	+	j	15499.519	0.00	+	j	0.000
C	2→1	0.00222000	-0.00	-	j	1.776	0.00	+	j	44.476
L	2→1	24.65000000	0.00	+	j	9.220	0.00	-	j	230.845
C	1→4	0.00100000	-0.00	+	j	55.090	0.00	+	j	157.771
L	4→0	16.20000000	0.00	+	j	157.771	0.00	+	j	0.000
R	**3→2**	1.00000000	1.00	-	j	2.192	**0.00**	**-**	**j**	**2.192**

Measured: 0.519 - j 2.06
(Difference: 0.519 0.136)

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 6 (*KFEQ Tower 2 – East Central*) (Continued)

KESJ Tower 6 – KFEQ T2 (E-C) Open Circuit – Self **WCAP OUTPUT AT FREQUENCY: 1.550 MHz**

WCAP PART **VSWR**

WCAP INPUT DATA:

	1.5500	0.0001	1	
R	287.73000000	5	0	-536.83000000
C	0.00001600	5	0	
C	0.00002300	5	0	
L	0.05000000	2	5	0.00000000
L	1591.50000000	2	0	0.00000000
C	0.00222000	2	1	
L	24.65000000	2	1	0.00000000
C	0.00100000	1	4	
L	16.20000000	4	0	0.00000000
R	1.00000000	3	2	0.00000000
I	1.00000000	0	3	0.00000000

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 7 (*KFEQ Tower 3 - West Central*)

KESJ Tower 7 – KFEQ T3 (W-C) Open Circuit – Self **WCAP OUTPUT AT FREQUENCY: 1.550 MHz**

NODE VOLTAGES

Node:	1	55.4012	∡	90.0772°	V
Node:	2	1.7080	∡	-89.9228°	V
Node:	3	1.9803	∡	-59.5938°	V
Node:	4	157.7566	∡	90.0772°	V
Node:	5	1.7096	∡	-89.9448°	V

WCAP PART			CURRENT IN BRANCH VOLTAGE				CURRENT OUT BRANCH CURRENT			
R	5→0	264.26000000	1.71	∡	-89.945°	V	0.00	∡	-27.094°	A
C	5→0	0.00001600	1.71	∡	-89.945°	V	0.00	∡	0.055°	A
C	5→0	0.00002300	1.71	∡	-89.945°	V	0.00	∡	0.055°	A
L	2→5	0.05000000	0.00	∡	67.704°	V	0.00	∡	-22.296°	A
L	2→0	1591.50000000	1.71	∡	-89.923°	V	0.00	∡	-179.923°	A
C	2→1	0.00222000	57.11	∡	-89.923°	V	1.23	∡	0.077°	A
L	2→1	24.65000000	57.11	∡	-89.923°	V	0.24	∡	-179.923°	A
C	1→4	0.00100000	102.36	∡	-89.923°	V	1.00	∡	0.077°	A
L	4→0	16.25000000	157.76	∡	90.077°	V	1.00	∡	0.077°	A
R	3→2	1.00000000	1.00	∡	0.000°	V	1.00	∡	0.000°	A

WCAP PART			FROM IMPEDANCE				TO IMPEDANCE			
R	5→0	264.26000000	264.26	-	j	515.320	0.00	+	j	0.000
C	5→0	0.00001600	0.00	-	j	6417.538	0.00	+	j	0.000
C	5→0	0.00002300	0.01	-	j	4464.374	0.00	+	j	0.000
L	2→5	0.05000000	183.53	-	j	445.887	183.53	-	j	446.374
L	2→0	1591.50000000	0.00	+	j	15499.519	0.00	+	j	0.000
C	2→1	0.00222000	0.00	-	j	1.383	0.00	+	j	44.869
L	2→1	24.65000000	-0.00	+	j	7.180	-0.00	-	j	232.885
C	1→4	0.00100000	-0.00	+	j	55.577	-0.00	+	j	158.258
L	4→0	16.25000000	-0.00	+	j	158.258	0.00	+	j	0.000
R	**3→2**	1.00000000	1.00	-	j	1.708	**0.00**	-	j	**1.708**

Measured: 0.455 - j 1.74
(Difference: 0.455 0.032)

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 7 (*KFEQ Tower 3 – West Central*) (Continued)

KESJ Tower 7 – KFEQ T3 (W-C) Open Circuit – Self WCAP OUTPUT AT FREQUENCY: 1.550 MHz

WCAP PART VSWR

WCAP INPUT DATA:

	1.5500	0.0001	1	
R	264.26000000	5	0	-515.32000000
C	0.00001600	5	0	
C	0.00002300	5	0	
L	0.05000000	2	5	0.00000000
L	1591.50000000	2	0	0.00000000
C	0.00222000	2	1	
L	24.65000000	2	1	0.00000000
C	0.00100000	1	4	
L	16.25000000	4	0	0.00000000
R	1.00000000	3	2	0.00000000
I	1.00000000	0	3	0.00000000

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 8 (*KFEQ Tower 4 - West*)

KESJ Tower 8 – KFEQ T4 (W) Open Circuit – Self WCAP OUTPUT AT FREQUENCY: 1.550 MHz

NODE VOLTAGES

Node:	1	56.9858	∡	90.0251°	V
Node:	2	0.4790	∡	-89.9749°	V
Node:	3	1.1090	∡	-25.5901°	V
Node:	4	159.5725	∡	90.0251°	V
Node:	5	0.4795	∡	-90.0004°	V

WCAP PART **CURRENT IN** **CURRENT OUT**

WCAP PART			BRANCH VOLTAGE				BRANCH CURRENT			
R	5→0	270.89000000	0.48	∡	-90.000°	V	0.01	∡	-29.822°	A
C	5→0	0.00001600	0.48	∡	-90.000°	V	0.01	∡	-0.000°	A
C	5→0	0.00002300	0.48	∡	-90.000°	V	0.00	∡	-0.000°	A
L	2→5	0.05000000	0.01	∡	65.163°	V	0.00	∡	-24.837°	A
L	2→0	1591.50000000	0.48	∡	-89.975°	V	0.00	∡	-179.975°	A
C	2→1	0.00221000	57.46	∡	-89.975°	V	1.24	∡	0.025°	A
L	2→1	24.82000000	57.46	∡	-89.975°	V	0.24	∡	-179.975°	A
C	1→4	0.00100000	102.59	∡	-89.975°	V	1.00	∡	0.025°	A
L	4→0	16.40000000	159.57	∡	90.025°	V	1.00	∡	0.025°	A
R	3→2	1.00000000	1.00	∡	0.000°	V	1.00	∡	0.000°	A

WCAP PART			FROM IMPEDANCE				TO IMPEDANCE			
R	5→0	270.89000000	270.89	-	j	472.580	0.00	+	j	0.000
C	5→0	0.00001600	0.01	-	j	6417.538	0.00	+	j	0.000
C	5→0	0.00002300	0.00	-	j	4464.374	0.00	+	j	0.000
L	2→5	0.05000000	193.25	-	j	417.033	193.25	-	j	417.520
L	2→0	1591.50000000	-0.01	+	j	15499.519	0.00	+	j	0.000
C	2→1	0.00221000	0.00	-	j	0.387	0.00	+	j	46.075
L	2→1	24.82000000	0.01	+	j	2.015	0.01	-	j	239.706
C	1→4	0.00100000	0.00	+	j	57.038	0.00	+	j	159.719
L	4→0	16.40000000	0.00	+	j	159.719	0.00	+	j	0.000
R	**3→2**	1.00000000	1.00	-	j	0.479	0.00	-	j	0.479

Measured: 0.572 - j 0.42
(Difference: 0.572 0.059)

WCAP Tower Base Open Circuit "Self" Analysis – KESJ Tower 8 (*KFEQ Tower 4 – West*)
(Continued)

KESJ Tower 8 – KFEQ T4 (W) Open Circuit – Self WCAP OUTPUT AT FREQUENCY: 1.550 MHz

WCAP PART VSWR

WCAP INPUT DATA:

	1.5500	0.0001	1	
R	270.89000000	5	0	-472.58000000
C	0.00001600	5	0	
C	0.00002300	5	0	
L	0.05000000	2	5	0.00000000
L	1591.50000000	2	0	0.00000000
C	0.00221000	2	1	
L	24.82000000	2	1	0.00000000
C	0.00100000	1	4	
L	16.40000000	4	0	0.00000000
R	1.00000000	3	2	0.00000000
I	1.00000000	0	3	0.00000000

Details of MoM "Open Circuit" Modeling - for Towers Driven Individually

In the underlying MoM modeling used in the preceding work, each tower is first considered individually. "Open Circuit" ("OC" or "Self") analysis calculations are made based upon the physical characteristics of the array. The modeled data is then "converged" with the "as-measured" data for each tower by applying corrections for velocity of propagation through the towers and assumed stray base reactances. For the analysis of this antenna array, "Expert MiniNEC Broadcast Professional" software (Version 14.5 –published by *EM Scientific Inc.*) was employed to develop the initial individual tower cases. Copies of program outputs are provided in the following pages to demonstrate the methods used and results achieved.

All of the antenna system radiators are identical, uniform cross-section, guyed *ERI* (Electronic Research Incorporated) towers. Given the slender diameters of the involved towers (18 and 21 inch faces), the accepted practice of using a single "wire" approach to represent each tower was employed herein, as opposed to a lattice or wire-frame model. The top and bottom wire end points of each of the tower wires were specified in electrical degrees in the Cartesian coordinate system. No end caps were employed. A perfect ground environment was also assumed. The geometry data used in this analysis were taken from the theoretical directional antenna specifications for KESJ and from the surveyed information for collocated KFEQ.

The KESJ towers are 90 electrical degrees high at 1550 kHz. For the purposes of this analysis, they were modeled using 10 segments. As such, the segment length is 9 degrees, which satisfies the Commission's requirement under §73.151(c)(1)(iii) that no less than one segment be used for 10 electrical degrees of the tower's physical height.

Similarly, the physical height of the KFEQ towers is 187.2 degrees at 1550 kHz. Since the KFEQ towers were modeled using 20 segments in this analysis, each segment length is 9.36 degrees, thus also satisfying the Commission's Method-of-Moments modeling criteria.

After the initial setup of antenna array information in the model, the individual towers were studied iteratively with all other towers open circuited[4], while characteristics were adjusted (in height and radius) until the modeled resistance approximately matched the measured resistance. Final adjustments to converge the model reactances with the measured reactances were made through the introduction of the WCAP circuit model, shown in the preceding pages, which allowed an approximation of the series stray reactances found in the tower base environment.

Each tower's adjusted modeled height relative to its physical height falls within the required range of 75 to 125 percent. Each modeled tower radius fell 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 sides. A summary of this portion of the model input data is provided below:

Tower	Radiator Physical Height	Modeled Height	Modeled % of Height	Radiator Physical Equivalent Radius	Modeled Radius	Modeled % of Radius
1– NW	90°	96°	106.7%	0.2183 m	0.297 m	136.1%
2 – SE	90°	97°	107.8%	0.2183 m	0.297 m	136.1%
3 – SW	90°	100°	111.1%	0.2183 m	0.297 m	136.1%
4 – NE	90°	100°	111.1%	0.2183 m	0.297 m	136.1%
5 (KFEQ–E)	187.2°	187°	99.9%	0.2574 m	0.231 m	89.7%
6 (KFEQ– EC)	187.2°	187°	99.9%	0.2574 m	0.231 m	89.7%
7 (KFEQ-WC)	187.2°	187°	99.9%	0.2574 m	0.231 m	89.7%
8 (KFEQ-W)	187.2°	187°	99.9%	0.2574 m	0.231 m	89.7%

The preceding WCAP tabulations detailed the base circuit analysis; the following tabulations show the details of the MoM OC models for the individually driven towers.

[4] The MoM model incorporated assumed loads at ground level for the "other" open circuited towers in the array using the stray shunt reactance data that were calculated using the base circuit models for the open circuited towers. The overall circuit model consists of series and parallel branches representing feedline inductances, shunt inductances (such as static drain chokes), and stray capacitances, such as base insulator capacitance to ground. For the initial lumped load assumptions, only shunt reactances were considered. Series feedline stray reactances are added in the final convergence step.

MoM Model Details for Towers Driven Individually – KESJ Tower 1 OC Self - (1 of 4)

KESJ T1 Open Circuit Self

GEOMETRY: Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.297	10
		0	0	96.		
2	none	121.6	116.9	0	.297	10
		121.6	116.9	97.		
3	none	99.9	171.	0	.297	10
		99.9	171.	100.		
4	none	95.	66.	0	.297	10
		95.	66.	100.		
5	none	705.8	93.4	0	.231	20
		705.8	93.4	187.		
6	none	489.1	93.4	0	.231	20
		489.1	93.4	187.		
7	none	272.4	93.4	0	.231	20
		272.4	93.4	187.		
8	none	161.3	273.4	0	.231	20
		161.3	273.4	187.		

Number of wires = 8 current nodes = 120

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	9.35	3	10.
radius	5	.231	1	.297

ELECTRICAL DESCRIPTION - Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.55	0	1	.0259722	.0277778

Sources:	source	node	sector	magnitude	phase	type
	1	1	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	0	0	0	0
2	11	0	-10,046.	0	0	0
3	21	0	-10,046.	0	0	0
4	31	0	-10,046.	0	0	0
5	41	0	-3,171.6	0	0	0
6	61	0	-3,171.6	0	0	0
7	81	0	-3,171.6	0	0	0
8	101	0	-3,171.6	0	0	0

MoM Model Details for Towers Driven Individually – KESJ Tower 1 OC Self - (2 of 4)

IMPEDANCE normalization = 50. source = 1; node 1, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.55	52.861	45.267	69.595	40.6	2.3535	-7.8809	-.77221

CURRENT: rms Frequency: 1.55 MHz Input power: .00545701 watts
Efficiency: 100. % coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	.0101604	319.4	7.72E-03	-6.61E-03
2	0	0	9.6	.0105259	316.4	7.63E-03	-7.25E-03
3	0	0	19.2	.0104601	314.7	7.36E-03	-7.43E-03
4	0	0	28.8	.0100787	313.4	6.93E-03	-7.32E-03
5	0	0	38.4	9.4E-03	312.3	6.33E-03	-6.95E-03
6	0	0	48.	8.45E-03	311.4	5.59E-03	-6.34E-03
7	0	0	57.6	7.25E-03	310.6	4.71E-03	-5.51E-03
8	0	0	67.2	5.82E-03	309.8	3.73E-03	-4.47E-03
9	0	0	76.8	4.17E-03	309.1	2.63E-03	-3.24E-03
10	0	0	86.4	2.32E-03	308.5	1.44E-03	-1.82E-03
END	0	0	96.	0	0	0	0
GND	-55.0161	-108.443	0	2.4E-05	127.1	-1.44E-05	1.91E-05
12	-55.0161	-108.443	9.7	2.7E-04	127.	-1.62E-04	2.16E-04
13	-55.0161	-108.443	19.4	4.06E-04	126.8	-2.43E-04	3.25E-04
14	-55.0161	-108.443	29.1	4.93E-04	126.6	-2.94E-04	3.96E-04
15	-55.0161	-108.443	38.8	5.37E-04	126.4	-3.19E-04	4.32E-04
16	-55.0161	-108.443	48.5	5.41E-04	126.2	-3.19E-04	4.37E-04
17	-55.0161	-108.443	58.2	5.07E-04	125.9	-2.97E-04	4.11E-04
18	-55.0161	-108.443	67.9	4.38E-04	125.6	-2.55E-04	3.56E-04
19	-55.0161	-108.443	77.6	3.34E-04	125.3	-1.93E-04	2.72E-04
20	-55.0161	-108.443	87.3	1.96E-04	125.	-1.12E-04	1.6E-04
END	-55.0161	-108.443	97.	0	0	0	0
GND	-98.6701	-15.6278	0	3.61E-05	170.3	-3.56E-05	6.07E-06
22	-98.6701	-15.6278	10.	4.14E-04	170.3	-4.08E-04	6.95E-05
23	-98.6701	-15.6278	20.	6.25E-04	170.4	-6.16E-04	1.04E-04
24	-98.6701	-15.6278	30.	7.6E-04	170.4	-7.49E-04	1.26E-04
25	-98.6701	-15.6278	40.	8.28E-04	170.5	-8.17E-04	1.37E-04
26	-98.6701	-15.6278	50.	8.34E-04	170.5	-8.23E-04	1.37E-04
27	-98.6701	-15.6278	60.	7.82E-04	170.6	-7.71E-04	1.28E-04
28	-98.6701	-15.6278	70.	6.74E-04	170.6	-6.65E-04	1.1E-04
29	-98.6701	-15.6278	80.	5.13E-04	170.7	-5.06E-04	8.29E-05
30	-98.6701	-15.6278	90.	3.E-04	170.7	-2.96E-04	4.83E-05
END	-98.6701	-15.6278	100.	0	0	0	0
GND	38.64	-86.7868	0	2.64E-05	170.8	-2.61E-05	4.21E-06
32	38.64	-86.7868	10.	3.02E-04	170.9	-2.98E-04	4.8E-05
33	38.64	-86.7868	20.	4.55E-04	170.9	-4.49E-04	7.16E-05
34	38.64	-86.7868	30.	5.52E-04	171.	-5.45E-04	8.59E-05
35	38.64	-86.7868	40.	5.99E-04	171.2	-5.92E-04	9.22E-05
36	38.64	-86.7868	50.	6.02E-04	171.3	-5.95E-04	9.13E-05
37	38.64	-86.7868	60.	5.61E-04	171.4	-5.55E-04	8.39E-05
38	38.64	-86.7868	70.	4.82E-04	171.6	-4.77E-04	7.08E-05
39	38.64	-86.7868	80.	3.65E-04	171.7	-3.61E-04	5.28E-05
40	38.64	-86.7868	90.	2.12E-04	171.8	-2.1E-04	3.02E-05
END	38.64	-86.7868	100.	0	0	0	0

MoM Model Details for Towers Driven Individually – KESJ Tower 1 OC Self - (3 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-41.8585	-704.558	0	2.18E-05	128.4	-1.36E-05	1.71E-05
42	-41.8585	-704.558	9.35	8.78E-05	128.6	-5.48E-05	6.86E-05
43	-41.8585	-704.558	18.7	1.33E-04	128.9	-8.37E-05	1.04E-04
44	-41.8585	-704.558	28.05	1.72E-04	129.3	-1.09E-04	1.33E-04
45	-41.8585	-704.558	37.4	2.05E-04	129.7	-1.31E-04	1.58E-04
46	-41.8585	-704.558	46.75	2.32E-04	130.1	-1.5E-04	1.78E-04
47	-41.8585	-704.558	56.1	2.54E-04	130.5	-1.65E-04	1.93E-04
48	-41.8585	-704.558	65.45	2.7E-04	131.	-1.77E-04	2.04E-04
49	-41.8585	-704.558	74.8	2.81E-04	131.5	-1.86E-04	2.1E-04
50	-41.8585	-704.558	84.15	2.85E-04	132.	-1.91E-04	2.11E-04
51	-41.8585	-704.558	93.5	2.83E-04	132.6	-1.91E-04	2.08E-04
52	-41.8585	-704.558	102.85	2.75E-04	133.1	-1.88E-04	2.01E-04
53	-41.8585	-704.558	112.2	2.61E-04	133.7	-1.81E-04	1.89E-04
54	-41.8585	-704.558	121.55	2.42E-04	134.4	-1.7E-04	1.73E-04
55	-41.8585	-704.558	130.9	2.19E-04	135.1	-1.55E-04	1.54E-04
56	-41.8585	-704.558	140.25	1.91E-04	135.8	-1.37E-04	1.33E-04
57	-41.8585	-704.558	149.6	1.59E-04	136.6	-1.16E-04	1.09E-04
58	-41.8585	-704.558	158.95	1.24E-04	137.5	-9.15E-05	8.39E-05
59	-41.8585	-704.558	168.3	8.68E-05	138.4	-6.49E-05	5.76E-05
60	-41.8585	-704.558	177.65	4.69E-05	139.5	-3.56E-05	3.04E-05
END	-41.8585	-704.558	187.	0	0	0	0
GND	-29.0068	-488.239	0	3.72E-05	358.8	3.71E-05	-7.65E-07
62	-29.0068	-488.239	9.35	1.5E-04	359.1	1.5E-04	-2.37E-06
63	-29.0068	-488.239	18.7	2.28E-04	359.5	2.28E-04	-1.86E-06
64	-29.0068	-488.239	28.05	2.95E-04	0.0	2.95E-04	1.83E-07
65	-29.0068	-488.239	37.4	3.53E-04	.6	3.53E-04	3.57E-06
66	-29.0068	-488.239	46.75	4.03E-04	1.2	4.03E-04	8.11E-06
67	-29.0068	-488.239	56.1	4.43E-04	1.8	4.43E-04	1.35E-05
68	-29.0068	-488.239	65.45	4.74E-04	2.4	4.73E-04	1.96E-05
69	-29.0068	-488.239	74.8	4.95E-04	3.	4.94E-04	2.6E-05
70	-29.0068	-488.239	84.15	5.05E-04	3.7	5.04E-04	3.23E-05
71	-29.0068	-488.239	93.5	5.04E-04	4.4	5.03E-04	3.83E-05
72	-29.0068	-488.239	102.85	4.94E-04	5.1	4.92E-04	4.35E-05
73	-29.0068	-488.239	112.2	4.73E-04	5.8	4.7E-04	4.76E-05
74	-29.0068	-488.239	121.55	4.42E-04	6.5	4.39E-04	5.03E-05
75	-29.0068	-488.239	130.9	4.02E-04	7.3	3.98E-04	5.12E-05
76	-29.0068	-488.239	140.25	3.53E-04	8.1	3.49E-04	5.E-05
77	-29.0068	-488.239	149.6	2.97E-04	9.	2.93E-04	4.65E-05
78	-29.0068	-488.239	158.95	2.34E-04	9.9	2.31E-04	4.03E-05
79	-29.0068	-488.239	168.3	1.65E-04	10.9	1.62E-04	3.11E-05
80	-29.0068	-488.239	177.65	9.03E-05	11.9	8.83E-05	1.86E-05
END	-29.0068	-488.239	187.	0	0	0	0

MoM Model Details for Towers Driven Individually – KESJ Tower 1 OC Self - (4 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-16.1551	-271.921	0	9.66E-05	216.9	-7.73E-05	-5.8E-05
82	-16.1551	-271.921	9.35	3.91E-04	217.1	-3.12E-04	-2.36E-04
83	-16.1551	-271.921	18.7	5.97E-04	217.3	-4.75E-04	-3.62E-04
84	-16.1551	-271.921	28.05	7.76E-04	217.7	-6.15E-04	-4.74E-04
85	-16.1551	-271.921	37.4	9.34E-04	218.	-7.36E-04	-5.75E-04
86	-16.1551	-271.921	46.75	1.07E-03	218.3	-8.4E-04	-6.63E-04
87	-16.1551	-271.921	56.1	1.18E-03	218.7	-9.24E-04	-7.39E-04
88	-16.1551	-271.921	65.45	1.27E-03	219.	-9.88E-04	-8.01E-04
89	-16.1551	-271.921	74.8	1.33E-03	219.4	-1.03E-03	-8.46E-04
90	-16.1551	-271.921	84.15	1.37E-03	219.7	-1.05E-03	-8.75E-04
91	-16.1551	-271.921	93.5	1.37E-03	220.1	-1.05E-03	-8.86E-04
92	-16.1551	-271.921	102.85	1.35E-03	220.5	-1.03E-03	-8.78E-04
93	-16.1551	-271.921	112.2	1.3E-03	220.8	-9.84E-04	-8.51E-04
94	-16.1551	-271.921	121.55	1.22E-03	221.2	-9.19E-04	-8.06E-04
95	-16.1551	-271.921	130.9	1.12E-03	221.6	-8.35E-04	-7.42E-04
96	-16.1551	-271.921	140.25	9.87E-04	222.	-7.33E-04	-6.6E-04
97	-16.1551	-271.921	149.6	8.34E-04	222.4	-6.16E-04	-5.62E-04
98	-16.1551	-271.921	158.95	6.6E-04	222.8	-4.84E-04	-4.49E-04
99	-16.1551	-271.921	168.3	4.68E-04	223.2	-3.41E-04	-3.21E-04
100	-16.1551	-271.921	177.65	2.57E-04	223.7	-1.86E-04	-1.77E-04
END	-16.1551	-271.921	187.	0	0	0	0
GND	9.56612	161.016	0	1.51E-04	345.8	1.47E-04	-3.7E-05
102	9.56612	161.016	9.35	6.12E-04	345.9	5.94E-04	-1.49E-04
103	9.56612	161.016	18.7	9.37E-04	345.9	9.09E-04	-2.28E-04
104	9.56612	161.016	28.05	1.22E-03	346.	1.19E-03	-2.95E-04
105	9.56612	161.016	37.4	1.47E-03	346.1	1.43E-03	-3.54E-04
106	9.56612	161.016	46.75	1.69E-03	346.2	1.64E-03	-4.04E-04
107	9.56612	161.016	56.1	1.87E-03	346.3	1.82E-03	-4.45E-04
108	9.56612	161.016	65.45	2.02E-03	346.3	1.96E-03	-4.76E-04
109	9.56612	161.016	74.8	2.12E-03	346.4	2.06E-03	-4.97E-04
110	9.56612	161.016	84.15	2.18E-03	346.5	2.12E-03	-5.08E-04
111	9.56612	161.016	93.5	2.19E-03	346.6	2.13E-03	-5.07E-04
112	9.56612	161.016	102.85	2.16E-03	346.7	2.1E-03	-4.96E-04
113	9.56612	161.016	112.2	2.08E-03	346.8	2.03E-03	-4.74E-04
114	9.56612	161.016	121.55	1.96E-03	347.	1.91E-03	-4.42E-04
115	9.56612	161.016	130.9	1.79E-03	347.1	1.74E-03	-4.E-04
116	9.56612	161.016	140.25	1.58E-03	347.2	1.54E-03	-3.5E-04
117	9.56612	161.016	149.6	1.34E-03	347.3	1.31E-03	-2.93E-04
118	9.56612	161.016	158.95	1.06E-03	347.5	1.04E-03	-2.3E-04
119	9.56612	161.016	168.3	7.52E-04	347.6	7.35E-04	-1.61E-04
120	9.56612	161.016	177.65	4.12E-04	347.8	4.03E-04	-8.71E-05
END	9.56612	161.016	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 2 OC Self - (1 of 4)

KESJ T2 Open Circuit Self

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.297	10
		0	0	96.		
2	none	121.6	116.9	0	.297	10
		121.6	116.9	97.		
3	none	99.9	171.	0	.297	10
		99.9	171.	100.		
4	none	95.	66.	0	.297	10
		95.	66.	100.		
5	none	705.8	93.4	0	.231	20
		705.8	93.4	187.		
6	none	489.1	93.4	0	.231	20
		489.1	93.4	187.		
7	none	272.4	93.4	0	.231	20
		272.4	93.4	187.		
8	none	161.3	273.4	0	.231	20
		161.3	273.4	187.		

Number of wires = 8
current nodes = 120

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	9.35	3	10.
radius	5	.231	1	.297

ELECTRICAL DESCRIPTION - Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.55	0	1	.0259722	.0277778

Sources:	source	node	sector	magnitude	phase	type
	1	11	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,046.	0	0	0
2	11	0	0	0	0	0
3	21	0	-10,046.	0	0	0
4	31	0	-10,046.	0	0	0
5	41	0	-3,171.6	0	0	0
6	61	0	-3,171.6	0	0	0
7	81	0	-3,171.6	0	0	0
8	101	0	-3,171.6	0	0	0

MoM Model Details for Towers Driven Individually - Tower 2 OC Self - (2 of 4)

IMPEDANCE normalization = 50. source = 1; node 11, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.55	52.517	49.688	72.298	43.4	2.5506	-7.1961	-.919

CURRENT: rms Frequency: 1.55 MHz Input power: .00502365 watts Efficiency: 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	2.3E-05	124.2	-1.3E-05	1.91E-05
2	0	0	9.6	2.58E-04	124.1	-1.45E-04	2.14E-04
3	0	0	19.2	3.88E-04	124.	-2.17E-04	3.22E-04
4	0	0	28.8	4.71E-04	123.8	-2.62E-04	3.92E-04
5	0	0	38.4	5.13E-04	123.6	-2.84E-04	4.28E-04
6	0	0	48.	5.17E-04	123.3	-2.84E-04	4.32E-04
7	0	0	57.6	4.85E-04	123.	-2.64E-04	4.06E-04
8	0	0	67.2	4.18E-04	122.7	-2.26E-04	3.52E-04
9	0	0	76.8	3.19E-04	122.4	-1.71E-04	2.69E-04
10	0	0	86.4	1.87E-04	122.1	-9.94E-05	1.59E-04
END	0	0	96.	0	0	0	0
GND	-55.0161	-108.443	0	9.78E-03	316.6	7.1E-03	-6.72E-03
12	-55.0161	-108.443	9.7	.0101789	313.6	7.02E-03	-7.37E-03
13	-55.0161	-108.443	19.4	.010141	311.9	6.78E-03	-7.54E-03
14	-55.0161	-108.443	29.1	9.79E-03	310.6	6.37E-03	-7.43E-03
15	-55.0161	-108.443	38.8	9.15E-03	309.6	5.82E-03	-7.05E-03
16	-55.0161	-108.443	48.5	8.23E-03	308.6	5.14E-03	-6.43E-03
17	-55.0161	-108.443	58.2	7.06E-03	307.8	4.33E-03	-5.58E-03
18	-55.0161	-108.443	67.9	5.67E-03	307.1	3.42E-03	-4.52E-03
19	-55.0161	-108.443	77.6	4.07E-03	306.4	2.42E-03	-3.27E-03
20	-55.0161	-108.443	87.3	2.26E-03	305.8	1.32E-03	-1.83E-03
END	-55.0161	-108.443	97.	0	0	0	0
GND	-98.6701	-15.6278	0	2.27E-05	163.9	-2.18E-05	6.31E-06
22	-98.6701	-15.6278	10.	2.6E-04	163.9	-2.5E-04	7.21E-05
23	-98.6701	-15.6278	20.	3.91E-04	163.9	-3.76E-04	1.08E-04
24	-98.6701	-15.6278	30.	4.74E-04	164.	-4.56E-04	1.31E-04
25	-98.6701	-15.6278	40.	5.15E-04	164.1	-4.95E-04	1.42E-04
26	-98.6701	-15.6278	50.	5.17E-04	164.1	-4.97E-04	1.41E-04
27	-98.6701	-15.6278	60.	4.82E-04	164.2	-4.64E-04	1.31E-04
28	-98.6701	-15.6278	70.	4.14E-04	164.3	-3.98E-04	1.12E-04
29	-98.6701	-15.6278	80.	3.13E-04	164.4	-3.02E-04	8.45E-05
30	-98.6701	-15.6278	90.	1.82E-04	164.4	-1.76E-04	4.9E-05
END	-98.6701	-15.6278	100.	0	0	0	0
GND	38.64	-86.7868	0	3.51E-05	168.9	-3.44E-05	6.73E-06
32	38.64	-86.7868	10.	4.02E-04	169.	-3.95E-04	7.69E-05
33	38.64	-86.7868	20.	6.07E-04	169.	-5.96E-04	1.16E-04
34	38.64	-86.7868	30.	7.37E-04	169.1	-7.24E-04	1.4E-04
35	38.64	-86.7868	40.	8.03E-04	169.1	-7.89E-04	1.52E-04
36	38.64	-86.7868	50.	8.09E-04	169.2	-7.95E-04	1.52E-04
37	38.64	-86.7868	60.	7.58E-04	169.3	-7.44E-04	1.41E-04
38	38.64	-86.7868	70.	6.52E-04	169.3	-6.41E-04	1.21E-04
39	38.64	-86.7868	80.	4.96E-04	169.4	-4.88E-04	9.13E-05
40	38.64	-86.7868	90.	2.9E-04	169.5	-2.85E-04	5.31E-05
END	38.64	-86.7868	100.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 2 OC Self - (3 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-41.8585	-704.558	0	2.66E-05	269.4	-2.59E-07	-2.66E-05
42	-41.8585	-704.558	9.35	1.07E-04	269.7	-6.17E-07	-1.07E-04
43	-41.8585	-704.558	18.7	1.63E-04	270.	1.08E-07	-1.63E-04
44	-41.8585	-704.558	28.05	2.1E-04	270.5	1.7E-06	-2.1E-04
45	-41.8585	-704.558	37.4	2.51E-04	270.9	4.05E-06	-2.51E-04
46	-41.8585	-704.558	46.75	2.85E-04	271.4	7.05E-06	-2.85E-04
47	-41.8585	-704.558	56.1	3.12E-04	271.9	1.06E-05	-3.12E-04
48	-41.8585	-704.558	65.45	3.32E-04	272.5	1.44E-05	-3.32E-04
49	-41.8585	-704.558	74.8	3.46E-04	273.	1.84E-05	-3.45E-04
50	-41.8585	-704.558	84.15	3.51E-04	273.6	2.23E-05	-3.51E-04
51	-41.8585	-704.558	93.5	3.5E-04	274.3	2.6E-05	-3.49E-04
52	-41.8585	-704.558	102.85	3.4E-04	274.9	2.91E-05	-3.39E-04
53	-41.8585	-704.558	112.2	3.24E-04	275.6	3.16E-05	-3.23E-04
54	-41.8585	-704.558	121.55	3.02E-04	276.3	3.32E-05	-3.E-04
55	-41.8585	-704.558	130.9	2.73E-04	277.1	3.36E-05	-2.71E-04
56	-41.8585	-704.558	140.25	2.39E-04	277.9	3.27E-05	-2.36E-04
57	-41.8585	-704.558	149.6	1.99E-04	278.7	3.03E-05	-1.97E-04
58	-41.8585	-704.558	158.95	1.56E-04	279.7	2.63E-05	-1.54E-04
59	-41.8585	-704.558	168.3	1.1E-04	280.7	2.03E-05	-1.08E-04
60	-41.8585	-704.558	177.65	5.94E-05	281.8	1.21E-05	-5.82E-05
END	-41.8585	-704.558	187.	0	0	0	0
GND	-29.0068	-488.239	0	4.89E-05	133.8	-3.39E-05	3.53E-05
62	-29.0068	-488.239	9.35	1.98E-04	134.1	-1.38E-04	1.42E-04
63	-29.0068	-488.239	18.7	3.02E-04	134.5	-2.11E-04	2.15E-04
64	-29.0068	-488.239	28.05	3.91E-04	135.	-2.77E-04	2.77E-04
65	-29.0068	-488.239	37.4	4.7E-04	135.5	-3.35E-04	3.29E-04
66	-29.0068	-488.239	46.75	5.37E-04	136.1	-3.87E-04	3.72E-04
67	-29.0068	-488.239	56.1	5.92E-04	136.7	-4.31E-04	4.07E-04
68	-29.0068	-488.239	65.45	6.35E-04	137.2	-4.67E-04	4.31E-04
69	-29.0068	-488.239	74.8	6.65E-04	137.8	-4.93E-04	4.46E-04
70	-29.0068	-488.239	84.15	6.81E-04	138.4	-5.1E-04	4.52E-04
71	-29.0068	-488.239	93.5	6.83E-04	139.1	-5.16E-04	4.47E-04
72	-29.0068	-488.239	102.85	6.7E-04	139.7	-5.11E-04	4.33E-04
73	-29.0068	-488.239	112.2	6.44E-04	140.4	-4.96E-04	4.11E-04
74	-29.0068	-488.239	121.55	6.04E-04	141.	-4.69E-04	3.8E-04
75	-29.0068	-488.239	130.9	5.51E-04	141.7	-4.32E-04	3.41E-04
76	-29.0068	-488.239	140.25	4.86E-04	142.4	-3.85E-04	2.96E-04
77	-29.0068	-488.239	149.6	4.1E-04	143.1	-3.28E-04	2.46E-04
78	-29.0068	-488.239	158.95	3.24E-04	143.9	-2.62E-04	1.91E-04
79	-29.0068	-488.239	168.3	2.3E-04	144.6	-1.87E-04	1.33E-04
80	-29.0068	-488.239	177.65	1.26E-04	145.5	-1.04E-04	7.14E-05
END	-29.0068	-488.239	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 2 OC Self - (4 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-16.1551	-271.921	0	1.39E-04	342.3	1.32E-04	-4.23E-05
82	-16.1551	-271.921	9.35	5.63E-04	342.3	5.37E-04	-1.71E-04
83	-16.1551	-271.921	18.7	8.62E-04	342.4	8.22E-04	-2.61E-04
84	-16.1551	-271.921	28.05	1.12E-03	342.5	1.07E-03	-3.39E-04
85	-16.1551	-271.921	37.4	1.35E-03	342.5	1.29E-03	-4.07E-04
86	-16.1551	-271.921	46.75	1.55E-03	342.6	1.48E-03	-4.65E-04
87	-16.1551	-271.921	56.1	1.72E-03	342.7	1.64E-03	-5.13E-04
88	-16.1551	-271.921	65.45	1.85E-03	342.8	1.77E-03	-5.5E-04
89	-16.1551	-271.921	74.8	1.95E-03	342.8	1.86E-03	-5.75E-04
90	-16.1551	-271.921	84.15	2.E-03	342.9	1.91E-03	-5.88E-04
91	-16.1551	-271.921	93.5	2.01E-03	343.	1.93E-03	-5.89E-04
92	-16.1551	-271.921	102.85	1.98E-03	343.1	1.9E-03	-5.77E-04
93	-16.1551	-271.921	112.2	1.91E-03	343.2	1.83E-03	-5.52E-04
94	-16.1551	-271.921	121.55	1.8E-03	343.3	1.72E-03	-5.16E-04
95	-16.1551	-271.921	130.9	1.64E-03	343.4	1.58E-03	-4.69E-04
96	-16.1551	-271.921	140.25	1.45E-03	343.5	1.39E-03	-4.12E-04
97	-16.1551	-271.921	149.6	1.23E-03	343.7	1.18E-03	-3.45E-04
98	-16.1551	-271.921	158.95	9.73E-04	343.8	9.34E-04	-2.72E-04
99	-16.1551	-271.921	168.3	6.9E-04	343.9	6.63E-04	-1.91E-04
100	-16.1551	-271.921	177.65	3.78E-04	344.1	3.64E-04	-1.04E-04
END	-16.1551	-271.921	187.	0	0	0	0
GND	9.56612	161.016	0	9.38E-05	202.9	-8.65E-05	-3.64E-05
102	9.56612	161.016	9.35	3.8E-04	203.	-3.49E-04	-1.48E-04
103	9.56612	161.016	18.7	5.8E-04	203.3	-5.32E-04	-2.29E-04
104	9.56612	161.016	28.05	7.53E-04	203.6	-6.9E-04	-3.02E-04
105	9.56612	161.016	37.4	9.06E-04	203.9	-8.28E-04	-3.68E-04
106	9.56612	161.016	46.75	1.04E-03	204.3	-9.46E-04	-4.27E-04
107	9.56612	161.016	56.1	1.15E-03	204.6	-1.04E-03	-4.78E-04
108	9.56612	161.016	65.45	1.23E-03	205.	-1.12E-03	-5.21E-04
109	9.56612	161.016	74.8	1.29E-03	205.3	-1.17E-03	-5.53E-04
110	9.56612	161.016	84.15	1.33E-03	205.7	-1.19E-03	-5.75E-04
111	9.56612	161.016	93.5	1.33E-03	206.1	-1.2E-03	-5.86E-04
112	9.56612	161.016	102.85	1.31E-03	206.5	-1.17E-03	-5.84E-04
113	9.56612	161.016	112.2	1.26E-03	206.9	-1.12E-03	-5.69E-04
114	9.56612	161.016	121.55	1.18E-03	207.2	-1.05E-03	-5.41E-04
115	9.56612	161.016	130.9	1.08E-03	207.6	-9.57E-04	-5.01E-04
116	9.56612	161.016	140.25	9.54E-04	208.	-8.42E-04	-4.48E-04
117	9.56612	161.016	149.6	8.06E-04	208.4	-7.09E-04	-3.84E-04
118	9.56612	161.016	158.95	6.38E-04	208.9	-5.59E-04	-3.08E-04
119	9.56612	161.016	168.3	4.53E-04	209.3	-3.95E-04	-2.21E-04
120	9.56612	161.016	177.65	2.48E-04	209.7	-2.15E-04	-1.23E-04
END	9.56612	161.016	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 3 OC Self - (1 of 4)

KESJ T3 Open Circuit Self

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.297	10
		0	0	96.		
2	none	121.6	116.9	0	.297	10
		121.6	116.9	97.		
3	none	99.9	171.	0	.297	10
		99.9	171.	100.		
4	none	95.	66.	0	.297	10
		95.	66.	100.		
5	none	705.8	93.4	0	.231	20
		705.8	93.4	187.		
6	none	489.1	93.4	0	.231	20
		489.1	93.4	187.		
7	none	272.4	93.4	0	.231	20
		272.4	93.4	187.		
8	none	161.3	273.4	0	.231	20
		161.3	273.4	187.		

Number of wires = 8
current nodes = 120

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	9.35	3	10.
radius	5	.231	1	.297

ELECTRICAL DESCRIPTION - Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.55	0	1	.0259722	.0277778

Sources:	**source**	**node**	**sector**	**magnitude**	**phase**	**type**
	1	21	1	1.	0	voltage

Lumped loads

load	**node**	**resistance (ohms)**	**reactance (ohms)**	**inductance (mH)**	**capacitance (uF)**	**passive circuit**
1	1	0	-10,046.	0	0	0
2	11	0	-10,046.	0	0	0
3	21	0	0	0	0	0
4	31	0	-10,046.	0	0	0
5	41	0	-3,171.6	0	0	0
6	61	0	-3,171.6	0	0	0
7	81	0	-3,171.6	0	0	0
8	101	0	-3,171.6	0	0	0

MoM Model Details for Towers Driven Individually - Tower 3 OC Self - (2 of 4)

IMPEDANCE normalization = 50. source = 1; node 21, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.55	55.157	72.843	91.37	52.9	3.6604	-4.8695	-1.7126

CURRENT: rms Frequency: 1.55 MHz Input power: .00330347 watts Efficiency: 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	2.74E-05	158.1	-2.54E-05	1.03E-05
2	0	0	9.6	3.07E-04	158.1	-2.85E-04	1.15E-04
3	0	0	19.2	4.63E-04	158.1	-4.29E-04	1.73E-04
4	0	0	28.8	5.62E-04	158.1	-5.21E-04	2.1E-04
5	0	0	38.4	6.12E-04	158.1	-5.68E-04	2.28E-04
6	0	0	48.	6.17E-04	158.1	-5.73E-04	2.3E-04
7	0	0	57.6	5.79E-04	158.1	-5.38E-04	2.16E-04
8	0	0	67.2	5.E-04	158.2	-4.64E-04	1.86E-04
9	0	0	76.8	3.82E-04	158.2	-3.54E-04	1.42E-04
10	0	0	86.4	2.24E-04	158.2	-2.08E-04	8.33E-05
END	0	0	96.	0	0	0	0
GND	-55.0161	-108.443	0	1.79E-05	154.4	-1.62E-05	7.73E-06
12	-55.0161	-108.443	9.7	2.02E-04	154.4	-1.82E-04	8.7E-05
13	-55.0161	-108.443	19.4	3.03E-04	154.5	-2.73E-04	1.31E-04
14	-55.0161	-108.443	29.1	3.67E-04	154.5	-3.31E-04	1.58E-04
15	-55.0161	-108.443	38.8	3.99E-04	154.5	-3.6E-04	1.72E-04
16	-55.0161	-108.443	48.5	4.01E-04	154.6	-3.62E-04	1.72E-04
17	-55.0161	-108.443	58.2	3.75E-04	154.6	-3.38E-04	1.61E-04
18	-55.0161	-108.443	67.9	3.22E-04	154.7	-2.91E-04	1.38E-04
19	-55.0161	-108.443	77.6	2.44E-04	154.7	-2.21E-04	1.04E-04
20	-55.0161	-108.443	87.3	1.43E-04	154.7	-1.29E-04	6.09E-05
END	-55.0161	-108.443	97.	0	0	0	0
GND	-98.6701	-15.6278	0	7.74E-03	307.1	4.67E-03	-6.17E-03
22	-98.6701	-15.6278	10.	8.25E-03	304.	4.62E-03	-6.84E-03
23	-98.6701	-15.6278	20.	8.33E-03	302.3	4.45E-03	-7.04E-03
24	-98.6701	-15.6278	30.	8.12E-03	301.	4.19E-03	-6.96E-03
25	-98.6701	-15.6278	40.	7.64E-03	300.	3.82E-03	-6.62E-03
26	-98.6701	-15.6278	50.	6.92E-03	299.1	3.36E-03	-6.05E-03
27	-98.6701	-15.6278	60.	5.97E-03	298.3	2.83E-03	-5.25E-03
28	-98.6701	-15.6278	70.	4.81E-03	297.6	2.23E-03	-4.26E-03
29	-98.6701	-15.6278	80.	3.46E-03	297.	1.57E-03	-3.08E-03
30	-98.6701	-15.6278	90.	1.92E-03	296.4	8.56E-04	-1.72E-03
END	-98.6701	-15.6278	100.	0	0	0	0
GND	38.64	-86.7868	0	2.29E-05	84.	2.4E-06	2.27E-05
32	38.64	-86.7868	10.	2.63E-04	83.9	2.8E-05	2.61E-04
33	38.64	-86.7868	20.	3.98E-04	83.7	4.36E-05	3.95E-04
34	38.64	-86.7868	30.	4.85E-04	83.5	5.48E-05	4.82E-04
35	38.64	-86.7868	40.	5.3E-04	83.3	6.2E-05	5.27E-04
36	38.64	-86.7868	50.	5.36E-04	83.	6.5E-05	5.32E-04
37	38.64	-86.7868	60.	5.05E-04	82.8	6.35E-05	5.01E-04
38	38.64	-86.7868	70.	4.37E-04	82.5	5.72E-05	4.33E-04
39	38.64	-86.7868	80.	3.34E-04	82.2	4.55E-05	3.31E-04
40	38.64	-86.7868	90.	1.96E-04	81.8	2.79E-05	1.94E-04
END	38.64	-86.7868	100.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 3 OC Self - (3 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-41.8585	-704.558	0	1.2E-05	168.1	-1.17E-05	2.46E-06
42	-41.8585	-704.558	9.35	4.82E-05	168.4	-4.72E-05	9.7E-06
43	-41.8585	-704.558	18.7	7.31E-05	168.8	-7.17E-05	1.42E-05
44	-41.8585	-704.558	28.05	9.44E-05	169.3	-9.28E-05	1.75E-05
45	-41.8585	-704.558	37.4	1.13E-04	169.8	-1.11E-04	1.99E-05
46	-41.8585	-704.558	46.75	1.28E-04	170.4	-1.26E-04	2.14E-05
47	-41.8585	-704.558	56.1	1.4E-04	171.	-1.39E-04	2.2E-05
48	-41.8585	-704.558	65.45	1.5E-04	171.6	-1.48E-04	2.19E-05
49	-41.8585	-704.558	74.8	1.56E-04	172.2	-1.54E-04	2.1E-05
50	-41.8585	-704.558	84.15	1.58E-04	172.9	-1.57E-04	1.95E-05
51	-41.8585	-704.558	93.5	1.57E-04	173.6	-1.57E-04	1.75E-05
52	-41.8585	-704.558	102.85	1.53E-04	174.4	-1.53E-04	1.51E-05
53	-41.8585	-704.558	112.2	1.46E-04	175.1	-1.46E-04	1.24E-05
54	-41.8585	-704.558	121.55	1.36E-04	176.	-1.36E-04	9.62E-06
55	-41.8585	-704.558	130.9	1.23E-04	176.8	-1.23E-04	6.86E-06
56	-41.8585	-704.558	140.25	1.08E-04	177.7	-1.08E-04	4.28E-06
57	-41.8585	-704.558	149.6	9.03E-05	178.7	-9.03E-05	2.05E-06
58	-41.8585	-704.558	158.95	7.09E-05	179.7	-7.09E-05	3.21E-07
59	-41.8585	-704.558	168.3	4.98E-05	180.9	-4.98E-05	-7.51E-07
60	-41.8585	-704.558	177.65	2.7E-05	182.1	-2.7E-05	-9.91E-07
END	-41.8585	-704.558	187.	0	0	0	0
GND	-29.0068	-488.239	0	2.2E-05	25.	2.E-05	9.3E-06
62	-29.0068	-488.239	9.35	8.9E-05	25.3	8.05E-05	3.8E-05
63	-29.0068	-488.239	18.7	1.36E-04	25.8	1.22E-04	5.89E-05
64	-29.0068	-488.239	28.05	1.76E-04	26.3	1.58E-04	7.79E-05
65	-29.0068	-488.239	37.4	2.11E-04	26.9	1.88E-04	9.54E-05
66	-29.0068	-488.239	46.75	2.41E-04	27.5	2.14E-04	1.11E-04
67	-29.0068	-488.239	56.1	2.66E-04	28.1	2.35E-04	1.25E-04
68	-29.0068	-488.239	65.45	2.85E-04	28.8	2.5E-04	1.37E-04
69	-29.0068	-488.239	74.8	2.99E-04	29.4	2.6E-04	1.47E-04
70	-29.0068	-488.239	84.15	3.06E-04	30.1	2.65E-04	1.53E-04
71	-29.0068	-488.239	93.5	3.07E-04	30.8	2.63E-04	1.57E-04
72	-29.0068	-488.239	102.85	3.01E-04	31.5	2.57E-04	1.57E-04
73	-29.0068	-488.239	112.2	2.89E-04	32.2	2.44E-04	1.54E-04
74	-29.0068	-488.239	121.55	2.71E-04	33.	2.27E-04	1.48E-04
75	-29.0068	-488.239	130.9	2.47E-04	33.8	2.06E-04	1.37E-04
76	-29.0068	-488.239	140.25	2.18E-04	34.6	1.8E-04	1.24E-04
77	-29.0068	-488.239	149.6	1.84E-04	35.4	1.5E-04	1.07E-04
78	-29.0068	-488.239	158.95	1.46E-04	36.2	1.18E-04	8.62E-05
79	-29.0068	-488.239	168.3	1.03E-04	37.1	8.24E-05	6.24E-05
80	-29.0068	-488.239	177.65	5.67E-05	38.1	4.46E-05	3.49E-05
END	-29.0068	-488.239	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 3 OC Self - (4 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-16.1551	-271.921	0	6.14E-05	218.4	-4.81E-05	-3.81E-05
82	-16.1551	-271.921	9.35	2.48E-04	218.6	-1.94E-04	-1.55E-04
83	-16.1551	-271.921	18.7	3.8E-04	218.8	-2.96E-04	-2.38E-04
84	-16.1551	-271.921	28.05	4.94E-04	219.1	-3.83E-04	-3.12E-04
85	-16.1551	-271.921	37.4	5.95E-04	219.4	-4.6E-04	-3.78E-04
86	-16.1551	-271.921	46.75	6.82E-04	219.8	-5.25E-04	-4.36E-04
87	-16.1551	-271.921	56.1	7.55E-04	220.1	-5.78E-04	-4.86E-04
88	-16.1551	-271.921	65.45	8.12E-04	220.4	-6.18E-04	-5.27E-04
89	-16.1551	-271.921	74.8	8.53E-04	220.8	-6.46E-04	-5.57E-04
90	-16.1551	-271.921	84.15	8.76E-04	221.1	-6.6E-04	-5.76E-04
91	-16.1551	-271.921	93.5	8.81E-04	221.5	-6.6E-04	-5.83E-04
92	-16.1551	-271.921	102.85	8.67E-04	221.8	-6.46E-04	-5.78E-04
93	-16.1551	-271.921	112.2	8.35E-04	222.1	-6.19E-04	-5.61E-04
94	-16.1551	-271.921	121.55	7.85E-04	222.5	-5.79E-04	-5.31E-04
95	-16.1551	-271.921	130.9	7.18E-04	222.9	-5.27E-04	-4.89E-04
96	-16.1551	-271.921	140.25	6.35E-04	223.2	-4.63E-04	-4.35E-04
97	-16.1551	-271.921	149.6	5.37E-04	223.6	-3.89E-04	-3.7E-04
98	-16.1551	-271.921	158.95	4.26E-04	223.9	-3.07E-04	-2.96E-04
99	-16.1551	-271.921	168.3	3.02E-04	224.3	-2.16E-04	-2.11E-04
100	-16.1551	-271.921	177.65	1.66E-04	224.7	-1.18E-04	-1.17E-04
END	-16.1551	-271.921	187.	0	0	0	0
GND	9.56612	161.016	0	1.11E-04	291.4	4.07E-05	-1.04E-04
102	9.56612	161.016	9.35	4.51E-04	291.5	1.66E-04	-4.2E-04
103	9.56612	161.016	18.7	6.9E-04	291.7	2.55E-04	-6.41E-04
104	9.56612	161.016	28.05	8.98E-04	291.8	3.34E-04	-8.33E-04
105	9.56612	161.016	37.4	1.08E-03	292.	4.05E-04	-1.E-03
106	9.56612	161.016	46.75	1.24E-03	292.2	4.68E-04	-1.15E-03
107	9.56612	161.016	56.1	1.37E-03	292.4	5.23E-04	-1.27E-03
108	9.56612	161.016	65.45	1.47E-03	292.6	5.67E-04	-1.36E-03
109	9.56612	161.016	74.8	1.55E-03	292.8	6.E-04	-1.43E-03
110	9.56612	161.016	84.15	1.59E-03	293.	6.21E-04	-1.46E-03
111	9.56612	161.016	93.5	1.6E-03	293.2	6.29E-04	-1.47E-03
112	9.56612	161.016	102.85	1.57E-03	293.4	6.24E-04	-1.44E-03
113	9.56612	161.016	112.2	1.51E-03	293.6	6.05E-04	-1.39E-03
114	9.56612	161.016	121.55	1.42E-03	293.8	5.74E-04	-1.3E-03
115	9.56612	161.016	130.9	1.3E-03	294.	5.28E-04	-1.19E-03
116	9.56612	161.016	140.25	1.15E-03	294.2	4.71E-04	-1.05E-03
117	9.56612	161.016	149.6	9.69E-04	294.4	4.01E-04	-8.82E-04
118	9.56612	161.016	158.95	7.67E-04	294.7	3.2E-04	-6.97E-04
119	9.56612	161.016	168.3	5.44E-04	294.9	2.29E-04	-4.93E-04
120	9.56612	161.016	177.65	2.98E-04	295.1	1.27E-04	-2.7E-04
END	9.56612	161.016	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 4 OC Self - (1 of 4)

KESJ T4 Open Circuit Self

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.297	10
		0	0	96.		
2	none	121.6	116.9	0	.297	10
		121.6	116.9	97.		
3	none	99.9	171.	0	.297	10
		99.9	171.	100.		
4	none	95.	66.	0	.297	10
		95.	66.	100.		
5	none	705.8	93.4	0	.231	20
		705.8	93.4	187.		
6	none	489.1	93.4	0	.231	20
		489.1	93.4	187.		
7	none	272.4	93.4	0	.231	20
		272.4	93.4	187.		
8	none	161.3	273.4	0	.231	20
		161.3	273.4	187.		

Number of wires = 8
current nodes = 120

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	5	9.35	3	10.
radius	5	.231	1	.297

ELECTRICAL DESCRIPTION - Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.55	0	1	.0259722	.0277778

Sources:

source	node	sector	magnitude	phase	type
1	31	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,046.	0	0	0
2	11	0	-10,046.	0	0	0
3	21	0	-10,046.	0	0	0
4	31	0	0	0	0	0
5	41	0	-3,171.6	0	0	0
6	61	0	-3,171.6	0	0	0
7	81	0	-3,171.6	0	0	0
8	101	0	-3,171.6	0	0	0

MoM Model Details for Towers Driven Individually - Tower 4 OC Self - (2 of 4)

IMPEDANCE normalization = 50. source = 1; node 31, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.55	51.788	69.914	87.006	53.5	3.612	-4.9383	-1.6797

CURRENT: rms Frequency: 1.55 MHz Input power: .00342065 watts Efficiency: 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	2.11E-05	157.9	-1.95E-05	7.91E-06
2	0	0	9.6	2.36E-04	158.	-2.18E-04	8.85E-05
3	0	0	19.2	3.54E-04	158.	-3.28E-04	1.33E-04
4	0	0	28.8	4.29E-04	158.	-3.98E-04	1.6E-04
5	0	0	38.4	4.66E-04	158.1	-4.33E-04	1.74E-04
6	0	0	48.	4.68E-04	158.2	-4.35E-04	1.74E-04
7	0	0	57.6	4.38E-04	158.3	-4.07E-04	1.62E-04
8	0	0	67.2	3.77E-04	158.3	-3.5E-04	1.39E-04
9	0	0	76.8	2.86E-04	158.4	-2.66E-04	1.05E-04
10	0	0	86.4	1.67E-04	158.5	-1.56E-04	6.12E-05
END	0	0	96.	0	0	0	0
GND	-55.0161	-108.443	0	2.91E-05	158.9	-2.71E-05	1.05E-05
12	-55.0161	-108.443	9.7	3.28E-04	158.9	-3.06E-04	1.18E-04
13	-55.0161	-108.443	19.4	4.94E-04	158.9	-4.61E-04	1.78E-04
14	-55.0161	-108.443	29.1	6.E-04	158.9	-5.6E-04	2.15E-04
15	-55.0161	-108.443	38.8	6.53E-04	159.	-6.1E-04	2.34E-04
16	-55.0161	-108.443	48.5	6.58E-04	159.	-6.15E-04	2.36E-04
17	-55.0161	-108.443	58.2	6.17E-04	159.1	-5.76E-04	2.21E-04
18	-55.0161	-108.443	67.9	5.32E-04	159.1	-4.97E-04	1.9E-04
19	-55.0161	-108.443	77.6	4.06E-04	159.1	-3.79E-04	1.44E-04
20	-55.0161	-108.443	87.3	2.38E-04	159.2	-2.22E-04	8.46E-05
END	-55.0161	-108.443	97.	0	0	0	0
GND	-98.6701	-15.6278	0	2.4E-05	83.4	2.78E-06	2.39E-05
22	-98.6701	-15.6278	10.	2.76E-04	83.3	3.24E-05	2.74E-04
23	-98.6701	-15.6278	20.	4.18E-04	83.1	5.03E-05	4.15E-04
24	-98.6701	-15.6278	30.	5.09E-04	82.9	6.3E-05	5.05E-04
25	-98.6701	-15.6278	40.	5.57E-04	82.7	7.11E-05	5.52E-04
26	-98.6701	-15.6278	50.	5.63E-04	82.4	7.43E-05	5.58E-04
27	-98.6701	-15.6278	60.	5.3E-04	82.2	7.24E-05	5.25E-04
28	-98.6701	-15.6278	70.	4.59E-04	81.9	6.5E-05	4.54E-04
29	-98.6701	-15.6278	80.	3.51E-04	81.5	5.16E-05	3.47E-04
30	-98.6701	-15.6278	90.	2.06E-04	81.2	3.16E-05	2.04E-04
END	-98.6701	-15.6278	100.	0	0	0	0
GND	38.64	-86.7868	0	8.13E-03	306.5	4.84E-03	-6.53E-03
32	38.64	-86.7868	10.	8.64E-03	303.6	4.78E-03	-7.19E-03
33	38.64	-86.7868	20.	8.7E-03	302.	4.61E-03	-7.38E-03
34	38.64	-86.7868	30.	8.47E-03	300.8	4.33E-03	-7.28E-03
35	38.64	-86.7868	40.	7.97E-03	299.8	3.96E-03	-6.91E-03
36	38.64	-86.7868	50.	7.2E-03	298.9	3.49E-03	-6.3E-03
37	38.64	-86.7868	60.	6.21E-03	298.2	2.93E-03	-5.47E-03
38	38.64	-86.7868	70.	5.E-03	297.5	2.31E-03	-4.43E-03
39	38.64	-86.7868	80.	3.59E-03	297.	1.63E-03	-3.2E-03
40	38.64	-86.7868	90.	2.E-03	296.4	8.87E-04	-1.79E-03
END	38.64	-86.7868	100.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 4 OC Self - (3 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-41.8585	-704.558	0	2.26E-05	241.8	-1.07E-05	-1.99E-05
42	-41.8585	-704.558	9.35	9.1E-05	242.	-4.28E-05	-8.04E-05
43	-41.8585	-704.558	18.7	1.38E-04	242.3	-6.42E-05	-1.22E-04
44	-41.8585	-704.558	28.05	1.78E-04	242.7	-8.17E-05	-1.59E-04
45	-41.8585	-704.558	37.4	2.13E-04	243.2	-9.61E-05	-1.9E-04
46	-41.8585	-704.558	46.75	2.42E-04	243.6	-1.07E-04	-2.17E-04
47	-41.8585	-704.558	56.1	2.65E-04	244.1	-1.16E-04	-2.39E-04
48	-41.8585	-704.558	65.45	2.83E-04	244.7	-1.21E-04	-2.56E-04
49	-41.8585	-704.558	74.8	2.94E-04	245.2	-1.23E-04	-2.67E-04
50	-41.8585	-704.558	84.15	2.99E-04	245.8	-1.23E-04	-2.73E-04
51	-41.8585	-704.558	93.5	2.98E-04	246.4	-1.19E-04	-2.73E-04
52	-41.8585	-704.558	102.85	2.9E-04	247.	-1.13E-04	-2.67E-04
53	-41.8585	-704.558	112.2	2.76E-04	247.6	-1.05E-04	-2.56E-04
54	-41.8585	-704.558	121.55	2.57E-04	248.3	-9.51E-05	-2.39E-04
55	-41.8585	-704.558	130.9	2.33E-04	249.	-8.33E-05	-2.17E-04
56	-41.8585	-704.558	140.25	2.04E-04	249.8	-7.04E-05	-1.91E-04
57	-41.8585	-704.558	149.6	1.7E-04	250.6	-5.66E-05	-1.61E-04
58	-41.8585	-704.558	158.95	1.33E-04	251.5	-4.24E-05	-1.27E-04
59	-41.8585	-704.558	168.3	9.36E-05	252.4	-2.83E-05	-8.92E-05
60	-41.8585	-704.558	177.65	5.08E-05	253.4	-1.45E-05	-4.87E-05
END	-41.8585	-704.558	187.	0	0	0	0
GND	-29.0068	-488.239	0	4.04E-05	104.8	-1.03E-05	3.9E-05
62	-29.0068	-488.239	9.35	1.63E-04	105.	-4.23E-05	1.57E-04
63	-29.0068	-488.239	18.7	2.49E-04	105.4	-6.61E-05	2.4E-04
64	-29.0068	-488.239	28.05	3.22E-04	105.9	-8.83E-05	3.1E-04
65	-29.0068	-488.239	37.4	3.87E-04	106.4	-1.09E-04	3.71E-04
66	-29.0068	-488.239	46.75	4.42E-04	106.9	-1.29E-04	4.23E-04
67	-29.0068	-488.239	56.1	4.88E-04	107.4	-1.46E-04	4.65E-04
68	-29.0068	-488.239	65.45	5.23E-04	108.	-1.61E-04	4.97E-04
69	-29.0068	-488.239	74.8	5.47E-04	108.5	-1.74E-04	5.19E-04
70	-29.0068	-488.239	84.15	5.6E-04	109.1	-1.84E-04	5.29E-04
71	-29.0068	-488.239	93.5	5.61E-04	109.7	-1.89E-04	5.28E-04
72	-29.0068	-488.239	102.85	5.51E-04	110.3	-1.91E-04	5.17E-04
73	-29.0068	-488.239	112.2	5.29E-04	110.9	-1.89E-04	4.94E-04
74	-29.0068	-488.239	121.55	4.96E-04	111.6	-1.82E-04	4.61E-04
75	-29.0068	-488.239	130.9	4.52E-04	112.2	-1.71E-04	4.18E-04
76	-29.0068	-488.239	140.25	3.98E-04	112.9	-1.55E-04	3.67E-04
77	-29.0068	-488.239	149.6	3.36E-04	113.6	-1.34E-04	3.08E-04
78	-29.0068	-488.239	158.95	2.66E-04	114.3	-1.09E-04	2.42E-04
79	-29.0068	-488.239	168.3	1.88E-04	115.	-7.96E-05	1.7E-04
80	-29.0068	-488.239	177.65	1.03E-04	115.8	-4.48E-05	9.27E-05
END	-29.0068	-488.239	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 4 OC Self - (4 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-16.1551	-271.921	0	1.1E-04	312.	7.36E-05	-8.17E-05
82	-16.1551	-271.921	9.35	4.45E-04	312.1	2.98E-04	-3.3E-04
83	-16.1551	-271.921	18.7	6.81E-04	312.2	4.57E-04	-5.04E-04
84	-16.1551	-271.921	28.05	8.87E-04	312.3	5.97E-04	-6.56E-04
85	-16.1551	-271.921	37.4	1.07E-03	312.4	7.21E-04	-7.89E-04
86	-16.1551	-271.921	46.75	1.23E-03	312.5	8.29E-04	-9.03E-04
87	-16.1551	-271.921	56.1	1.36E-03	312.7	9.2E-04	-9.98E-04
88	-16.1551	-271.921	65.45	1.46E-03	312.8	9.92E-04	-1.07E-03
89	-16.1551	-271.921	74.8	1.53E-03	312.9	1.04E-03	-1.12E-03
90	-16.1551	-271.921	84.15	1.58E-03	313.	1.08E-03	-1.15E-03
91	-16.1551	-271.921	93.5	1.58E-03	313.2	1.08E-03	-1.16E-03
92	-16.1551	-271.921	102.85	1.56E-03	313.3	1.07E-03	-1.14E-03
93	-16.1551	-271.921	112.2	1.5E-03	313.4	1.03E-03	-1.09E-03
94	-16.1551	-271.921	121.55	1.41E-03	313.6	9.74E-04	-1.02E-03
95	-16.1551	-271.921	130.9	1.29E-03	313.7	8.92E-04	-9.33E-04
96	-16.1551	-271.921	140.25	1.14E-03	313.9	7.91E-04	-8.23E-04
97	-16.1551	-271.921	149.6	9.64E-04	314.	6.7E-04	-6.94E-04
98	-16.1551	-271.921	158.95	7.64E-04	314.2	5.32E-04	-5.48E-04
99	-16.1551	-271.921	168.3	5.41E-04	314.3	3.78E-04	-3.87E-04
100	-16.1551	-271.921	177.65	2.97E-04	314.5	2.08E-04	-2.12E-04
END	-16.1551	-271.921	187.	0	0	0	0
GND	9.56612	161.016	0	6.78E-05	241.	-3.28E-05	-5.93E-05
102	9.56612	161.016	9.35	2.74E-04	241.2	-1.32E-04	-2.4E-04
103	9.56612	161.016	18.7	4.2E-04	241.4	-2.01E-04	-3.69E-04
104	9.56612	161.016	28.05	5.47E-04	241.6	-2.6E-04	-4.81E-04
105	9.56612	161.016	37.4	6.59E-04	241.9	-3.1E-04	-5.81E-04
106	9.56612	161.016	46.75	7.56E-04	242.2	-3.53E-04	-6.68E-04
107	9.56612	161.016	56.1	8.37E-04	242.5	-3.87E-04	-7.42E-04
108	9.56612	161.016	65.45	9.01E-04	242.7	-4.13E-04	-8.01E-04
109	9.56612	161.016	74.8	9.47E-04	243.	-4.3E-04	-8.44E-04
110	9.56612	161.016	84.15	9.73E-04	243.3	-4.37E-04	-8.69E-04
111	9.56612	161.016	93.5	9.79E-04	243.6	-4.35E-04	-8.76E-04
112	9.56612	161.016	102.85	9.64E-04	243.9	-4.25E-04	-8.65E-04
113	9.56612	161.016	112.2	9.29E-04	244.1	-4.05E-04	-8.36E-04
114	9.56612	161.016	121.55	8.74E-04	244.4	-3.77E-04	-7.88E-04
115	9.56612	161.016	130.9	8.E-04	244.7	-3.42E-04	-7.23E-04
116	9.56612	161.016	140.25	7.07E-04	245.	-2.99E-04	-6.41E-04
117	9.56612	161.016	149.6	5.99E-04	245.3	-2.5E-04	-5.44E-04
118	9.56612	161.016	158.95	4.75E-04	245.6	-1.96E-04	-4.32E-04
119	9.56612	161.016	168.3	3.37E-04	245.9	-1.38E-04	-3.08E-04
120	9.56612	161.016	177.65	1.85E-04	246.2	-7.48E-05	-1.69E-04
END	9.56612	161.016	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 5 OC Self - (1 of 4)

KESJ T5 (KFEQ T1 East) Open Circuit Self

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.297	10
		0	0	96.		
2	none	121.6	116.9	0	.297	10
		121.6	116.9	97.		
3	none	99.9	171.	0	.297	10
		99.9	171.	100.		
4	none	95.	66.	0	.297	10
		95.	66.	100.		
5	none	705.8	93.4	0	.231	20
		705.8	93.4	187.		
6	none	489.1	93.4	0	.231	20
		489.1	93.4	187.		
7	none	272.4	93.4	0	.231	20
		272.4	93.4	187.		
8	none	161.3	273.4	0	.231	20
		161.3	273.4	187.		

Number of wires = 8
current nodes = 120

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	9.35	3	10.
radius	5	.231	1	.297

ELECTRICAL DESCRIPTION - Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.55	0	1	.0259722	.0277778

Sources:	**source**	**node**	**sector**	**magnitude**	**phase**	**type**
	1	41	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,046.	0	0	0
2	11	0	-10,046.	0	0	0
3	21	0	-10,046.	0	0	0
4	31	0	-10,046.	0	0	0
5	41	0	0	0	0	0
6	61	0	-3,171.6	0	0	0
7	81	0	-3,171.6	0	0	0
8	101	0	-3,171.6	0	0	0

MoM Model Details for Towers Driven Individually - Tower 5 OC Self - (2 of 4)

IMPEDANCE normalization = 50. source = 1; node 41, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.55	281.89	-509.04	581.89	299.	24.159	-.71949	-8.1624

CURRENT: rms Frequency: 1.55 MHz Input power: 4.163E-04 watts Efficiency: 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	9.63E-07	234.1	-5.65E-07	-7.8E-07
2	0	0	9.6	1.08E-05	234.1	-6.35E-06	-8.77E-06
3	0	0	19.2	1.64E-05	234.2	-9.59E-06	-1.33E-05
4	0	0	28.8	2.E-05	234.2	-1.17E-05	-1.62E-05
5	0	0	38.4	2.2E-05	234.3	-1.28E-05	-1.79E-05
6	0	0	48.	2.24E-05	234.4	-1.3E-05	-1.82E-05
7	0	0	57.6	2.12E-05	234.5	-1.23E-05	-1.73E-05
8	0	0	67.2	1.85E-05	234.6	-1.07E-05	-1.51E-05
9	0	0	76.8	1.43E-05	234.8	-8.23E-06	-1.17E-05
10	0	0	86.4	8.48E-06	235.	-4.87E-06	-6.95E-06
END	0	0	96.	0	0	0	0
GND	-55.0161	-108.443	0	1.22E-06	18.	1.16E-06	3.77E-07
12	-55.0161	-108.443	9.7	1.38E-05	17.9	1.31E-05	4.25E-06
13	-55.0161	-108.443	19.4	2.09E-05	17.9	1.99E-05	6.43E-06
14	-55.0161	-108.443	29.1	2.56E-05	17.8	2.44E-05	7.84E-06
15	-55.0161	-108.443	38.8	2.82E-05	17.7	2.68E-05	8.58E-06
16	-55.0161	-108.443	48.5	2.87E-05	17.6	2.73E-05	8.69E-06
17	-55.0161	-108.443	58.2	2.72E-05	17.5	2.59E-05	8.2E-06
18	-55.0161	-108.443	67.9	2.38E-05	17.4	2.27E-05	7.11E-06
19	-55.0161	-108.443	77.6	1.84E-05	17.3	1.75E-05	5.46E-06
20	-55.0161	-108.443	87.3	1.09E-05	17.1	1.04E-05	3.22E-06
END	-55.0161	-108.443	97.	0	0	0	0
GND	-98.6701	-15.6278	0	6.95E-07	286.1	1.93E-07	-6.68E-07
22	-98.6701	-15.6278	10.	8.02E-06	286.1	2.22E-06	-7.7E-06
23	-98.6701	-15.6278	20.	1.22E-05	286.1	3.38E-06	-1.17E-05
24	-98.6701	-15.6278	30.	1.5E-05	286.1	4.16E-06	-1.44E-05
25	-98.6701	-15.6278	40.	1.65E-05	286.1	4.59E-06	-1.59E-05
26	-98.6701	-15.6278	50.	1.69E-05	286.1	4.69E-06	-1.62E-05
27	-98.6701	-15.6278	60.	1.61E-05	286.1	4.46E-06	-1.54E-05
28	-98.6701	-15.6278	70.	1.41E-05	286.1	3.91E-06	-1.35E-05
29	-98.6701	-15.6278	80.	1.09E-05	286.1	3.03E-06	-1.05E-05
30	-98.6701	-15.6278	90.	6.51E-06	286.1	1.81E-06	-6.25E-06
END	-98.6701	-15.6278	100.	0	0	0	0
GND	38.64	-86.7868	0	1.25E-06	.3	1.25E-06	7.36E-09
32	38.64	-86.7868	10.	1.44E-05	.3	1.44E-05	7.39E-08
33	38.64	-86.7868	20.	2.19E-05	.2	2.19E-05	8.68E-08
34	38.64	-86.7868	30.	2.68E-05	.1	2.68E-05	6.79E-08
35	38.64	-86.7868	40.	2.95E-05	0.0	2.95E-05	2.52E-08
36	38.64	-86.7868	50.	3.01E-05	359.9	3.01E-05	-3.21E-08
37	38.64	-86.7868	60.	2.85E-05	359.8	2.85E-05	-9.22E-08
38	38.64	-86.7868	70.	2.49E-05	359.7	2.49E-05	-1.41E-07
39	38.64	-86.7868	80.	1.92E-05	359.5	1.92E-05	-1.61E-07
40	38.64	-86.7868	90.	1.14E-05	359.3	1.14E-05	-1.31E-07
END	38.64	-86.7868	100.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 5 OC Self - (3 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-41.8585	-704.558	0	1.22E-03	61.	5.89E-04	1.06E-03
42	-41.8585	-704.558	9.35	6.98E-04	32.9	5.86E-04	3.79E-04
43	-41.8585	-704.558	18.7	5.87E-04	349.1	5.76E-04	-1.11E-04
44	-41.8585	-704.558	28.05	7.84E-04	315.7	5.61E-04	-5.48E-04
45	-41.8585	-704.558	37.4	1.09E-03	299.8	5.4E-04	-9.44E-04
46	-41.8585	-704.558	46.75	1.4E-03	291.6	5.14E-04	-1.3E-03
47	-41.8585	-704.558	56.1	1.68E-03	286.7	4.83E-04	-1.61E-03
48	-41.8585	-704.558	65.45	1.92E-03	283.5	4.48E-04	-1.87E-03
49	-41.8585	-704.558	74.8	2.12E-03	281.2	4.1E-04	-2.08E-03
50	-41.8585	-704.558	84.15	2.25E-03	279.4	3.7E-04	-2.22E-03
51	-41.8585	-704.558	93.5	2.33E-03	278.1	3.28E-04	-2.31E-03
52	-41.8585	-704.558	102.85	2.35E-03	277.	2.85E-04	-2.34E-03
53	-41.8585	-704.558	112.2	2.31E-03	276.	2.43E-04	-2.3E-03
54	-41.8585	-704.558	121.55	2.21E-03	275.2	2.01E-04	-2.2E-03
55	-41.8585	-704.558	130.9	2.05E-03	274.5	1.62E-04	-2.04E-03
56	-41.8585	-704.558	140.25	1.83E-03	273.9	1.25E-04	-1.83E-03
57	-41.8585	-704.558	149.6	1.57E-03	273.4	9.18E-05	-1.56E-03
58	-41.8585	-704.558	158.95	1.25E-03	272.9	6.23E-05	-1.25E-03
59	-41.8585	-704.558	168.3	8.94E-04	272.4	3.71E-05	-8.93E-04
60	-41.8585	-704.558	177.65	4.94E-04	271.9	1.66E-05	-4.93E-04
END	-41.8585	-704.558	187.	0	0	0	0
GND	-29.0068	-488.239	0	3.9E-05	262.8	-4.87E-06	-3.87E-05
62	-29.0068	-488.239	9.35	1.58E-04	262.9	-1.94E-05	-1.56E-04
63	-29.0068	-488.239	18.7	2.4E-04	263.1	-2.9E-05	-2.38E-04
64	-29.0068	-488.239	28.05	3.11E-04	263.2	-3.67E-05	-3.09E-04
65	-29.0068	-488.239	37.4	3.72E-04	263.4	-4.29E-05	-3.7E-04
66	-29.0068	-488.239	46.75	4.25E-04	263.6	-4.77E-05	-4.22E-04
67	-29.0068	-488.239	56.1	4.67E-04	263.7	-5.1E-05	-4.64E-04
68	-29.0068	-488.239	65.45	5.E-04	263.9	-5.29E-05	-4.97E-04
69	-29.0068	-488.239	74.8	5.22E-04	264.1	-5.35E-05	-5.19E-04
70	-29.0068	-488.239	84.15	5.33E-04	264.3	-5.27E-05	-5.3E-04
71	-29.0068	-488.239	93.5	5.33E-04	264.5	-5.08E-05	-5.3E-04
72	-29.0068	-488.239	102.85	5.21E-04	264.7	-4.78E-05	-5.19E-04
73	-29.0068	-488.239	112.2	4.99E-04	265.	-4.38E-05	-4.97E-04
74	-29.0068	-488.239	121.55	4.66E-04	265.2	-3.91E-05	-4.65E-04
75	-29.0068	-488.239	130.9	4.24E-04	265.4	-3.38E-05	-4.22E-04
76	-29.0068	-488.239	140.25	3.72E-04	265.7	-2.8E-05	-3.71E-04
77	-29.0068	-488.239	149.6	3.13E-04	265.9	-2.21E-05	-3.12E-04
78	-29.0068	-488.239	158.95	2.46E-04	266.2	-1.63E-05	-2.46E-04
79	-29.0068	-488.239	168.3	1.74E-04	266.5	-1.06E-05	-1.73E-04
80	-29.0068	-488.239	177.65	9.46E-05	266.8	-5.25E-06	-9.44E-05
END	-29.0068	-488.239	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 5 OC Self - (4 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-16.1551	-271.921	0	1.71E-05	43.2	1.25E-05	1.17E-05
82	-16.1551	-271.921	9.35	6.92E-05	43.3	5.03E-05	4.75E-05
83	-16.1551	-271.921	18.7	1.05E-04	43.6	7.63E-05	7.25E-05
84	-16.1551	-271.921	28.05	1.36E-04	43.8	9.83E-05	9.44E-05
85	-16.1551	-271.921	37.4	1.63E-04	44.1	1.17E-04	1.14E-04
86	-16.1551	-271.921	46.75	1.86E-04	44.4	1.33E-04	1.3E-04
87	-16.1551	-271.921	56.1	2.05E-04	44.7	1.45E-04	1.44E-04
88	-16.1551	-271.921	65.45	2.19E-04	45.1	1.55E-04	1.55E-04
89	-16.1551	-271.921	74.8	2.28E-04	45.4	1.6E-04	1.63E-04
90	-16.1551	-271.921	84.15	2.33E-04	45.8	1.63E-04	1.67E-04
91	-16.1551	-271.921	93.5	2.33E-04	46.1	1.61E-04	1.68E-04
92	-16.1551	-271.921	102.85	2.28E-04	46.5	1.57E-04	1.65E-04
93	-16.1551	-271.921	112.2	2.18E-04	46.9	1.49E-04	1.59E-04
94	-16.1551	-271.921	121.55	2.03E-04	47.3	1.38E-04	1.49E-04
95	-16.1551	-271.921	130.9	1.84E-04	47.7	1.24E-04	1.36E-04
96	-16.1551	-271.921	140.25	1.62E-04	48.1	1.08E-04	1.21E-04
97	-16.1551	-271.921	149.6	1.36E-04	48.6	8.98E-05	1.02E-04
98	-16.1551	-271.921	158.95	1.07E-04	49.1	6.99E-05	8.07E-05
99	-16.1551	-271.921	168.3	7.52E-05	49.6	4.87E-05	5.72E-05
100	-16.1551	-271.921	177.65	4.09E-05	50.2	2.62E-05	3.14E-05
END	-16.1551	-271.921	187.	0	0	0	0
GND	9.56612	161.016	0	8.49E-06	324.	6.87E-06	-4.98E-06
102	9.56612	161.016	9.35	3.42E-05	324.2	2.78E-05	-2.E-05
103	9.56612	161.016	18.7	5.2E-05	324.3	4.23E-05	-3.03E-05
104	9.56612	161.016	28.05	6.73E-05	324.5	5.48E-05	-3.9E-05
105	9.56612	161.016	37.4	8.04E-05	324.7	6.57E-05	-4.64E-05
106	9.56612	161.016	46.75	9.15E-05	325.	7.49E-05	-5.25E-05
107	9.56612	161.016	56.1	1.E-04	325.2	8.25E-05	-5.73E-05
108	9.56612	161.016	65.45	1.07E-04	325.5	8.83E-05	-6.08E-05
109	9.56612	161.016	74.8	1.12E-04	325.7	9.22E-05	-6.29E-05
110	9.56612	161.016	84.15	1.14E-04	326.	9.42E-05	-6.36E-05
111	9.56612	161.016	93.5	1.13E-04	326.3	9.42E-05	-6.29E-05
112	9.56612	161.016	102.85	1.1E-04	326.6	9.22E-05	-6.09E-05
113	9.56612	161.016	112.2	1.05E-04	326.9	8.83E-05	-5.76E-05
114	9.56612	161.016	121.55	9.81E-05	327.2	8.25E-05	-5.31E-05
115	9.56612	161.016	130.9	8.88E-05	327.6	7.5E-05	-4.76E-05
116	9.56612	161.016	140.25	7.77E-05	327.9	6.59E-05	-4.13E-05
117	9.56612	161.016	149.6	6.5E-05	328.3	5.53E-05	-3.41E-05
118	9.56612	161.016	158.95	5.09E-05	328.8	4.36E-05	-2.64E-05
119	9.56612	161.016	168.3	3.57E-05	329.2	3.07E-05	-1.83E-05
120	9.56612	161.016	177.65	1.93E-05	329.8	1.67E-05	-9.74E-06
END	9.56612	161.016	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 6 OC Self - (1 of 4)

KESJ T6 (KFEQ T2 East-Central) Open Circuit Self

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.297	10
		0	0	96.		
2	none	121.6	116.9	0	.297	10
		121.6	116.9	97.		
3	none	99.9	171.	0	.297	10
		99.9	171.	100.		
4	none	95.	66.	0	.297	10
		95.	66.	100.		
5	none	705.8	93.4	0	.231	20
		705.8	93.4	187.		
6	none	489.1	93.4	0	.231	20
		489.1	93.4	187.		
7	none	272.4	93.4	0	.231	20
		272.4	93.4	187.		
8	none	161.3	273.4	0	.231	20
		161.3	273.4	187.		

Number of wires = 8
current nodes = 120

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	9.35	3	10.
radius	5	.231	1	.297

ELECTRICAL DESCRIPTION - Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	1.55	0	1	.0259722	.0277778

Sources:	source	node	sector	magnitude	phase	type
	1	61	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,046.	0	0	0
2	11	0	-10,046.	0	0	0
3	21	0	-10,046.	0	0	0
4	31	0	-10,046.	0	0	0
5	41	0	-3,171.6	0	0	0
6	61	0	0	0	0	0
7	81	0	-3,171.6	0	0	0
8	101	0	-3,171.6	0	0	0

MoM Model Details for Towers Driven Individually - Tower 6 OC Self - (2 of 4)

IMPEDANCE normalization = 50. source = 1; node 61, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.55	287.73	-536.83	609.07	298.2	25.921	-.67051	-8.4447

CURRENT: rms Frequency: 1.55 MHz Input power: 3.878E-04 watts Efficiency: 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.58E-06	105.3	-4.18E-07	1.52E-06
2	0	0	9.6	1.77E-05	105.3	-4.69E-06	1.71E-05
3	0	0	19.2	2.68E-05	105.3	-7.09E-06	2.59E-05
4	0	0	28.8	3.28E-05	105.3	-8.65E-06	3.16E-05
5	0	0	38.4	3.6E-05	105.3	-9.49E-06	3.47E-05
6	0	0	48.	3.66E-05	105.3	-9.64E-06	3.53E-05
7	0	0	57.6	3.46E-05	105.3	-9.12E-06	3.34E-05
8	0	0	67.2	3.02E-05	105.3	-7.95E-06	2.91E-05
9	0	0	76.8	2.33E-05	105.3	-6.14E-06	2.25E-05
10	0	0	86.4	1.38E-05	105.3	-3.65E-06	1.33E-05
END	0	0	96.	0	0	0	0
GND	-55.0161	-108.443	0	2.16E-06	243.2	-9.75E-07	-1.93E-06
12	-55.0161	-108.443	9.7	2.44E-05	243.2	-1.1E-05	-2.18E-05
13	-55.0161	-108.443	19.4	3.7E-05	243.1	-1.67E-05	-3.3E-05
14	-55.0161	-108.443	29.1	4.51E-05	243.	-2.05E-05	-4.02E-05
15	-55.0161	-108.443	38.8	4.95E-05	242.9	-2.26E-05	-4.41E-05
16	-55.0161	-108.443	48.5	5.03E-05	242.8	-2.3E-05	-4.47E-05
17	-55.0161	-108.443	58.2	4.75E-05	242.6	-2.19E-05	-4.22E-05
18	-55.0161	-108.443	67.9	4.14E-05	242.5	-1.91E-05	-3.67E-05
19	-55.0161	-108.443	77.6	3.19E-05	242.3	-1.48E-05	-2.82E-05
20	-55.0161	-108.443	87.3	1.89E-05	242.1	-8.85E-06	-1.67E-05
END	-55.0161	-108.443	97.	0	0	0	0
GND	-98.6701	-15.6278	0	1.23E-06	143.8	-9.94E-07	7.28E-07
22	-98.6701	-15.6278	10.	1.42E-05	143.8	-1.14E-05	8.39E-06
23	-98.6701	-15.6278	20.	2.16E-05	143.7	-1.74E-05	1.28E-05
24	-98.6701	-15.6278	30.	2.64E-05	143.7	-2.13E-05	1.57E-05
25	-98.6701	-15.6278	40.	2.91E-05	143.6	-2.34E-05	1.72E-05
26	-98.6701	-15.6278	50.	2.96E-05	143.6	-2.38E-05	1.76E-05
27	-98.6701	-15.6278	60.	2.81E-05	143.5	-2.26E-05	1.67E-05
28	-98.6701	-15.6278	70.	2.45E-05	143.5	-1.97E-05	1.46E-05
29	-98.6701	-15.6278	80.	1.89E-05	143.4	-1.52E-05	1.13E-05
30	-98.6701	-15.6278	90.	1.12E-05	143.3	-9.E-06	6.7E-06
END	-98.6701	-15.6278	100.	0	0	0	0
GND	38.64	-86.7868	0	2.15E-06	224.2	-1.54E-06	-1.5E-06
32	38.64	-86.7868	10.	2.47E-05	224.1	-1.77E-05	-1.72E-05
33	38.64	-86.7868	20.	3.75E-05	224.1	-2.7E-05	-2.61E-05
34	38.64	-86.7868	30.	4.59E-05	224.	-3.31E-05	-3.19E-05
35	38.64	-86.7868	40.	5.04E-05	223.8	-3.64E-05	-3.49E-05
36	38.64	-86.7868	50.	5.13E-05	223.7	-3.71E-05	-3.54E-05
37	38.64	-86.7868	60.	4.85E-05	223.6	-3.51E-05	-3.34E-05
38	38.64	-86.7868	70.	4.22E-05	223.4	-3.07E-05	-2.9E-05
39	38.64	-86.7868	80.	3.25E-05	223.2	-2.37E-05	-2.23E-05
40	38.64	-86.7868	90.	1.92E-05	223.	-1.41E-05	-1.31E-05
END	38.64	-86.7868	100.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 6 OC Self - (3 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-41.8585	-704.558	0	3.76E-05	263.7	-4.13E-06	-3.73E-05
42	-41.8585	-704.558	9.35	1.52E-04	263.8	-1.65E-05	-1.51E-04
43	-41.8585	-704.558	18.7	2.31E-04	263.9	-2.46E-05	-2.29E-04
44	-41.8585	-704.558	28.05	2.99E-04	264.	-3.12E-05	-2.97E-04
45	-41.8585	-704.558	37.4	3.58E-04	264.2	-3.64E-05	-3.56E-04
46	-41.8585	-704.558	46.75	4.08E-04	264.3	-4.04E-05	-4.06E-04
47	-41.8585	-704.558	56.1	4.49E-04	264.5	-4.32E-05	-4.47E-04
48	-41.8585	-704.558	65.45	4.8E-04	264.6	-4.48E-05	-4.78E-04
49	-41.8585	-704.558	74.8	5.01E-04	264.8	-4.53E-05	-4.99E-04
50	-41.8585	-704.558	84.15	5.11E-04	265.	-4.46E-05	-5.09E-04
51	-41.8585	-704.558	93.5	5.11E-04	265.2	-4.3E-05	-5.09E-04
52	-41.8585	-704.558	102.85	5.E-04	265.4	-4.04E-05	-4.98E-04
53	-41.8585	-704.558	112.2	4.78E-04	265.6	-3.7E-05	-4.77E-04
54	-41.8585	-704.558	121.55	4.47E-04	265.8	-3.3E-05	-4.46E-04
55	-41.8585	-704.558	130.9	4.06E-04	266.	-2.85E-05	-4.05E-04
56	-41.8585	-704.558	140.25	3.56E-04	266.2	-2.36E-05	-3.56E-04
57	-41.8585	-704.558	149.6	2.99E-04	266.4	-1.86E-05	-2.99E-04
58	-41.8585	-704.558	158.95	2.36E-04	266.7	-1.36E-05	-2.35E-04
59	-41.8585	-704.558	168.3	1.66E-04	266.9	-8.86E-06	-1.66E-04
60	-41.8585	-704.558	177.65	9.03E-05	267.2	-4.38E-06	-9.02E-05
END	-41.8585	-704.558	187.	0	0	0	0
GND	-29.0068	-488.239	0	1.16E-03	61.8	5.48E-04	1.02E-03
62	-29.0068	-488.239	9.35	6.43E-04	31.9	5.46E-04	3.4E-04
63	-29.0068	-488.239	18.7	5.57E-04	344.4	5.37E-04	-1.5E-04
64	-29.0068	-488.239	28.05	7.86E-04	311.7	5.23E-04	-5.86E-04
65	-29.0068	-488.239	37.4	1.1E-03	297.2	5.03E-04	-9.81E-04
66	-29.0068	-488.239	46.75	1.42E-03	289.7	4.79E-04	-1.33E-03
67	-29.0068	-488.239	56.1	1.7E-03	285.3	4.51E-04	-1.64E-03
68	-29.0068	-488.239	65.45	1.95E-03	282.4	4.18E-04	-1.9E-03
69	-29.0068	-488.239	74.8	2.14E-03	280.3	3.83E-04	-2.11E-03
70	-29.0068	-488.239	84.15	2.28E-03	278.7	3.46E-04	-2.25E-03
71	-29.0068	-488.239	93.5	2.36E-03	277.5	3.07E-04	-2.34E-03
72	-29.0068	-488.239	102.85	2.37E-03	276.5	2.67E-04	-2.36E-03
73	-29.0068	-488.239	112.2	2.33E-03	275.6	2.28E-04	-2.32E-03
74	-29.0068	-488.239	121.55	2.23E-03	274.9	1.89E-04	-2.22E-03
75	-29.0068	-488.239	130.9	2.06E-03	274.2	1.53E-04	-2.06E-03
76	-29.0068	-488.239	140.25	1.84E-03	273.7	1.18E-04	-1.84E-03
77	-29.0068	-488.239	149.6	1.58E-03	273.2	8.71E-05	-1.57E-03
78	-29.0068	-488.239	158.95	1.26E-03	272.7	5.93E-05	-1.26E-03
79	-29.0068	-488.239	168.3	8.99E-04	272.3	3.56E-05	-8.98E-04
80	-29.0068	-488.239	177.65	4.96E-04	271.9	1.61E-05	-4.96E-04
END	-29.0068	-488.239	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 6 OC Self - (4 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-16.1551	-271.921	0	3.86E-05	267.1	-1.97E-06	-3.85E-05
82	-16.1551	-271.921	9.35	1.56E-04	267.1	-7.75E-06	-1.56E-04
83	-16.1551	-271.921	18.7	2.37E-04	267.3	-1.13E-05	-2.37E-04
84	-16.1551	-271.921	28.05	3.07E-04	267.4	-1.39E-05	-3.07E-04
85	-16.1551	-271.921	37.4	3.68E-04	267.5	-1.58E-05	-3.67E-04
86	-16.1551	-271.921	46.75	4.19E-04	267.7	-1.68E-05	-4.19E-04
87	-16.1551	-271.921	56.1	4.61E-04	267.9	-1.72E-05	-4.61E-04
88	-16.1551	-271.921	65.45	4.93E-04	268.	-1.7E-05	-4.93E-04
89	-16.1551	-271.921	74.8	5.15E-04	268.2	-1.62E-05	-5.14E-04
90	-16.1551	-271.921	84.15	5.25E-04	268.4	-1.5E-05	-5.25E-04
91	-16.1551	-271.921	93.5	5.25E-04	268.5	-1.33E-05	-5.25E-04
92	-16.1551	-271.921	102.85	5.14E-04	268.7	-1.13E-05	-5.13E-04
93	-16.1551	-271.921	112.2	4.91E-04	268.9	-9.17E-06	-4.91E-04
94	-16.1551	-271.921	121.55	4.59E-04	269.1	-6.96E-06	-4.59E-04
95	-16.1551	-271.921	130.9	4.17E-04	269.3	-4.81E-06	-4.17E-04
96	-16.1551	-271.921	140.25	3.66E-04	269.6	-2.83E-06	-3.66E-04
97	-16.1551	-271.921	149.6	3.08E-04	269.8	-1.16E-06	-3.08E-04
98	-16.1551	-271.921	158.95	2.42E-04	270.	1.01E-07	-2.42E-04
99	-16.1551	-271.921	168.3	1.71E-04	270.3	8.27E-07	-1.71E-04
100	-16.1551	-271.921	177.65	9.29E-05	270.6	8.95E-07	-9.29E-05
END	-16.1551	-271.921	187.	0	0	0	0
GND	9.56612	161.016	0	1.21E-05	192.1	-1.18E-05	-2.54E-06
102	9.56612	161.016	9.35	4.89E-05	192.2	-4.78E-05	-1.04E-05
103	9.56612	161.016	18.7	7.43E-05	192.4	-7.26E-05	-1.6E-05
104	9.56612	161.016	28.05	9.62E-05	192.6	-9.39E-05	-2.1E-05
105	9.56612	161.016	37.4	1.15E-04	192.8	-1.12E-04	-2.56E-05
106	9.56612	161.016	46.75	1.31E-04	193.1	-1.28E-04	-2.96E-05
107	9.56612	161.016	56.1	1.44E-04	193.3	-1.4E-04	-3.32E-05
108	9.56612	161.016	65.45	1.54E-04	193.5	-1.5E-04	-3.61E-05
109	9.56612	161.016	74.8	1.61E-04	193.8	-1.56E-04	-3.84E-05
110	9.56612	161.016	84.15	1.64E-04	194.1	-1.59E-04	-3.99E-05
111	9.56612	161.016	93.5	1.64E-04	194.4	-1.58E-04	-4.06E-05
112	9.56612	161.016	102.85	1.6E-04	194.7	-1.55E-04	-4.04E-05
113	9.56612	161.016	112.2	1.53E-04	195.	-1.48E-04	-3.94E-05
114	9.56612	161.016	121.55	1.43E-04	195.3	-1.37E-04	-3.76E-05
115	9.56612	161.016	130.9	1.29E-04	195.6	-1.24E-04	-3.48E-05
116	9.56612	161.016	140.25	1.13E-04	196.	-1.09E-04	-3.12E-05
117	9.56612	161.016	149.6	9.5E-05	196.3	-9.12E-05	-2.67E-05
118	9.56612	161.016	158.95	7.46E-05	196.8	-7.15E-05	-2.15E-05
119	9.56612	161.016	168.3	5.24E-05	197.2	-5.01E-05	-1.55E-05
120	9.56612	161.016	177.65	2.85E-05	197.7	-2.71E-05	-8.65E-06
END	9.56612	161.016	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 7 OC Self – (1 of 4)

KESJ T7 (KFEQ T3 West-Central) Open Circuit Self

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.297	10
		0	0	96.		
2	none	121.6	116.9	0	.297	10
		121.6	116.9	97.		
3	none	99.9	171.	0	.297	10
		99.9	171.	100.		
4	none	95.	66.	0	.297	10
		95.	66.	100.		
5	none	705.8	93.4	0	.231	20
		705.8	93.4	187.		
6	none	489.1	93.4	0	.231	20
		489.1	93.4	187.		
7	none	272.4	93.4	0	.231	20
		272.4	93.4	187.		
8	none	161.3	273.4	0	.231	20
		161.3	273.4	187.		

Number of wires = 8
current nodes = 120

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	9.35	3	10.
radius	5	.231	1	.297

ELECTRICAL DESCRIPTION - Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.55	0	1	.0259722	.0277778

Sources: source	node	sector	magnitude	phase	type
1	81	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,046.	0	0	0
2	11	0	-10,046.	0	0	0
3	21	0	-10,046.	0	0	0
4	31	0	-10,046.	0	0	0
5	41	0	-3,171.6	0	0	0
6	61	0	-3,161.6	0	0	0
7	81	0	0	0	0	0
8	101	0	-3,171.6	0	0	0

MoM Model Details for Towers Driven Individually - Tower 7 OC Self - (2 of 4)

IMPEDANCE normalization = 50. source = 1; node 81, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.55	264.26	-515.32	579.12	297.1	25.533	-.6807	-8.3842

CURRENT: rms Frequency: 1.55 MHz Input power: 3.94E-04 watts Efficiency: 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	4.29E-06	324.1	3.48E-06	-2.51E-06
2	0	0	9.6	4.82E-05	324.1	3.91E-05	-2.83E-05
3	0	0	19.2	7.28E-05	324.1	5.9E-05	-4.27E-05
4	0	0	28.8	8.88E-05	324.1	7.2E-05	-5.21E-05
5	0	0	38.4	9.73E-05	324.1	7.88E-05	-5.71E-05
6	0	0	48.	9.87E-05	324.1	7.99E-05	-5.79E-05
7	0	0	57.6	9.32E-05	324.1	7.55E-05	-5.47E-05
8	0	0	67.2	8.1E-05	324.1	6.56E-05	-4.75E-05
9	0	0	76.8	6.23E-05	324.1	5.05E-05	-3.66E-05
10	0	0	86.4	3.69E-05	324.1	2.99E-05	-2.16E-05
END	0	0	96.	0	0	0	0
GND	-55.0161	-108.443	0	6.42E-06	92.4	-2.65E-07	6.41E-06
12	-55.0161	-108.443	9.7	7.26E-05	92.3	-2.97E-06	7.26E-05
13	-55.0161	-108.443	19.4	1.1E-04	92.3	-4.43E-06	1.1E-04
14	-55.0161	-108.443	29.1	1.35E-04	92.3	-5.31E-06	1.34E-04
15	-55.0161	-108.443	38.8	1.48E-04	92.2	-5.69E-06	1.48E-04
16	-55.0161	-108.443	48.5	1.5E-04	92.1	-5.61E-06	1.5E-04
17	-55.0161	-108.443	58.2	1.43E-04	92.1	-5.13E-06	1.42E-04
18	-55.0161	-108.443	67.9	1.24E-04	92.	-4.28E-06	1.24E-04
19	-55.0161	-108.443	77.6	9.59E-05	91.9	-3.14E-06	9.59E-05
20	-55.0161	-108.443	87.3	5.69E-05	91.8	-1.75E-06	5.69E-05
END	-55.0161	-108.443	97.	0	0	0	0
GND	-98.6701	-15.6278	0	3.59E-06	337.9	3.32E-06	-1.35E-06
22	-98.6701	-15.6278	10.	4.13E-05	337.9	3.82E-05	-1.55E-05
23	-98.6701	-15.6278	20.	6.26E-05	337.9	5.8E-05	-2.35E-05
24	-98.6701	-15.6278	30.	7.65E-05	338.	7.09E-05	-2.87E-05
25	-98.6701	-15.6278	40.	8.39E-05	338.	7.78E-05	-3.15E-05
26	-98.6701	-15.6278	50.	8.52E-05	338.	7.9E-05	-3.19E-05
27	-98.6701	-15.6278	60.	8.04E-05	338.1	7.46E-05	-3.E-05
28	-98.6701	-15.6278	70.	6.99E-05	338.1	6.49E-05	-2.61E-05
29	-98.6701	-15.6278	80.	5.37E-05	338.2	4.98E-05	-2.E-05
30	-98.6701	-15.6278	90.	3.17E-05	338.2	2.94E-05	-1.18E-05
END	-98.6701	-15.6278	100.	0	0	0	0
GND	38.64	-86.7868	0	6.12E-06	72.2	1.88E-06	5.83E-06
32	38.64	-86.7868	10.	7.04E-05	72.1	2.16E-05	6.71E-05
33	38.64	-86.7868	20.	1.07E-04	72.1	3.28E-05	1.02E-04
34	38.64	-86.7868	30.	1.31E-04	72.1	4.02E-05	1.25E-04
35	38.64	-86.7868	40.	1.44E-04	72.1	4.42E-05	1.37E-04
36	38.64	-86.7868	50.	1.46E-04	72.1	4.51E-05	1.39E-04
37	38.64	-86.7868	60.	1.38E-04	72.	4.27E-05	1.32E-04
38	38.64	-86.7868	70.	1.21E-04	72.	3.73E-05	1.15E-04
39	38.64	-86.7868	80.	9.28E-05	71.9	2.88E-05	8.83E-05
40	38.64	-86.7868	90.	5.49E-05	71.9	1.71E-05	5.22E-05
END	38.64	-86.7868	100.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 7 OC Self - (3 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-41.8585	-704.558	0	1.72E-05	44.7	1.23E-05	1.21E-05
42	-41.8585	-704.558	9.35	6.96E-05	44.9	4.93E-05	4.91E-05
43	-41.8585	-704.558	18.7	1.06E-04	45.1	7.47E-05	7.5E-05
44	-41.8585	-704.558	28.05	1.37E-04	45.4	9.63E-05	9.75E-05
45	-41.8585	-704.558	37.4	1.64E-04	45.6	1.15E-04	1.17E-04
46	-41.8585	-704.558	46.75	1.87E-04	45.9	1.3E-04	1.34E-04
47	-41.8585	-704.558	56.1	2.05E-04	46.3	1.42E-04	1.48E-04
48	-41.8585	-704.558	65.45	2.2E-04	46.6	1.51E-04	1.59E-04
49	-41.8585	-704.558	74.8	2.29E-04	46.9	1.56E-04	1.67E-04
50	-41.8585	-704.558	84.15	2.33E-04	47.2	1.58E-04	1.71E-04
51	-41.8585	-704.558	93.5	2.33E-04	47.6	1.57E-04	1.72E-04
52	-41.8585	-704.558	102.85	2.28E-04	48.	1.52E-04	1.69E-04
53	-41.8585	-704.558	112.2	2.18E-04	48.3	1.45E-04	1.63E-04
54	-41.8585	-704.558	121.55	2.03E-04	48.7	1.34E-04	1.53E-04
55	-41.8585	-704.558	130.9	1.84E-04	49.2	1.2E-04	1.39E-04
56	-41.8585	-704.558	140.25	1.61E-04	49.6	1.05E-04	1.23E-04
57	-41.8585	-704.558	149.6	1.35E-04	50.1	8.69E-05	1.04E-04
58	-41.8585	-704.558	158.95	1.06E-04	50.5	6.76E-05	8.21E-05
59	-41.8585	-704.558	168.3	7.48E-05	51.1	4.7E-05	5.82E-05
60	-41.8585	-704.558	177.65	4.06E-05	51.6	2.52E-05	3.19E-05
END	-41.8585	-704.558	187.	0	0	0	0
GND	-29.0068	-488.239	0	4.04E-05	267.8	-1.58E-06	-4.04E-05
62	-29.0068	-488.239	9.35	1.63E-04	267.9	-6.11E-06	-1.63E-04
63	-29.0068	-488.239	18.7	2.48E-04	268.	-8.7E-06	-2.48E-04
64	-29.0068	-488.239	28.05	3.21E-04	268.1	-1.04E-05	-3.21E-04
65	-29.0068	-488.239	37.4	3.84E-04	268.3	-1.13E-05	-3.84E-04
66	-29.0068	-488.239	46.75	4.38E-04	268.5	-1.15E-05	-4.38E-04
67	-29.0068	-488.239	56.1	4.82E-04	268.7	-1.11E-05	-4.82E-04
68	-29.0068	-488.239	65.45	5.16E-04	268.9	-1.02E-05	-5.15E-04
69	-29.0068	-488.239	74.8	5.38E-04	269.1	-8.78E-06	-5.38E-04
70	-29.0068	-488.239	84.15	5.49E-04	269.3	-7.E-06	-5.49E-04
71	-29.0068	-488.239	93.5	5.49E-04	269.5	-4.99E-06	-5.49E-04
72	-29.0068	-488.239	102.85	5.37E-04	269.7	-2.84E-06	-5.37E-04
73	-29.0068	-488.239	112.2	5.14E-04	269.9	-7.1E-07	-5.14E-04
74	-29.0068	-488.239	121.55	4.8E-04	270.2	1.28E-06	-4.8E-04
75	-29.0068	-488.239	130.9	4.36E-04	270.4	3.E-06	-4.36E-04
76	-29.0068	-488.239	140.25	3.83E-04	270.6	4.32E-06	-3.83E-04
77	-29.0068	-488.239	149.6	3.22E-04	270.9	5.11E-06	-3.22E-04
78	-29.0068	-488.239	158.95	2.53E-04	271.2	5.24E-06	-2.53E-04
79	-29.0068	-488.239	168.3	1.78E-04	271.5	4.61E-06	-1.78E-04
80	-29.0068	-488.239	177.65	9.71E-05	271.8	3.05E-06	-9.71E-05
END	-29.0068	-488.239	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 7 OC Self - (4 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-16.1551	-271.921	0	1.22E-03	62.9	5.57E-04	1.09E-03
82	-16.1551	-271.921	9.35	6.85E-04	36.	5.54E-04	4.03E-04
83	-16.1551	-271.921	18.7	5.52E-04	350.8	5.45E-04	-8.79E-05
84	-16.1551	-271.921	28.05	7.47E-04	315.3	5.31E-04	-5.26E-04
85	-16.1551	-271.921	37.4	1.06E-03	299.	5.11E-04	-9.23E-04
86	-16.1551	-271.921	46.75	1.37E-03	290.8	4.86E-04	-1.28E-03
87	-16.1551	-271.921	56.1	1.65E-03	286.	4.57E-04	-1.59E-03
88	-16.1551	-271.921	65.45	1.9E-03	282.9	4.24E-04	-1.85E-03
89	-16.1551	-271.921	74.8	2.1E-03	280.7	3.87E-04	-2.06E-03
90	-16.1551	-271.921	84.15	2.24E-03	279.	3.49E-04	-2.21E-03
91	-16.1551	-271.921	93.5	2.32E-03	277.7	3.09E-04	-2.3E-03
92	-16.1551	-271.921	102.85	2.34E-03	276.6	2.69E-04	-2.33E-03
93	-16.1551	-271.921	112.2	2.3E-03	275.7	2.29E-04	-2.29E-03
94	-16.1551	-271.921	121.55	2.2E-03	274.9	1.9E-04	-2.2E-03
95	-16.1551	-271.921	130.9	2.04E-03	274.3	1.52E-04	-2.04E-03
96	-16.1551	-271.921	140.25	1.83E-03	273.7	1.17E-04	-1.83E-03
97	-16.1551	-271.921	149.6	1.56E-03	273.1	8.59E-05	-1.56E-03
98	-16.1551	-271.921	158.95	1.25E-03	272.7	5.81E-05	-1.25E-03
99	-16.1551	-271.921	168.3	8.94E-04	272.2	3.45E-05	-8.93E-04
100	-16.1551	-271.921	177.65	4.94E-04	271.8	1.53E-05	-4.94E-04
END	-16.1551	-271.921	187.	0	0	0	0
GND	9.56612	161.016	0	2.66E-05	49.5	1.73E-05	2.02E-05
102	9.56612	161.016	9.35	1.07E-04	49.6	6.96E-05	8.17E-05
103	9.56612	161.016	18.7	1.63E-04	49.7	1.06E-04	1.25E-04
104	9.56612	161.016	28.05	2.12E-04	49.9	1.37E-04	1.62E-04
105	9.56612	161.016	37.4	2.54E-04	50.	1.63E-04	1.95E-04
106	9.56612	161.016	46.75	2.9E-04	50.2	1.86E-04	2.23E-04
107	9.56612	161.016	56.1	3.19E-04	50.4	2.04E-04	2.46E-04
108	9.56612	161.016	65.45	3.42E-04	50.6	2.17E-04	2.64E-04
109	9.56612	161.016	74.8	3.57E-04	50.8	2.26E-04	2.77E-04
110	9.56612	161.016	84.15	3.65E-04	51.	2.3E-04	2.84E-04
111	9.56612	161.016	93.5	3.65E-04	51.2	2.29E-04	2.85E-04
112	9.56612	161.016	102.85	3.57E-04	51.5	2.23E-04	2.8E-04
113	9.56612	161.016	112.2	3.42E-04	51.7	2.12E-04	2.69E-04
114	9.56612	161.016	121.55	3.2E-04	51.9	1.97E-04	2.52E-04
115	9.56612	161.016	130.9	2.91E-04	52.2	1.78E-04	2.3E-04
116	9.56612	161.016	140.25	2.56E-04	52.5	1.56E-04	2.03E-04
117	9.56612	161.016	149.6	2.15E-04	52.7	1.3E-04	1.71E-04
118	9.56612	161.016	158.95	1.69E-04	53.	1.02E-04	1.35E-04
119	9.56612	161.016	168.3	1.19E-04	53.3	7.11E-05	9.56E-05
120	9.56612	161.016	177.65	6.49E-05	53.7	3.84E-05	5.23E-05
END	9.56612	161.016	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 8 OC Self - (1 of 4)

KESJ T8 (KFEQ T4 West) Open Circuit Self

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.297	10
		0	0	96.		
2	none	121.6	116.9	0	.297	10
		121.6	116.9	97.		
3	none	99.9	171.	0	.297	10
		99.9	171.	100.		
4	none	95.	66.	0	.297	10
		95.	66.	100.		
5	none	705.8	93.4	0	.231	20
		705.8	93.4	187.		
6	none	489.1	93.4	0	.231	20
		489.1	93.4	187.		
7	none	272.4	93.4	0	.231	20
		272.4	93.4	187.		
8	none	161.3	273.4	0	.231	20
		161.3	273.4	187.		

Number of wires = 8
current nodes = 120

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	5	9.35	3	10.
radius	5	.231	1	.297

ELECTRICAL DESCRIPTION - Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.55	0	1	.0259722	.0277778

Sources:	source	node	sector	magnitude	phase	type
	1	101	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	-10,046.	0	0	0
2	11	0	-10,046.	0	0	0
3	21	0	-10,046.	0	0	0
4	31	0	-10,046.	0	0	0
5	41	0	-3,171.6	0	0	0
6	61	0	-3,161.6	0	0	0
7	81	0	-3,171.6	0	0	0
8	101	0	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 8 OC Self - (2 of 4)

IMPEDANCE normalization = 50. source = 1; node 101, sector 1

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
1.55	270.89	-472.58	544.71	299.8	22.045	-.78855	-7.7979

CURRENT: rms Frequency: 1.55 MHz Input power: 4.565E-04 watts Efficiency: 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	7.06E-06	90.5	-6.76E-08	7.06E-06
2	0	0	9.6	7.94E-05	90.5	-7.19E-07	7.94E-05
3	0	0	19.2	1.2E-04	90.5	-9.88E-07	1.2E-04
4	0	0	28.8	1.47E-04	90.4	-1.06E-06	1.47E-04
5	0	0	38.4	1.61E-04	90.3	-9.56E-07	1.61E-04
6	0	0	48.	1.64E-04	90.3	-7.28E-07	1.64E-04
7	0	0	57.6	1.55E-04	90.2	-4.2E-07	1.55E-04
8	0	0	67.2	1.36E-04	90.	-9.53E-08	1.36E-04
9	0	0	76.8	1.05E-04	89.9	1.65E-07	1.05E-04
10	0	0	86.4	6.22E-05	89.8	2.61E-07	6.22E-05
END	0	0	96.	0	0	0	0
GND	-55.0161	-108.443	0	4.55E-06	310.4	2.95E-06	-3.47E-06
12	-55.0161	-108.443	9.7	5.14E-05	310.4	3.33E-05	-3.92E-05
13	-55.0161	-108.443	19.4	7.78E-05	310.4	5.04E-05	-5.92E-05
14	-55.0161	-108.443	29.1	9.49E-05	310.3	6.14E-05	-7.23E-05
15	-55.0161	-108.443	38.8	1.04E-04	310.3	6.73E-05	-7.93E-05
16	-55.0161	-108.443	48.5	1.05E-04	310.3	6.82E-05	-8.04E-05
17	-55.0161	-108.443	58.2	9.96E-05	310.3	6.44E-05	-7.59E-05
18	-55.0161	-108.443	67.9	8.65E-05	310.3	5.6E-05	-6.6E-05
19	-55.0161	-108.443	77.6	6.65E-05	310.3	4.3E-05	-5.07E-05
20	-55.0161	-108.443	87.3	3.93E-05	310.3	2.54E-05	-3.E-05
END	-55.0161	-108.443	97.	0	0	0	0
GND	-98.6701	-15.6278	0	6.85E-06	48.4	4.55E-06	5.12E-06
22	-98.6701	-15.6278	10.	7.88E-05	48.4	5.23E-05	5.9E-05
23	-98.6701	-15.6278	20.	1.2E-04	48.4	7.95E-05	8.95E-05
24	-98.6701	-15.6278	30.	1.46E-04	48.4	9.73E-05	1.09E-04
25	-98.6701	-15.6278	40.	1.61E-04	48.3	1.07E-04	1.2E-04
26	-98.6701	-15.6278	50.	1.63E-04	48.3	1.09E-04	1.22E-04
27	-98.6701	-15.6278	60.	1.55E-04	48.3	1.03E-04	1.15E-04
28	-98.6701	-15.6278	70.	1.34E-04	48.2	8.96E-05	1.E-04
29	-98.6701	-15.6278	80.	1.03E-04	48.2	6.9E-05	7.71E-05
30	-98.6701	-15.6278	90.	6.12E-05	48.1	4.09E-05	4.55E-05
END	-98.6701	-15.6278	100.	0	0	0	0
GND	38.64	-86.7868	0	3.97E-06	358.6	3.97E-06	-9.36E-08
32	38.64	-86.7868	10.	4.56E-05	358.7	4.56E-05	-1.07E-06
33	38.64	-86.7868	20.	6.92E-05	358.7	6.92E-05	-1.62E-06
34	38.64	-86.7868	30.	8.47E-05	358.7	8.47E-05	-1.96E-06
35	38.64	-86.7868	40.	9.3E-05	358.7	9.29E-05	-2.13E-06
36	38.64	-86.7868	50.	9.44E-05	358.7	9.44E-05	-2.13E-06
37	38.64	-86.7868	60.	8.92E-05	358.7	8.92E-05	-1.98E-06
38	38.64	-86.7868	70.	7.76E-05	358.8	7.76E-05	-1.69E-06
39	38.64	-86.7868	80.	5.97E-05	358.8	5.97E-05	-1.27E-06
40	38.64	-86.7868	90.	3.53E-05	358.8	3.53E-05	-7.32E-07
END	38.64	-86.7868	100.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 8 OC Self - (3 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-41.8585	-704.558	0	8.98E-06	323.1	7.18E-06	-5.39E-06
42	-41.8585	-704.558	9.35	3.62E-05	323.2	2.9E-05	-2.17E-05
43	-41.8585	-704.558	18.7	5.49E-05	323.5	4.41E-05	-3.27E-05
44	-41.8585	-704.558	28.05	7.08E-05	323.7	5.71E-05	-4.19E-05
45	-41.8585	-704.558	37.4	8.45E-05	324.	6.84E-05	-4.97E-05
46	-41.8585	-704.558	46.75	9.6E-05	324.3	7.8E-05	-5.6E-05
47	-41.8585	-704.558	56.1	1.05E-04	324.7	8.59E-05	-6.09E-05
48	-41.8585	-704.558	65.45	1.12E-04	325.	9.18E-05	-6.42E-05
49	-41.8585	-704.558	74.8	1.16E-04	325.4	9.58E-05	-6.61E-05
50	-41.8585	-704.558	84.15	1.18E-04	325.8	9.78E-05	-6.65E-05
51	-41.8585	-704.558	93.5	1.18E-04	326.2	9.77E-05	-6.55E-05
52	-41.8585	-704.558	102.85	1.15E-04	326.6	9.56E-05	-6.31E-05
53	-41.8585	-704.558	112.2	1.09E-04	327.	9.14E-05	-5.93E-05
54	-41.8585	-704.558	121.55	1.01E-04	327.5	8.54E-05	-5.44E-05
55	-41.8585	-704.558	130.9	9.14E-05	328.	7.75E-05	-4.85E-05
56	-41.8585	-704.558	140.25	7.98E-05	328.5	6.81E-05	-4.17E-05
57	-41.8585	-704.558	149.6	6.66E-05	329.1	5.71E-05	-3.42E-05
58	-41.8585	-704.558	158.95	5.2E-05	329.7	4.49E-05	-2.62E-05
59	-41.8585	-704.558	168.3	3.64E-05	330.4	3.16E-05	-1.8E-05
60	-41.8585	-704.558	177.65	1.97E-05	331.1	1.72E-05	-9.49E-06
END	-41.8585	-704.558	187.	0	0	0	0
GND	-29.0068	-488.239	0	1.33E-05	190.3	-1.31E-05	-2.38E-06
62	-29.0068	-488.239	9.35	5.37E-05	190.5	-5.28E-05	-9.76E-06
63	-29.0068	-488.239	18.7	8.16E-05	190.8	-8.02E-05	-1.53E-05
64	-29.0068	-488.239	28.05	1.06E-04	191.1	-1.04E-04	-2.04E-05
65	-29.0068	-488.239	37.4	1.26E-04	191.5	-1.24E-04	-2.52E-05
66	-29.0068	-488.239	46.75	1.44E-04	191.9	-1.41E-04	-2.96E-05
67	-29.0068	-488.239	56.1	1.58E-04	192.3	-1.54E-04	-3.37E-05
68	-29.0068	-488.239	65.45	1.69E-04	192.7	-1.65E-04	-3.72E-05
69	-29.0068	-488.239	74.8	1.76E-04	193.2	-1.71E-04	-4.01E-05
70	-29.0068	-488.239	84.15	1.79E-04	193.6	-1.74E-04	-4.22E-05
71	-29.0068	-488.239	93.5	1.79E-04	194.1	-1.74E-04	-4.36E-05
72	-29.0068	-488.239	102.85	1.75E-04	194.6	-1.69E-04	-4.4E-05
73	-29.0068	-488.239	112.2	1.67E-04	195.1	-1.61E-04	-4.35E-05
74	-29.0068	-488.239	121.55	1.56E-04	195.6	-1.5E-04	-4.2E-05
75	-29.0068	-488.239	130.9	1.41E-04	196.2	-1.36E-04	-3.94E-05
76	-29.0068	-488.239	140.25	1.24E-04	196.8	-1.19E-04	-3.58E-05
77	-29.0068	-488.239	149.6	1.04E-04	197.4	-9.91E-05	-3.11E-05
78	-29.0068	-488.239	158.95	8.16E-05	198.1	-7.76E-05	-2.53E-05
79	-29.0068	-488.239	168.3	5.74E-05	198.8	-5.43E-05	-1.85E-05
80	-29.0068	-488.239	177.65	3.12E-05	199.5	-2.94E-05	-1.04E-05
END	-29.0068	-488.239	187.	0	0	0	0

MoM Model Details for Towers Driven Individually - Tower 8 OC Self - (4 of 4)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-16.1551	-271.921	0	2.79E-05	46.9	1.91E-05	2.04E-05
82	-16.1551	-271.921	9.35	1.13E-04	47.	7.69E-05	8.26E-05
83	-16.1551	-271.921	18.7	1.72E-04	47.2	1.17E-04	1.26E-04
84	-16.1551	-271.921	28.05	2.23E-04	47.4	1.51E-04	1.64E-04
85	-16.1551	-271.921	37.4	2.67E-04	47.6	1.8E-04	1.97E-04
86	-16.1551	-271.921	46.75	3.05E-04	47.8	2.05E-04	2.26E-04
87	-16.1551	-271.921	56.1	3.36E-04	48.1	2.25E-04	2.5E-04
88	-16.1551	-271.921	65.45	3.6E-04	48.3	2.39E-04	2.69E-04
89	-16.1551	-271.921	74.8	3.76E-04	48.5	2.49E-04	2.82E-04
90	-16.1551	-271.921	84.15	3.84E-04	48.8	2.53E-04	2.89E-04
91	-16.1551	-271.921	93.5	3.84E-04	49.	2.52E-04	2.9E-04
92	-16.1551	-271.921	102.85	3.76E-04	49.3	2.45E-04	2.85E-04
93	-16.1551	-271.921	112.2	3.61E-04	49.6	2.34E-04	2.75E-04
94	-16.1551	-271.921	121.55	3.37E-04	49.9	2.17E-04	2.58E-04
95	-16.1551	-271.921	130.9	3.07E-04	50.2	1.96E-04	2.36E-04
96	-16.1551	-271.921	140.25	2.7E-04	50.5	1.72E-04	2.08E-04
97	-16.1551	-271.921	149.6	2.27E-04	50.8	1.43E-04	1.76E-04
98	-16.1551	-271.921	158.95	1.79E-04	51.2	1.12E-04	1.39E-04
99	-16.1551	-271.921	168.3	1.26E-04	51.5	7.83E-05	9.85E-05
100	-16.1551	-271.921	177.65	6.86E-05	51.9	4.23E-05	5.4E-05
END	-16.1551	-271.921	187.	0	0	0	0
GND	9.56612	161.016	0	1.3E-03	60.2	6.46E-04	1.13E-03
102	9.56612	161.016	9.35	7.8E-04	34.5	6.42E-04	4.42E-04
103	9.56612	161.016	18.7	6.34E-04	355.6	6.32E-04	-4.86E-05
104	9.56612	161.016	28.05	7.85E-04	321.6	6.15E-04	-4.87E-04
105	9.56612	161.016	37.4	1.06E-03	303.8	5.92E-04	-8.85E-04
106	9.56612	161.016	46.75	1.36E-03	294.4	5.63E-04	-1.24E-03
107	9.56612	161.016	56.1	1.64E-03	288.8	5.28E-04	-1.55E-03
108	9.56612	161.016	65.45	1.88E-03	285.1	4.9E-04	-1.82E-03
109	9.56612	161.016	74.8	2.08E-03	282.5	4.48E-04	-2.03E-03
110	9.56612	161.016	84.15	2.22E-03	280.5	4.03E-04	-2.18E-03
111	9.56612	161.016	93.5	2.3E-03	278.9	3.57E-04	-2.27E-03
112	9.56612	161.016	102.85	2.32E-03	277.7	3.1E-04	-2.3E-03
113	9.56612	161.016	112.2	2.28E-03	276.6	2.63E-04	-2.27E-03
114	9.56612	161.016	121.55	2.18E-03	275.7	2.18E-04	-2.17E-03
115	9.56612	161.016	130.9	2.03E-03	274.9	1.75E-04	-2.02E-03
116	9.56612	161.016	140.25	1.82E-03	274.3	1.35E-04	-1.81E-03
117	9.56612	161.016	149.6	1.55E-03	273.6	9.81E-05	-1.55E-03
118	9.56612	161.016	158.95	1.24E-03	273.1	6.61E-05	-1.24E-03
119	9.56612	161.016	168.3	8.87E-04	272.5	3.9E-05	-8.86E-04
120	9.56612	161.016	177.65	4.9E-04	272.	1.72E-05	-4.9E-04
END	9.56612	161.016	187.	0	0	0	0

Derivation of Directional Antenna Operating Parameters

With the antenna array characteristics now verified and the model converged for the individual towers, moment method calculations ("Medium Wave Array Synthesis") were made using the Construction Permit antenna field ratio magnitudes and phases for the KESJ directional pattern, in conjunction with the established array geometry and the converged tower heights and radii. For the unused detuned (KFEQ) towers, "drive" voltages were employed of 0.00001 magnitude at 0° using the geometry established for those towers (by survey) with respect to the KESJ reference Tower #1. This process yields the directional antenna complex voltage values and impedances for sources located at ground level for each tower of the array. Notice is then taken of the impedance values shown at the base of the unused towers, and the conjugate of these values are then employed for lumped loads for these towers. The model is then re-run with the lumped loads applied to the KFEQ towers and with the KESJ towers being driven using the CP theoretical field and ratio values. The results become the directional antenna complex voltage values for sources located at ground level for each tower of the array that would produce current moment sums for the towers. These values, when normalized, will equate to the theoretical field parameters for the authorized directional antenna pattern.

Tower base currents and driving point impedances were then calculated for the directional pattern. (The indicated voltages and currents not specified as "RMS" values are corresponding "peak" values.) Since the resulting current magnitude at the base of KESJ Tower #4 is the highest of the group, currents and phases were normalized to Tower 4. The currents at the ATU J-plug "reference point" outputs (where the TCT derived antenna monitor samples are taken) were then calculated from the MoM tower currents using the WCAP circuit modeling software, along with the base environment assumptions that were derived from the single tower open-circuit measurements, and the MoM-calculated directional antenna operating impedances, and corresponding base voltages and currents.

The following pages provide details of the MoM array synthesis modeling performed for the directional antenna along with the resulting normalized antenna monitor parameters, derived from the WCAP analysis.

MoM Model Details – Directional Antenna Array Synthesis (1 of 8)

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = 1.55 MHz

tower	field ratio magnitude	Phase (deg)
1	1	0
2	0.72	230
3	0.92	105
4	1.33	95
5	1.00E-05	0
6	1.00E-05	0
7	1.00E-05	0
8	1.00E-05	0

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	voltage phase (deg)	current magnitude	current phase (deg)
1	254.618	60.9	1.66911	9.7
11	119.654	341.4	1.28625	225.7
21	79.5798	172.6	1.73856	107.4
31	160.811	153.5	2.44724	99.7
41	9.75191	205	0.0541476	290.4
61	14.2817	58	0.0781939	141.2
81	25.4745	261.9	0.130735	341.8
101	143.35	297.7	0.690212	22

Sum of square of source currents = 27.909
Total power = 500. watts

MoM Model Details – Directional Antenna Array Synthesis (2 of 8)

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	0.00709903	-0.00636517
Y(1, 2)	0.000892512	0.00297777
Y(1, 3)	0.00278277	0.00338659
Y(1, 4)	0.00236404	0.00353555
Y(1, 5)	9.43E-06	2.99E-05
Y(1, 6)	1.26E-05	-3.17E-05
Y(1, 7)	-3.60E-05	-8.49E-07
Y(1, 8)	0.00141515	-0.000873486
Y(2, 1)	0.000892582	0.00297775
Y(2, 2)	0.00679659	-0.00637712
Y(2, 3)	0.00227412	0.00302035
Y(2, 4)	0.00278089	0.00322221
Y(2, 5)	2.73E-05	-0.000487185
Y(2, 6)	-0.000449545	0.000625808
Y(2, 7)	0.00122952	-0.000812592
Y(2, 8)	2.20E-05	3.40E-05
Y(3, 1)	0.00278303	0.00338632
Y(3, 2)	0.0022743	0.00302016
Y(3, 3)	0.00521918	-0.00593618
Y(3, 4)	0.000135861	0.000632985
Y(3, 5)	-0.000118279	-4.88E-06
Y(3, 6)	0.000132837	8.85E-05
Y(3, 7)	-0.00013958	-0.00015263
Y(3, 8)	0.00029901	-0.000663804
Y(4, 1)	0.00236432	0.00353528
Y(4, 2)	0.00278109	0.003222
Y(4, 3)	0.000135872	0.000632992
Y(4, 4)	0.00497328	-0.00620209
Y(4, 5)	-9.71E-05	-0.000286649
Y(4, 6)	-0.000126651	0.000458455
Y(4, 7)	0.00057584	-0.000705201
Y(4, 8)	-0.000107917	-0.000269384

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(5, 1)	9.42E-06	2.99E-05
Y(5, 2)	2.73E-05	-0.000487189
Y(5, 3)	-0.000118271	-4.87E-06
Y(5, 4)	-9.70E-05	-0.000286645
Y(5, 5)	0.000869154	0.00153866
Y(5, 6)	-0.000195087	-0.000279813
Y(5, 7)	0.000176786	3.38E-05
Y(5, 8)	3.04E-05	-5.43E-05
Y(6, 1)	1.26E-05	-3.17E-05
Y(6, 2)	-0.000449544	0.000625821
Y(6, 3)	0.000132829	8.85E-05
Y(6, 4)	-0.000126664	0.000458443
Y(6, 5)	-0.000195087	-0.000279813
Y(6, 6)	0.000852671	0.00148972
Y(6, 7)	-0.000238517	-0.00022721
Y(6, 8)	-6.96E-05	3.27E-05
Y(7, 1)	-3.60E-05	-8.86E-07
Y(7, 2)	0.00122955	-0.000812637
Y(7, 3)	-0.000139575	-0.000152611
Y(7, 4)	0.000575864	-0.000705197
Y(7, 5)	0.000176785	3.38E-05
Y(7, 6)	-0.000238516	-0.000227207
Y(7, 7)	0.000994215	0.00142991
Y(7, 8)	9.43E-05	1.14E-05
Y(8, 1)	0.00141517	-0.000873554
Y(8, 2)	2.20E-05	3.40E-05
Y(8, 3)	0.000299019	-0.000663803
Y(8, 4)	-0.000107926	-0.000269368
Y(8, 5)	3.04E-05	-5.43E-05
Y(8, 6)	-6.96E-05	3.27E-05
Y(8, 7)	9.43E-05	1.14E-05
Y(8, 8)	0.00102585	0.00143155

MoM Model Details – Directional Antenna Array Synthesis (3 of 8)

TOWER IMPEDANCE MATRIX		
impedance	real (mhos)	imaginary (mhos)
Z(1, 1)	53.8636	44.9659
Z(1, 2)	-5.788	-23.2794
Z(1, 3)	18.66	-30.9345
Z(1, 4)	12.8908	-22.5184
Z(1, 5)	-2.01998	-7.55881
Z(1, 6)	-8.1123	10.3199
Z(1, 7)	34.782	-5.71184
Z(1, 8)	-28.318	47.3661
Z(2, 1)	-5.78758	-23.2794
Z(2, 2)	53.4801	49.2896
Z(2, 3)	9.9072	-20.586
Z(2, 4)	19.6494	-30.6017
Z(2, 5)	7.31264	6.34419
Z(2, 6)	-0.650271	-17.7292
Z(2, 7)	-26.6671	45.5786
Z(2, 8)	33.194	-12.4896
Z(3, 1)	18.6625	-30.9333
Z(3, 2)	9.90888	-20.5852
Z(3, 3)	54.8831	72.3095
Z(3, 4)	-20.7437	-21.8305
Z(3, 5)	3.0708	-3.859
Z(3, 6)	-9.12045	2.02385
Z(3, 7)	28.4939	1.93117
Z(3, 8)	9.82036	51.8779
Z(4, 1)	12.8931	-22.517
Z(4, 2)	19.6514	-30.6007
Z(4, 3)	-20.7437	-21.8304
Z(4, 4)	51.7871	69.2853
Z(4, 5)	8.79176	4.02032
Z(4, 6)	-5.97211	-16.2116
Z(4, 7)	-9.08	48.6325
Z(4, 8)	26.6175	13.8007

TOWER IMPEDANCE MATRIX		
impedance	real (mhos)	imaginary (mhos)
Z(5, 1)	-2.01988	-7.55889
Z(5, 2)	7.31275	6.34425
Z(5, 3)	3.07101	-3.85903
Z(5, 4)	8.79198	4.02046
Z(5, 5)	284.352	-511.986
Z(5, 6)	52.8842	-105.746
Z(5, 7)	14.9009	48.3734
Z(5, 8)	24.4339	-3.13812
Z(6, 1)	-8.11247	10.3199
Z(6, 2)	-0.650513	-17.7293
Z(6, 3)	-9.12063	2.0238
Z(6, 4)	-5.97236	-16.2119
Z(6, 5)	52.8841	-105.746
Z(6, 6)	293.533	-541.655
Z(6, 7)	60.853	-104.984
Z(6, 8)	-26.9305	-24.1197
Z(7, 1)	34.782	-5.71166
Z(7, 2)	-26.6667	45.5773
Z(7, 3)	28.4929	1.93074
Z(7, 4)	-9.0798	48.6303
Z(7, 5)	14.9008	48.3733
Z(7, 6)	60.8529	-104.984
Z(7, 7)	266.86	-519.964
Z(7, 8)	11.2267	77.4398
Z(8, 1)	-28.3174	47.3651
Z(8, 2)	33.1938	-12.4896
Z(8, 3)	9.82047	51.8758
Z(8, 4)	26.6168	13.7999
Z(8, 5)	24.4338	-3.13806
Z(8, 6)	-26.9303	-24.1197
Z(8, 7)	11.2267	77.4397
Z(8, 8)	270.116	-474.183

MoM Model Details - Directional Antenna Array Synthesis (4 of 8)

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.297	10
		0	0	96.		
2	none	121.6	116.9	0	.297	10
		121.6	116.9	97.		
3	none	99.9	171.	0	.297	10
		99.9	171.	100.		
4	none	95.	66.	0	.297	10
		95.	66.	100.		
5	none	705.8	93.4	0	.231	20
		705.8	93.4	187.		
6	none	489.1	93.4	0	.231	20
		489.1	93.4	187.		
7	none	272.4	93.4	0	.231	20
		272.4	93.4	187.		
8	none	161.3	273.4	0	.231	20
		161.3	273.4	187.		

Number of wires = 8 current nodes = 120

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	5	9.35	3	10.
radius	5	.231	1	.297

ELECTRICAL DESCRIPTION - Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.55	0	1	.0259722	.0277778

MoM Model Details - Directional Antenna Array Synthesis (5 of 8)

Sources:

source	node	sector	magnitude	phase	type
1	1	1	360.085	60.9	voltage
2	11	1	169.216	341.4	voltage
3	21	1	112.543	172.6	voltage
4	31	1	227.421	153.5	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	41	0	179.51	0	0	0
2	61	0	181.36	0	0	0
3	81	0	191.86	0	0	0
4	101	0	206.68	0	0	0

IMPEDANCE normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.55	98.289	119.71	154.89	50.6	5.1981	-3.3841	-2.6661
source = 2; node 11, sector 1							
1.55	-41.102	83.973	93.492	116.1	****	****	****
source = 3; node 21, sector 1							
1.55	19.054	41.248	45.436	65.2	4.5723	-3.8617	-2.2988
source = 4; node 31, sector 1							
1.55	38.51	52.884	65.42	53.9	3.2094	-5.5989	-1.3996

MoM Model Details - Directional Antenna Array Synthesis (6 of 8)

CURRENT: rms Frequency: 1.55 MHz Input power: 500. watts Efficiency: 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.66152	10.3	1.6348	.296735
2	0	0	9.6	1.85234	5.1	1.84488	.166004
3	0	0	19.2	1.91866	2.5	1.91678	.0848927
4	0	0	28.8	1.90794	.7	1.90781	.0223968
5	0	0	38.4	1.82599	359.2	1.82582	-.0243887
6	0	0	48.	1.67696	358.1	1.67601	-.0564178
7	0	0	57.6	1.46509	357.1	1.46321	-.074115
8	0	0	67.2	1.19484	356.3	1.19231	-.07781
9	0	0	76.8	.869968	355.5	.867324	-.0677706
10	0	0	86.4	.490322	354.9	.488354	-.0438886
END	0	0	96.	0	0	0	0
GND	-55.0161	-108.443	0	1.29358	225.3	-.909577	-.91979
12	-55.0161	-108.443	9.7	1.39087	227.6	-.938666	-1.02636
13	-55.0161	-108.443	19.4	1.40981	228.7	-.929718	-1.05981
14	-55.0161	-108.443	29.1	1.37808	229.6	-.893053	-1.04955
15	-55.0161	-108.443	38.8	1.29997	230.3	-.830774	-.999873
16	-55.0161	-108.443	48.5	1.17886	230.8	-.744788	-.913787
17	-55.0161	-108.443	58.2	1.01822	231.3	-.637144	-.794245
18	-55.0161	-108.443	67.9	.821666	231.6	-.50996	-.644264
19	-55.0161	-108.443	77.6	.592277	232.	-.365001	-.46644
20	-55.0161	-108.443	87.3	.330514	232.2	-.202415	-.261281
END	-55.0161	-108.443	97.	0	0	0	0
GND	-98.6701	-15.6278	0	1.7703	107.4	-.529218	1.68934
22	-98.6701	-15.6278	10.	1.82618	106.3	-.512172	1.75289
23	-98.6701	-15.6278	20.	1.80801	105.6	-.487551	1.74104
24	-98.6701	-15.6278	30.	1.73538	105.1	-.453223	1.67515
25	-98.6701	-15.6278	40.	1.61245	104.7	-.409669	1.55955
26	-98.6701	-15.6278	50.	1.44321	104.4	-.35777	1.39816
27	-98.6701	-15.6278	60.	1.23201	104.	-.298636	1.19527
28	-98.6701	-15.6278	70.	.983431	103.7	-.233458	.955319
29	-98.6701	-15.6278	80.	.701512	103.5	-.163277	.682246
30	-98.6701	-15.6278	90.	.38727	103.2	-.0884313	.377038
END	-98.6701	-15.6278	100.	0	0	0	0
GND	38.64	-86.7868	0	2.48455	99.6	-.41273	2.45003
32	38.64	-86.7868	10.	2.5946	97.4	-.332061	2.57326
33	38.64	-86.7868	20.	2.58813	96.1	-.274726	2.57351
34	38.64	-86.7868	30.	2.49916	95.1	-.222986	2.48919
35	38.64	-86.7868	40.	2.334	94.3	-.175608	2.32738
36	38.64	-86.7868	50.	2.09833	93.6	-.132642	2.09414
37	38.64	-86.7868	60.	1.79836	93.	-.0945477	1.79588
38	38.64	-86.7868	70.	1.4407	92.5	-.0618683	1.43937
39	38.64	-86.7868	80.	1.03112	92.	-.0351011	1.03053
40	38.64	-86.7868	90.	.571031	91.5	-.0146098	.570844
END	38.64	-86.7868	100.	0	0	0	0

MoM Model Details - Directional Antenna Array Synthesis (7 of 8)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-41.8585	-704.558	0	.0496987	286.8	.0143314	-.0475875
42	-41.8585	-704.558	9.35	.0408185	286.8	.0118089	-.039073
43	-41.8585	-704.558	18.7	.033886	287.	9.92E-03	-.0324005
44	-41.8585	-704.558	28.05	.0271393	287.5	8.16E-03	-.0258833
45	-41.8585	-704.558	37.4	.0204733	288.5	6.48E-03	-.0194196
46	-41.8585	-704.558	46.75	.013944	290.5	4.89E-03	-.0130567
47	-41.8585	-704.558	56.1	7.69E-03	296.3	3.41E-03	-6.9E-03
48	-41.8585	-704.558	65.45	2.31E-03	332.7	2.05E-03	-1.06E-03
49	-41.8585	-704.558	74.8	4.41E-03	79.	8.39E-04	4.33E-03
50	-41.8585	-704.558	84.15	9.13E-03	91.3	-2.08E-04	9.13E-03
51	-41.8585	-704.558	93.5	.0132811	94.6	-1.08E-03	.0132374
52	-41.8585	-704.558	102.85	.016634	96.1	-1.75E-03	.0165412
53	-41.8585	-704.558	112.2	.0190832	96.7	-2.24E-03	.0189516
54	-41.8585	-704.558	121.55	.0205521	97.1	-2.52E-03	.0203965
55	-41.8585	-704.558	130.9	.0209884	97.2	-2.62E-03	.020824
56	-41.8585	-704.558	140.25	.0203605	97.2	-2.54E-03	.0202014
57	-41.8585	-704.558	149.6	.0186553	97.1	-2.3E-03	.0185136
58	-41.8585	-704.558	158.95	.0158717	96.9	-1.91E-03	.015757
59	-41.8585	-704.558	168.3	.0120038	96.7	-1.39E-03	.0119227
60	-41.8585	-704.558	177.65	6.99E-03	96.4	-7.76E-04	6.95E-03
END	-41.8585	-704.558	187.	0	0	0	0
GND	-29.0068	-488.239	0	.0715432	137.7	-.0528987	.048168
62	-29.0068	-488.239	9.35	.0586339	137.8	-.0434154	.0394085
63	-29.0068	-488.239	18.7	.0485696	138.1	-.0361561	.0324306
64	-29.0068	-488.239	28.05	.0387906	138.9	-.0292172	.025516
65	-29.0068	-488.239	37.4	.0291517	140.4	-.0224699	.0185722
66	-29.0068	-488.239	46.75	.0197564	143.8	-.0159468	.0116625
67	-29.0068	-488.239	56.1	.0109039	153.2	-9.74E-03	4.91E-03
68	-29.0068	-488.239	65.45	4.24E-03	201.3	-3.95E-03	-1.54E-03
69	-29.0068	-488.239	74.8	7.65E-03	279.9	1.31E-03	-7.53E-03
70	-29.0068	-488.239	84.15	.0142086	294.7	5.94E-03	-.012909
71	-29.0068	-488.239	93.5	.0200924	299.3	9.83E-03	-.0175242
72	-29.0068	-488.239	102.85	.0248591	301.3	.0129122	-.0212427
73	-29.0068	-488.239	112.2	.0283234	302.3	.0151262	-.0239461
74	-29.0068	-488.239	121.55	.0303658	302.8	.0164312	-.0255362
75	-29.0068	-488.239	130.9	.0309073	302.9	.0168091	-.0259368
76	-29.0068	-488.239	140.25	.0299028	302.9	.0162624	-.0250941
77	-29.0068	-488.239	149.6	.0273358	302.8	.0148131	-.0229743
78	-29.0068	-488.239	158.95	.0232085	302.6	.0124968	-.0195566
79	-29.0068	-488.239	168.3	.0175172	302.3	9.35E-03	-.0148129
80	-29.0068	-488.239	177.65	.0101793	301.9	5.37E-03	-8.65E-03
END	-29.0068	-488.239	187.	0	0	0	0

MoM Model Details - Directional Antenna Array Synthesis (8 of 8)

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-16.1551	-271.921	0	.120833	338.7	.112547	-.0439761
82	-16.1551	-271.921	9.35	.0978768	338.8	.0912643	-.0353651
83	-16.1551	-271.921	18.7	.080222	339.4	.0751091	-.0281812
84	-16.1551	-271.921	28.05	.0633039	340.8	.0597935	-.0207875
85	-16.1551	-271.921	37.4	.0468953	343.7	.0450192	-.0131316
86	-16.1551	-271.921	46.75	.0313058	350.2	.0308496	-5.32E-03
87	-16.1551	-271.921	56.1	.0176415	8.	.0174699	2.45E-03
88	-16.1551	-271.921	65.45	.0112243	62.9	5.11E-03	1.E-02
89	-16.1551	-271.921	74.8	.0181024	109.4	-6.01E-03	.0170743
90	-16.1551	-271.921	84.15	.0282159	123.7	-.0156731	.0234626
91	-16.1551	-271.921	93.5	.0373979	129.3	-.0236856	.0289413
92	-16.1551	-271.921	102.85	.0447593	131.9	-.0299015	.0333061
93	-16.1551	-271.921	112.2	.0499375	133.2	-.034214	.0363752
94	-16.1551	-271.921	121.55	.0527293	133.9	-.0365626	.0379942
95	-16.1551	-271.921	130.9	.0530208	134.2	-.0369344	.0380402
96	-16.1551	-271.921	140.25	.0507662	134.2	-.0353627	.0364237
97	-16.1551	-271.921	149.6	.0459742	134.	-.031921	.0330858
98	-16.1551	-271.921	158.95	.0386899	133.7	-.0267116	.0279892
99	-16.1551	-271.921	168.3	.0289536	133.2	-.0198369	.0210905
100	-16.1551	-271.921	177.65	.0166811	132.7	-.0113197	.0122525
END	-16.1551	-271.921	187.	0	0	0	0
GND	9.56612	161.016	0	.670915	20.3	.629299	.232614
102	9.56612	161.016	9.35	.534702	20.4	.50123	.186212
103	9.56612	161.016	18.7	.43233	20.7	.404294	.153152
104	9.56612	161.016	28.05	.336236	21.6	.312634	.123752
105	9.56612	161.016	37.4	.244548	23.4	.224428	.0971364
106	9.56612	161.016	46.75	.157977	27.6	.140017	.073158
107	9.56612	161.016	56.1	.079677	40.6	.0604744	.0518774
108	9.56612	161.016	65.45	.0357921	111.1	-.012878	.0333951
109	9.56612	161.016	74.8	.0806671	167.3	-.078682	.0177857
110	9.56612	161.016	84.15	.135747	177.9	-.135653	5.07E-03
111	9.56612	161.016	93.5	.182718	181.5	-.182655	-4.8E-03
112	9.56612	161.016	102.85	.21907	183.1	-.218745	-.0119316
113	9.56612	161.016	112.2	.243775	183.9	-.243214	-.0165174
114	9.56612	161.016	121.55	.25629	184.2	-.2556	-.0188026
115	9.56612	161.016	130.9	.256409	184.3	-.255697	-.0190917
116	9.56612	161.016	140.25	.244197	184.2	-.243552	-.0177354
117	9.56612	161.016	149.6	.219946	183.9	-.219426	-.01512
118	9.56612	161.016	158.95	.184093	183.6	-.183724	-.0116543
119	9.56612	161.016	168.3	.137021	183.2	-.136801	-7.75E-03
120	9.56612	161.016	177.65	.0785141	182.8	-.0784211	-3.82E-03
END	9.56612	161.016	187.	0	0	0	0

Derivation of Directional Antenna System "Antenna Monitor" Parameters

With the modeled directional antenna ground level complex voltage and current values for sources located at ground level for each tower now derived, WCAP circuit analysis calculations[5] were run to develop the current magnitude and phase information that will be present at the ATU reference point, where the TCT sampling devices are located.

Since the current transformers and sampling lines are essentially identical, the antenna monitor ratios and phases corresponding to the theoretical parameters can be calculated and normalized directly from the modeled ATU currents, as shown below.

Note: Although Tower 1 is the theoretical electrical and geometry reference, given that the current magnitude in Tower 4 is higher than any of the others, and considering the practical characteristics of the antenna monitor, it was elected to normalize all antenna monitor parameters to Tower 4, making Tower 4 the operating parameter reference tower.

Directional Antenna Monitor Operating Parameters

Tower	Modeled Current Pulse	Current Magnitude at Toroid	Current Phase at Toroid	Antenna Monitor Ratio	Antenna Monitor Phase
1 - Northwest	1	1.65152	10.87°	**0.667**	**-89.0°**
2 - Southeast	11	1.28358	225.06°	**0.519**	**125.2°**
3 - Southwest	21	1.7603	107.51°	**0.711**	**7.7°**
4 - Northeast	31	2.47455	99.82°	**1.000**	**0.0°**

The phasing and coupling systems for the authorized day pattern were adjusted accordingly such that the antenna monitor phase and ratio indications were within 5% of the ratio values, and 3° of the phase values shown above, per the requirements of §73.62(a) of the Commission's Rules.

[5] For the WCAP driven tower analysis, the same schematic diagrams and node nomenclature are employed as were described previously for the OC-self analysis. Specifically, KESJ node 2 represents the ATU TCT reference point and KESJ node 3 represents the tower feedpoint. Node 0 represents ground potential. The tower operating impedances were represented by complex loads from KESJ node 3 to ground (R_{3-0}).

As-Constructed Certified Array Geometry

A survey was conducted to confirm proper antenna array construction. A copy of the surveyor's certification is provided in a following page.

Using the information provided in the survey, the relative distances in feet and azimuths (referenced to true north) provided on the certified survey drawing were compared to the relative distances and azimuths relative to true north of the array elements using the Construction Permit array geometry as baseline, and the "Law of Cosines" analysis method. The following tabulation shows those distances and other information along with error determination.

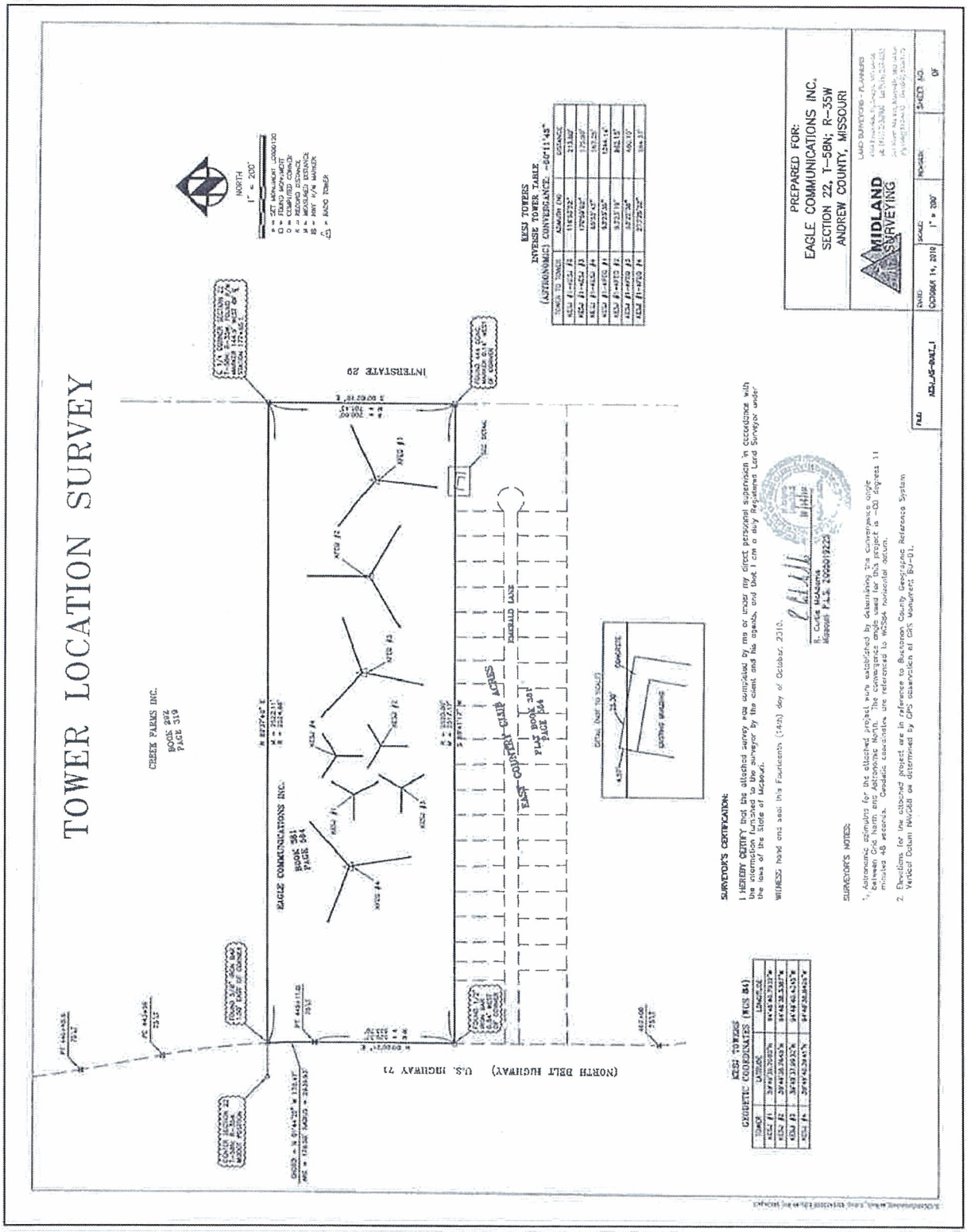
"As-Built" Array Geometry Summary

Tower	Specified Array Geometry			"As-Built" Survey		"As-Built" Error/Deviation	
	Spacing (deg)	Spacing (feet)	Azimuth (° True)	Spacing (feet)	Azimuth (° True)	(feet)	(degrees)
1 – NW	0.0°	0	0°	0	0°	0	0°
2 – SE	121.6°	214.34	116.9°	213.800	116.897778	0.54	0.31°
3 – SW	99.9°	176.09	171.1°	175.900	170.983889	0.20	0.11°
4 - NE	95.0°	167.45	66.0°	167.250	65.878611	0.41	0.23°

The "as built" tower displacements from their specified locations, as documented in the survey of the following page, are expressed in the above table in terms of feet, as well as in electrical degrees at carrier frequency. (This corresponds to space phasing differences in the far-field radiation pattern of the array.)

The results shown above are well below the +/- 3° operating phase range specified for antenna monitor parameters by the FCC Rules and well within the 1.5° tolerance specified in the Commission's DA 09-2340 Public Notice. As such, it has been proven that this antenna array has been constructed in accordance with the terms of its Construction Permit and the pertinent Rules and Regulations of the Federal Communications Commission.

"As-Built" Survey of Array



Sampling System Measurements

Impedance and length measurements were made of the antenna monitor sampling system using a precision calibrated measurement system consisting of a *Hewlett-Packard* model 8753C network analyzer in conjunction with a *Tunwall Radio* directional coupler system and an *Electronic Navigation Industries* (ENI) Model 310 L RF amplifier. Analyzer calibration was field verified prior to each measurement using the procedures specified in the manufacturer's instruction manual using precision calibration standards and techniques.

The measurements were accomplished by looking into the antenna monitor ends of the sampling lines for two conditions – with and without the sampling lines connected to the sampling devices at the tower bases under open-circuited conditions.

The following table shows the frequency nearest the carrier frequency where resonance (zero reactance corresponding with low resistance) was found. As the length of a distortion-less transmission line is 180 electrical degrees at the difference frequency between adjacent frequencies of resonance, and frequencies of resonance occur at odd multiples of 90 degrees electrical length, the sampling line length at the resonant frequency below carrier frequency, which is the closest one to the carrier frequency in terms of the ratio of frequencies, was found to be 270 electrical degrees. The electrical lengths at carrier frequency appearing in the table below were calculated by ratioing the frequencies in the customary fashion.

Tower	Sampling Line Open-Circuited Resonance Nearest to 1550 kHz	Sampling Line Ratio Calculated Electrical Length at 1550 kHz	1550 kHz Measured Impedance with Sampling Toroid (TCT) Connected
1 – NW	1077.56 kHz	388.4°	51.26 +j0.715 Ω
2 – SE	1077.56 kHz	388.4°	51.27 +j0.721 Ω
3 – SW	1078.22 kHz	388.1°	51.11 +j0.543 Ω
4 – NE	1077.34 kHz	388.5°	51.35 +j0.678 Ω

As shown, the sampling line lengths meet the Commission's requirement that they be equal in length within +/-1 electrical degree.

The characteristic impedance of the sampling lines was calculated using the following formula, where $R_1 + jX_1$ and $R_2 + jX_2$ are the measured impedances at the +45 and –45 degree offset frequencies, respectively:

$$Zo = \sqrt{\sqrt{R_1^2 + X_1^2} \bullet \sqrt{R_2^2 + X_2^2}}$$

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 – NW	898.0	3.6699 –j49.97	1257.2	5.2559 +j50.293	50.34
2 –SE	898.0	3.7148 –j50.03	1257.2	5.2949 +j50.406	50.43
3 – SW	898.5	3.6950 –j49.82	1257.9	5.3500 +j50.357	50.30
4 – NE	897.8	3.6770 –j49.92	1256.9	5.263 00+j50.172	50.25

As shown, the sampling line measured characteristic impedances meet the Commission's requirement that they be equal within +/-2 ohms.

The *Delta Electronics, Inc.* TCT-3 toroidal transformers used for the station were calibrated by measuring their outputs with a common reference signal using a *Hewlett-Packard* 8753C network analyzer in a calibrated measurement system. They were placed side-by-side with a conductor passing the reference signal through them. The outputs of the TCT-3 were fed into the A and B receiver inputs of the analyzer which was configured to measure the relative ratios and phases of their output voltages.

The following results were found for the carrier frequency, 1550 kilohertz:

Tower	TCT Serial Number	Test 1 Ratio	Test 1 Phase	Test 2 Ratio	Test 2 Phase
1 – NW	17985	Reference	Reference	--	--
2 – SE	17986	1.0017	+0.576°	Reference	Reference
3 – SW	17987	1.0012	+0.670°	--	--
4 – NW	17988	1.0009	+0.814°	1.0007	+0.241°

Delta type TCT-3 toroidal transformers are rated for absolute magnitude accuracy of ±2% and absolute phase accuracy of ±2 degrees. As the maximum measured transformer-to-transformer variations between the three transformers were fractional amounts, they clearly provide far more accurate relative indications than could be the case assuming their rated accuracies.

The calibration of the *Potomac Instruments* Antenna Monitor (factory calibrated –new- on September 29, 2010) was also field verified.

Reference Point Field Strength Measurements

Reference field strength measurements on the adjusted nighttime directional antenna pattern were made using a *Potomac Instruments, Inc.* model FIM-4100, Serial Number 122, last calibrated on July 27, 2009. Measurement points were selected at three locations along the designated "monitored radials" (28.5°, 71°, 141.5°, and 220°) specified on the station's CP and additionally on a major lobe radial (300°). The radial directions, measured field strengths, measurement point distance, location descriptions, and GPS coordinates (with datum reference) for these reference points are shown in the following tables.

Reference Point Field Strength Measurements – 28.5° (Monitored Minima)

Date	Point	Distance (km)	Field Strength	GPS Coordinates NAD-83	Description
02/07/2011	1	2.67	24.9 mV/m	39° 59' 55.0" 94° 47' 46.6"	On CR 349, 0.2 miles South of CR 350
02/07/2011	2	4.77	10.5 mV/m	39° 51' 54.7" 94° 47' 04.5"	On CR 349 at a group of 3 mailboxes plus 1 yellow newspaper tube
02/07/2011	3	6.21	5.98 mV/m	39° 52' 35.6" 94° 46' 35.7"	On CR 344

Reference Point Field Strength Measurements – 71° (Monitored Minima)

Date	Point	Distance (km)	Field Strength	GPS Coordinates NAD-83	Description
02/07/2011	1	3.04	6.04 mV/m	39° 50' 09.9" 94° 46' 38.5"	Center of "Y" median at CR 403 and East-West Road
02/07/2011	2	6.13	7.53 mV/m	39° 50' 43.6" 94° 44' 35.7"	On MO-W at 16909 mailbox at Rd 2962
02/07/2011	3	7.83	4.14 mV/m	39° 51' 01.3" 94° 43' 28.1"	On CR 294 at small cement block barn even with pole # 82585

Reference Point Field Strength Measurements – 141.5° (Monitored Minima)

Date	Point	Distance (km)	Field Strength	GPS Coordinates NAD-83	Description
02/07/2011	1	3.04	18.7 mV/m	39° 48' 22.5" 94° 47' 19.1"	4701 Kensington, at mailbox
02/07/2011	2	5.03	12.9 mV/m	39° 47' 31.8" 94° 46' 27.6"	On Gene Fields, 50 feet West of fire hydrant
02/07/2011	3	6.31	9.47 mV/m	39° 47' 00.1" 94° 45' 53.6"	On Fredricks Road, at light pole before 45 MPH sign

Reference Point Field Strength Measurements – 220° (Monitored Minima)

Date	Point	Distance (km)	Field Strength	GPS Coordinates NAD-83	Description
02/07/2011	1	2.27	33.6 mV/m	39° 48' 43.0" 94° 49' 41.9"	On Jersey, West of 2625, at pole # SJ4638
02/07/2011	2	4.13	10.4 mV/m	39° 47' 56.9" 94° 50' 32.3"	On Karnes, at SE corner of ball field, at yellow 5 foot pipe and pole
02/07/2011	3	6.42	10.0 mV/m	39° 47' 59.9" 94° 51' 33.7"	At SW corner of Highland Avenue and Main Street at stop sign

Reference Point Field Strength Measurements – 300° (Main Lobe)

Date	Point	Distance (km)	Field Strength	GPS Coordinates NAD-83	Description
02/07/2011	1	2.27	171.0 mV/m	39° 50' 15.4" 94° 50' 03.2"	On State Route DD, 3rd pole from John Glen Road
02/07/2011	2	5.63	58.7 mV/m	39° 51' 08.5" 94° 52' 06.5"	On CR 390 (top of hill) across from big black mailbox
02/07/2011	3	8.97	24.9 mV/m	39° 52' 03.0" 94° 54' 07.8"	Dead end of CR 393, at cattle guard in front of 2 story house

Direct Measurement of Power

Nighttime Phasor Common point impedance measurements were made using a *Hewlett-Packard* model 8753C network analyzer in conjunction with a *Tunwall Radio* directional coupler system and an *Electronic Navigation Industries* (ENI) Model 310 L RF amplifier. Analyzer calibration was field verified prior to each measurement using the procedures specified in the manufacturer's instruction manual using precision calibration standards and techniques. The "as adjusted" common point impedance measurements were made at the phasor cabinet input jack adjacent to the common point current meter that is used to determine operating power. Non-

directional base impedance measurements were taken in a similar manner at the output J-Plug location in the non-directional tower antenna tuning unit. The results are as follows:

Mode	Antenna Base Resistance	Antenna Base Reactance
Non- Directional - Daytime	59.5 Ω	+j80.9 Ω

Mode	Common Point Resistance	Common Point Reactance
Directional – Nighttime	50.5 Ω	-j13.3 Ω

The authorized non-directional power is 2.5 kW. The common point input power of the nominal 500 W nighttime directional antenna system is 540 watts. This value is obtained by applying the provisions of §73.51(b)(1) of the Commission's Rules, i.e. 500 Watts x 1.08 = 540 Watts. Accordingly, the currents for each mode of operation, found by the following calculation $(\text{Watts/Resistance})^{1/2}$ are:

Mode	Operating Power	Antenna Base Current
Non- Directional - Daytime	2500 Watts	6.482 Amperes

Mode	Operating Power	Common Point Current
Directional – Nighttime	540 Watts	3.270 Amperes

RF Exposure Evaluation

The operation of facility described herein will not result in the exposure of workers or the general public to levels of radio frequency radiation in excess of the limits specified in FCC Rule Section 1.1310. In particular, fences have been installed around the tower bases to restrict public access. The as-constructed fence distances are beyond those necessary to prevent electric and magnetic field exposure above the levels described in the Commission's Rules.

The minimum fence sizes were determined with reference to FCC OET Bulletin 65 (Edition 97-01). Interpolated values from the Supplement A tables can be employed to estimate

the necessary "Distance for Compliance with FCC limits" at 1550 kilohertz, for each tower using the MoM modeled base currents and drive point impedances, or actual measured values. In this instance, the interpolated fence values from Table 2 of Supplement A of OET Bulletin 65 were used as a guideline. Assuming the electrical tower heights of 90° and a maximum power at any tower of 2.5 kW, the minimum fence distance should be 1.4 meters. However, non-metallic fences were constructed about each tower base that come no closer than 2.74 meters to any tower surface. Based upon the above, it is believed that the Commission's RF exposure prevention requirements are met in that the fences limit public access to areas with fields that exceed the requirements of the Rules for this directional antenna operation. Further, the entire site is fenced, and all fence enclosure areas are posted with RF exposure warning signs on all fence sides.

With respect to worker safety, no work will be permitted that will endanger employees or subcontractors. Access to high exposure or shock/burn areas will be controlled and supervised by knowledgeable, responsible, station personnel. If it is necessary for workers to be inside the tower base fence enclosures for extended periods of time, the station may switch to low power nondirectional operation on alternative towers, or it may choose to temporarily terminate operation entirely while work is performed within the enclosures. No one will be permitted to climb an energized tower. It is therefore believed that the constructed facility is in full compliance with the FCC's requirements with regard to radio frequency energy exposure.

Satisfaction of CP Conditions

The KESJ Construction Permit is subject to five Special Operating Conditions or restrictions, which are discussed in the following paragraphs. All five Special Operating Conditions are being met with the filing of this License Application. Specifically:

FCC Special Operating Condition 1 requires that the Permittee submit a proof of performance as set forth in either Section 73.151(a) or 73.151(c) of the Rules before program tests are authorized. This Statement, which is attached to this Application, provides a Method of Moments proof of performance, as set forth in Section 73.151(c) of the Commission's Rules. This antenna system uses series-fed radiators and the associated sampling system is constructed

as described in Section 73.151(c)(2)(i) of the Commission's Rules. Therefore this Special Operating Condition is satisfied.

FCC Special Operating Condition 2 requires that the Permittee install a type-accepted transmitter. A type-accepted *Broadcast Electronics* transmitter has been acquired and was properly installed at the authorized transmitter site. This Special Operating Condition is also satisfied.

FCC Special Operating Condition 3 requires that the Permittee, prior to construction authorized in the CP, permittee shall notify AM Station KFEQ, Facility ID: 34419 so that, if necessary that AM station: may determine operating power by a method described in Section 73.51(a)(1) or (d), and/or request temporary authority from the Commission in Washington, D.C. to operate with parameters at variance in order to maintain monitoring point field strengths within authorized limits.

Station KFEQ is also licensed to the permittee and as such is fully aware of the construction proposed herein. Further, the entire KFEQ array was reconstructed (including new towers, sample lines, transmission lines, antenna monitor) as part of the KESJ construction project. A Method of Moments proof of performance has been completed on the KFEQ antenna array after the completion of the construction and tuning authorized in the KESJ CP. The KFEQ proof will be filed simultaneously with or shortly following the filing of the KESJ application for license / proof-of-performance. Further, Special Temporary Authority was requested and received from the FCC to operate KFEQ with parameters at variance during the construction (see BSTA-20101123ARJ). In particular, KFEQ is authorized under the STA to operate with substantially adjusted Method of Moments antenna parameters.

Special Operating Condition 3 also states that the Permittee shall be responsible for installation and continued maintenance of detuning apparatus necessary to prevent adverse effects upon the radiation pattern of the AM station. This has been accomplished as part of the KFEQ re-build and KESJ construction.

This FCC condition also required that prior to construction of the tower and subsequent to the installation of all appurtenances thereon, a partial proof of performance, as defined by Section 73.154(a) of the Commission's Rules, shall be conducted to establish that the AM array has not been adversely affected and prior to or simultaneous with the filing of the application for license to cover this permit, the results submitted to the Commission. As discussed above, a complete Method of Moments proof of performance was completed after this extensive renovation and construction and will be filed with the FCC simultaneously with (or within days of) the filling of the KESJ proof of performance / Application for License.

FCC Special Operating Condition 4 requires that a ground system be installed which minimally consists of 120 equally spaced, buried, copper radials about the base of each tower, each 48.4 meters in length except where intersecting radials are shortened and bonded to a transverse copper strap midway between adjacent towers. As described elsewhere in this Statement, a conventional buried copper wire ground system has been installed per the above, consisting of 120 equally spaced number 10 soft-drawn copper radial wires, has been buried into the ground, and arrayed every 3° around each tower, to a length of 48.4 meters, except where terminated in common, 4-inch transverse copper straps. Additionally, a set of 120 shorter (15.2 meter) copper radials are interspersed and buried between the longer radials. Further, copper straps are also buried between the towers and in the transmission line and sample cable trench. They are tied to the tower base ground strap as well as the transmitter building grounding system. As such, it is felt that this Special Operating Condition has been satisfied.

FCC Special Operating Condition 5 states that, before program tests are authorized, sufficient data shall be submitted to show that adequate filters, traps and other equipment has been installed and adjusted to prevent interaction, intermodulation and/or generation of spurious radiation products which may be caused by common usage of the same antenna system by Stations KESJ(AM), Facility ID: 8767, and KFEQ(AM), Facility ID: 34419, and there shall be filed with the license application copies of a firm agreement entered into by the 2 stations involved clearly fixing the responsibility of each with regard to the installation and maintenance of such equipment. In addition, field observations shall be made to determine whether spurious

emissions exist and any objectionable problems resulting therefrom shall be eliminated. Following construction, and prior to authorization of program test under this grant, Stations KESJ(AM), Facility ID: 8767 , and KFEQ(AM), Facility ID: 34419, shall each measure antenna or common point resistance and submit FCC Form 302 as application notifying the return to direct measurement of power.

As part of the replacement RF system for KFEQ, and the new RF system for KESJ, filters and traps were factory installed within the equipment as necessary to prevent undesired interaction between the two stations. It should be noted that the two facilities share the same parcel of land, but do NOT share antenna structures. (No direct connections or diplexers are involved.) Only the buried wire copper ground radials are interconnected.

Inasmuch as the two stations are commonly owned, licensed, and operated, a written agreement, as stipulated above, has not been drafted since it is not possible to enter into an agreement with one's self. However, in the event of a transfer of control (sale) to another entity, the licensee will draft such an agreement as required to provide clear lines of responsibility for each party with regard to the installation and maintenance of said filtering and trap equipment.

Regarding the required field observations to determine whether spurious emissions or objectionable interference problems exist, such measurements have been undertaken and are attached to this proof-of-performance statement as **Attachment II**. As shown therein, no instances of spurious emissions, harmonics, or unpermitted out of band emissions were noted.

Finally, this Condition requires that, following construction, and prior to authorization of program test under this grant, Stations KESJ(AM), Facility ID: 8767, and KFEQ(AM), Facility ID: 34419, shall each measure antenna or common point resistance and submit FCC Form 302 application notifying the return to direct measurement of power. FCC Form 302-AM (with appropriate antenna impedance measurements) is being supplied as an attachment to this Statement for KESJ. FCC Form 302-AM (with appropriate antenna impedance measurements) is also being prepared for KFEQ along with a proof-of-performance, and will be filed with the FCC

either simultaneously with or shortly after the filing of the KESJ Application for License. Accordingly, it is felt that this Condition is essentially satisfied.

Request for Program Test Authority

Program Test Authority (PTA) is herein being respectfully requested on behalf of the licensee. KESJ is presently operating with crippled temporary facilities under the terms of a STA (see BESTA-20100723AAH and BESTA-20110210AAG) and desired to abandon the presently licensed site as soon as possible. The newly constructed KESJ facility is ready for operation as authorized under its CP with 2.5 kW non-directional daytime and 500 Watts, directional nighttime (using an antenna array that has been adjusted to the method-of-moments parameters described herein). Accordingly, an expedited grant of PTA is respectfully requested pending processing of the attached license application materials.

Certification

These application materials have been prepared on behalf of *Eagle Communications, Inc.* by the undersigned or under his direction and are true and correct to the best of his knowledge and belief. Mr. Cavell's qualifications are a matter of record before the FCC.

Respectfully submitted,

Garrison C. Cavell
Cavell, Mertz & Associates, Inc.
7732 Donegan Drive, Manassas, Virginia 20109
703.392.9090; Facsimile 703.392.9559
E-Mail: gcavell@cavellmertz.com

Attachment I

Copy of Construction Permit

United States of America

FEDERAL COMMUNICATIONS COMMISSION

AM BROADCAST STATION CONSTRUCTION PERMIT

Authorizing Official:

Son Nguyen
Supervisory Engineer
Audio Division
Media Bureau

Official Mailing Address:

EAGLE COMMUNICATIONS, INC.
2703 HALL
SUITE 15
HAYS KS 67601

Grant Date: June 30, 2010

This permit expires 3:00 a.m. local time, 36 months after the grant date specified above.

Facility Id: 8767

Call Sign: KESJ

Permit File Number: BP-20100317AAN

Subject to the provisions of the Communications Act of 1934, as amended, subsequent acts and treaties, and all regulations heretofore or hereafter made by this Commission, and further subject to the conditions set forth in this permit, the permittee is hereby authorized to construct the radio transmitting apparatus herein described. Installation and adjustment of equipment not specifically set forth herein shall be in accordance with representations contained in the permittee's application for construction permit except for such modifications as are presently permitted, without application, by the Commission's Rules.

Commission rules which became effective on February 16, 1999, have a bearing on this construction permit. See Report & Order, Streamlining of Mass Media Applications, MM Docket No. 98-43, 13 FCC RCD 23056, Para. 77-90 (November 25, 1998); 63 Fed. Reg. 70039 (December 18, 1998). Pursuant to these rules, this construction permit will be subject to automatic forfeiture unless construction is complete and an application for license to cover is filed prior to expiration. See Section 73.3598.

Equipment and program tests shall be conducted only pursuant to Sections 73.1610 and 73.1620 of the Commission's Rules.

Hours of Operation: Unlimited

Average hours of sunrise and sunset:
Local Standard Time (Non-Advanced)

Jan.	7:45 AM	5:15 PM	Jul.	5:00 AM	7:45 PM
Feb.	7:15 AM	6:00 PM	Aug.	5:30 AM	7:15 PM
Mar.	6:30 AM	6:30 PM	Sep.	6:00 AM	6:30 PM
Apr.	5:45 AM	7:00 PM	Oct.	6:30 AM	5:45 PM
May	5:00 AM	7:30 PM	Nov.	7:00 AM	5:00 PM
Jun.	4:45 AM	7:45 PM	Dec.	7:30 AM	5:00 PM

Callsign: KESJ Permit No.: BP-20100317AAN

Name of Permittee: EAGLE COMMUNICATIONS, INC.

Station Location: ST. JOSEPH, MO

Frequency (kHz): 1550

Station Class: B

Antenna Coordinates:

	Day			
Latitude:	N	39 Deg	49 Min	39 Sec
Longitude:	W	94 Deg	48 Min	39 Sec

	Night			
Latitude:	N	39 Deg	49 Min	39 Sec
Longitude:	W	94 Deg	48 Min	39 Sec

Transmitter(s): Type Accepted. See Sections 73.1660, 73.1665 and 73.1670 of the Commission's Rules.

Nominal Power (kW): Day: 2.5 Night: 0.50

Antenna Mode: Day: ND Night: DA

(DA=Directional Antenna, ND=Non-directional Antenna; CH=Critical Hours)

Antenna Registration Number(s):

Day:

Tower No.	ASRN	
1	None	49.9

Night:

Tower No.	ASRN	
1	None	49.9
2	None	49.9
3	None	49.9
4	None	49.9

Callsign: KESJ Permit No.: BP-20100317AAN

DESCRIPTION OF DIRECTIONAL ANTENNA SYSTEM

Theoretical RMS (mV/m/km): Night: 219

Standard RMS (mV/m/km): Night: 230.1

Augmented RMS (mV/m/km):

Q Factor: Night:

Theoretical Parameters:

Night Directional Antenna:

Tower No.	Field Ratio	Phasing (Deg.)	Spacing (Deg.)	Orientation (Deg.)	Tower Ref Switch *	Height (Deg.)
1	1.0000	0.000	0.0000	0.000	0	90.0
2	0.7200	230.000	121.6000	116.900	0	90.0
3	0.9200	105.000	99.9000	171.000	0	90.0
4	1.3300	95.000	95.0000	66.000	0	90.0

* Tower Reference Switch
0 = Spacing and orientation from reference tower
1 = Spacing and orientation from previous tower

Non-Directional Antenna: Day

Radiator Height: 48.4 meters; 90 deg

Theoretical Efficiency: 305.8 mV/m/kw at 1km

Inverse Distance Field Strength:
The inverse distance field strength at a distance of one kilometer from the above antenna in the directions specified shall not exceed the following values:

Night:

Azimuth:	Radiation:	
28.5	17.6	mV/m
71	43.9	mV/m
141.5	108.2	mV/m
220	107.7	mV/m

Special operating conditions or restrictions:

1 The permittee must submit a proof of performance as set forth in either Section 73.151(a) or 73.151(c) of the rules before program tests are authorized.
A proof of performance based on field strength measurements, per Section 73.151(a), shall include a complete nondirectional proof of performance, in addition to a complete proof on the (night) directional antenna system. The nondirectional and directional field strength measurements must be made under similar environmental conditions. The proof(s) of performance submitted to the Commission must contain all of the data specified in Section 73.186 of the rules.
Permittees who elect to submit a moment method proof of performance, as set forth in Section 73.151(c), must use series-fed radiators. In addition, the sampling system must be constructed as described in Section 73.151(c) (2) (i).

2 Permittee shall install a type accepted transmitter, or submit application (FCC Form 301) along with data prescribed in Section 73.1660(b) should non-type accepted transmitter be proposed.

3 Prior to construction of the tower authorized herein, permittee shall notify AM Station KFEQ, Facility ID: 34419 so that, if necessary that AM station: may
determine operating power by a method described in Section 73.51(a)(1) or (d), and/or request temporary authority from the Commission in Washington, D.C. to operate with parameters at variance in order to maintain monitoring point field strengths within authorized limits. Permittee shall be responsible for installation and continued maintenance of detuning apparatus necessary to prevent adverse effects upon the radiation pattern of the AM station. Both prior to construction of the tower and subsequent to the installation of all appurtenances thereon, a partial proof of performance, as defined by Section 73.154(a) of the Commission's Rules, shall be conducted to establish that the AM array has not been adversely affected and prior to or simultaneous with the filing of the application for license to cover this permit, the results submitted to the Commission.

4 Ground system consists of 120 equally spaced, buried, copper radials about the base of each tower, each 48.4 meters in length except where terminated by property boundaries or where intersecting radials are shortened and bonded to a transverse copper strap midway between adjacent towers.

Special operating conditions or restrictions:

5 Before program tests are authorized, sufficient data shall be submitted to show that adequate filters, traps and other equipment has been installed and adjusted to prevent interaction, intermodulation and/or generation of spurious radiation products which may be caused by common usage of the same antenna system by Stations KESJ(AM), Facility ID: 8767 , and KFEQ(Am), Facility ID: 34419, and there shall be filed with the license application copies of a firm agreement entered into by the 2 stations involved clearly fixing the responsibility of each with regard to the installation and maintenance of such equipment. In addition, field observations shall be made to determine whether spurious emissions exist and any objectionable problems resulting therefrom shall be eliminated. Following construction, and prior to authorization of program test under this grant, Stations KESJ(AM), Facility ID: 8767 , and KFEQ(Am), Facility ID: 34419, shall each measure antenna or common point
resistance and submit FCC Form 302 as application notifying the return to direct measurement of power.

*** END OF AUTHORIZATION ***

Attachment II

SUPPLEMENT TO AN APPLICATION FOR STATION LICENSE
METHOD OF MOMENTS - PROOF OF PERFORMANCE
prepared for
Eagle Communications, Inc.
Station KESJ St. Joseph, Missouri
1550 kHz DA-N U (2.5 kW ND-D 0.5 kW DA-N)

This Attachment will serve to document the installation of filters and traps at the KESJ / KFEQ common site as well as thee subsequent, post-construction, harmonic, spurious emission and intermodulation interference measurements. As will be shown herein, no objectionable effects were observed.

The 680 kHz reject filters were installed at the base of each KESJ tower. They were measured from the filter cabinet output j-plug back toward the ATU networks with a 50 ohm termination to ground at the ATU output j-plug to confirm proper adjustment and operation. The measurements are as follows: 680 kHz reject 1550 kHz pass circuits were:

	680- kHz	1550 kHz
T1	121 ohms +j 1464.3 ohms	50.125 ohms -j 0.55 ohm
T2	128 ohms +j 1511.2 ohms	50.200 ohms -j 0.01 ohm
T3	121 ohms +j 1487.2 ohms	50.187 ohms -j 0.27 ohm
T4	126 ohms +j 1478.9 ohms	50.118 ohms -j 0.32 ohm

The 680 kHz shunt trap to ground between the KESJ antenna system and the KESJ transmitter measured 0 ohm +/-j 0 ohm at 680 kHz. The 1550 kHz shunt trap to ground between the KFEQ antenna system and the KFEQ transmitter measured 0 ohm +/-j 0 ohm at 1550 kHz. Additionally, filters and traps are installed in the phasor cabinet prior to the common point.

Intermodulation product frequencies were calculated for specific observations, through the third harmonic, as follows:

870, 1060, 1360 (KMRN), 1740, 2040, 2230, 2420,
2610, 2910, 3100, 3290, 3590, 3780, and 3970 kilohertz.

Attachment II (continued)

SUPPLEMENT TO AN APPLICATION FOR STATION LICENSE
prepared for
Eagle Communications, Inc.
Station KESJ St. Joseph, Missouri
1550 kHz DA-N U (2.5 kW ND-D 0.5 kW DA-N)

Observations and measurements were made with an *Anritsu* Model 2721A spectrum analyzer and a *Chris Scott* magnetic loop antenna. The measurement observation location was 1.25 km distant on bearing 319 degrees True, from the approximate center of both KFEQ and KESJ arrays. The specific location is on John Glenn Drive, at the west end of the gravel parking lot of the fire station.

Measurements were made with both stations operating in various combinations of Daytime and Nighttime modes. The analyzer reports/plots follow this narrative and show no evidence of undesired emissions being emitted by the collocated stations.

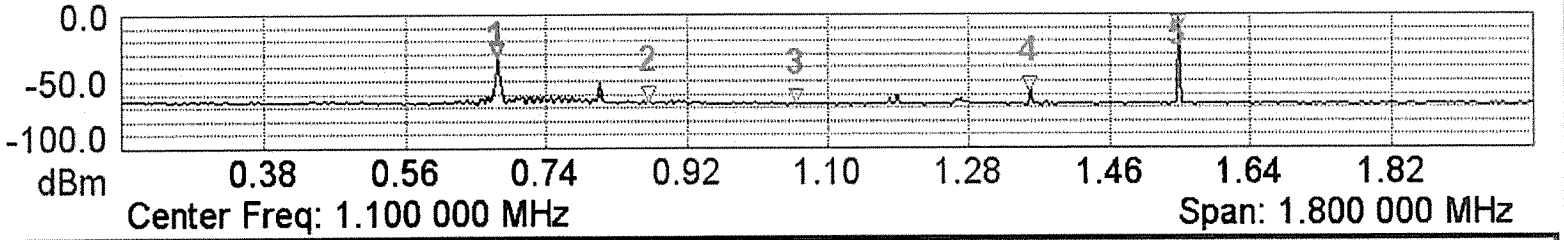
In addition to the spectrum analyzer measurements, field strength measurements were made with a *Potomac Instruments* Model 4100 Field Strength Meter, Serial #122, factory calibrated on 07/27/2009. In particular, measurements were made at each of the above listed intermod frequencies as well as harmonic frequencies. Observed values were found to be near zero microvolts/meter and were simply noise, with the exception of 1360 kHz (twice the KFEQ licensed frequency), which was the carrier for KMRN, Cameron, Missouri (located 53.6 km distant at 108.6 degrees True). No audio was detectable on any intermod or harmonic frequency.

Accordingly, it is believed that KESJ and KFEQ are operating in full accordance with the Rules and Regulations of the Federal Communications Commission with respect to prohibited RF out-of-band emissions.

Spectrum Analyzer Data

kesj_lo-third (2/7/2011 3:12:35 PM)

Spectrum Analyzer



Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	■	□	**677.818 2 kHz**	**-32.181015015 dBm**	- -	- -
2	■	□	870.909 1 kHz	-64.680000305 dBm	- -	- -
3	■	□	1.060 0 MHz	-66.531997681 dBm	- -	- -
4	■	□	1.358 2 MHz	-58.170280457 dBm	- -	- -
5	■	□	1.548 4 MHz	-0.306009889 dBm	- -	- -
6	□	□	- -	- -	- -	- -

Trace Mode = Average
Trace Average = 100
Trace Mode = Average
Preamp = ON
Min Sweep Time = 5E-05 S
Reference Level Offset = -75.5 dB
Input Attenuation = 0.0 dB
RBW = 300.0 Hz

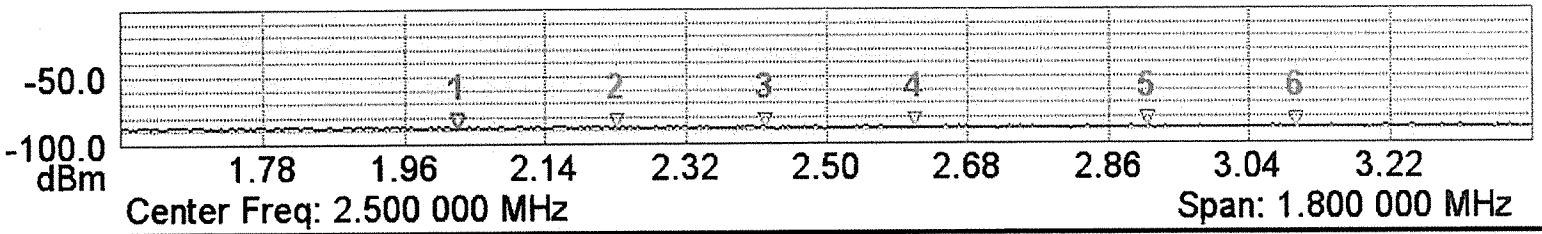
VBW = 3.0 MHz
Detection = Sample
Center Frequency = 1.100 000 MHz
Start Frequency = 200.000 000 kHz
Stop Frequency = 2.000 000 MHz
Frequency Span = 1.800 000 MHz
Reference Level = -75.500 dBm
Scale = 10.0 dB/div

Operator Name =
Tower =
Serial Number = 623020
Base Ver. = V1.78
App Ver. = V1.79
Date = 2/7/2011 3:12:35 PM
Device Name = Willoughby-Voss

Spectrum Analyzer Data

kesj_mid-third (2/7/2011 3:18:32 PM)

Spectrum Analyzer



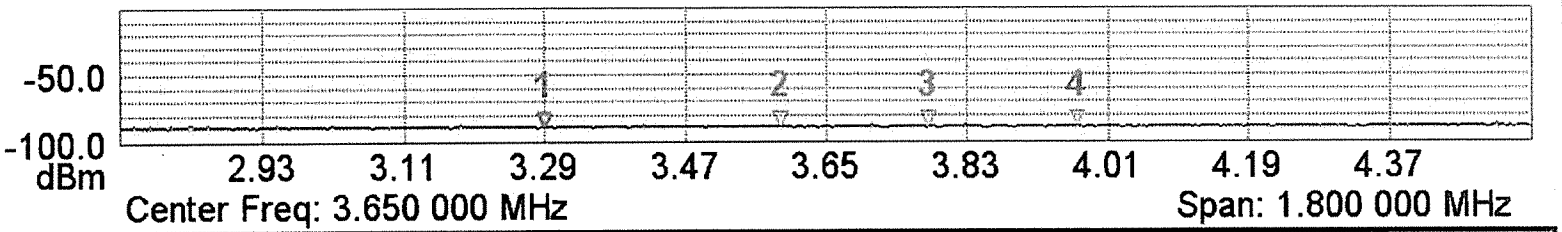
Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	■	□	2.028 7 MHz	**-87.847999573 dBm**	- -	- -
2	■	□	2.231 6 MHz	-87.974975586 dBm	- -	- -
3	■	□	2.421 5 MHz	-87.772956848 dBm	- -	- -
4	■	□	2.611 3 MHz	-87.9529953 dBm	- -	- -
5	■	□	2.909 1 MHz	-87.338996887 dBm	- -	- -
6	■	□	3.098 9 MHz	-88.159988403 dBm	- -	- -

Trace Mode = Average	VBW = 3.0 MHz	Operator Name =
Trace Average = 100	Detection = Sample	Tower =
Trace Mode = Average	Center Frequency = 2.500 000 MHz	Serial Number = 623020
Preamp = ON	Start Frequency = 1.600 000 MHz	Base Ver. = V1.78
Min Sweep Time = 5E-05 S	Stop Frequency = 3.400 000 MHz	App Ver. = V1.79
Reference Level Offset = -55.6 dB	Frequency Span = 1.800 000 MHz	Date = 2/7/2011 3:18:32 PM
Input Attenuation = 0.0 dB	Reference Level = -55.600 dBm	Device Name = Willoughby-Voss
RBW = 300.0 Hz	Scale = 10.0 dB/div	

Spectrum Analyzer Data

kesj_hi-third (2/7/2011 3:23:00 PM)

Spectrum Analyzer



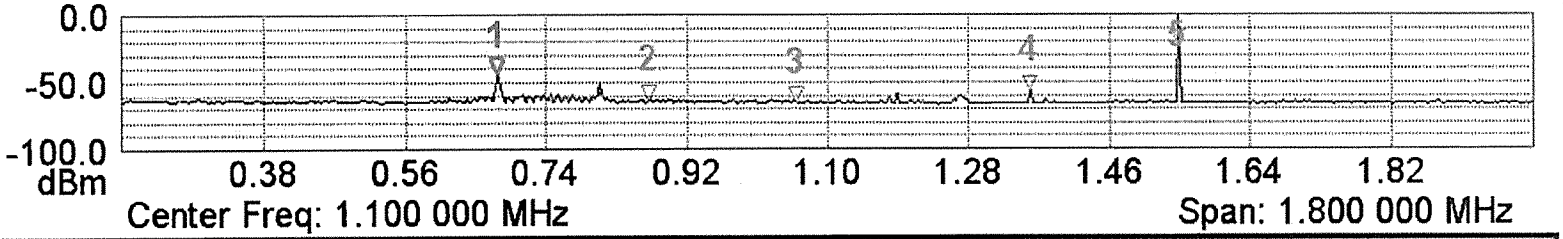
Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	■	□	3.290 0 MHz	**-88.457992554 dBm**	- -	- -
2	■	□	3.591 1 MHz	-88.259002686 dBm	- -	- -
3	■	□	3.780 9 MHz	-88.401008606 dBm	- -	- -
4	■	□	3.970 7 MHz	-87.773994446 dBm	- -	- -
5	□	□	- -	- -	- -	- -
6	□	□	- -	- -	- -	- -

Trace Mode = Average	VBW = 3.0 MHz	Operator Name =
Trace Average = 100	Detection = Sample	Tower =
Trace Mode = Average	Center Frequency = 3.650 000 MHz	Serial Number = 623020
Preamp = ON	Start Frequency = 2.750 000 MHz	Base Ver. = V1.78
Min Sweep Time = 5E-05 S	Stop Frequency = 4.550 000 MHz	App Ver. = V1.79
Reference Level Offset = -55.6 dB	Frequency Span = 1.800 000 MHz	Date = 2/7/2011 3:23:00 PM
Input Attenuation = 0.0 dB	Reference Level = -55.600 dBm	Device Name = Willoughby-Voss
RBW = 300.0 Hz	Scale = 10.0 dB/div	

Spectrum Analyzer Data

kesj_nite_lo-third (2/7/2011 3:31:47 PM)

Spectrum Analyzer



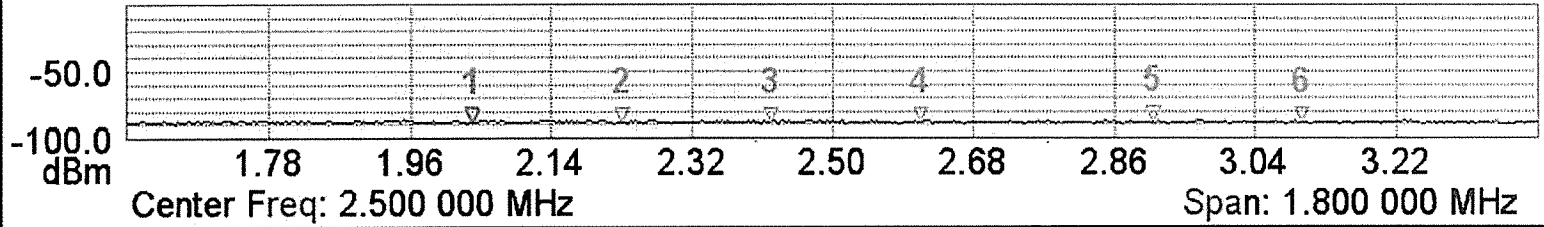
Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	■	□	**677.818 2 kHz**	**-43.135009766 dBm**	- -	- -
2	■	□	870.909 1 kHz	-63.5000 dBm	- -	- -
3	■	□	1.060 0 MHz	-65.064544678 dBm	- -	- -
4	■	□	1.358 2 MHz	-56.22328186 dBm	- -	- -
5	■	□	1.547 3 MHz	-22.126893997 dBm	- -	- -
6	□	□	- -	- -	- -	- -

Trace Mode = Average	VBW = 3.0 MHz	Operator Name =
Trace Average = 100	Detection = Sample	Tower =
Trace Mode = Average	Center Frequency = 1.100 000 MHz	Serial Number = 623020
Preamp = ON	Start Frequency = 200.000 000 kHz	Base Ver. = V1.78
Min Sweep Time = 5E-05 S	Stop Frequency = 2.000 000 MHz	App Ver. = V1.79
Reference Level Offset = -77.3 dB	Frequency Span = 1.800 000 MHz	Date = 2/7/2011 3:31:47 PM
Input Attenuation = 0.0 dB	Reference Level = -77.300 dBm	Device Name = Willoughby-Voss
RBW = 300.0 Hz	Scale = 10.0 dB/div	

Spectrum Analyzer Data

kesj_nite_mid-third (2/7/2011 3:35:22 PM)

Spectrum Analyzer



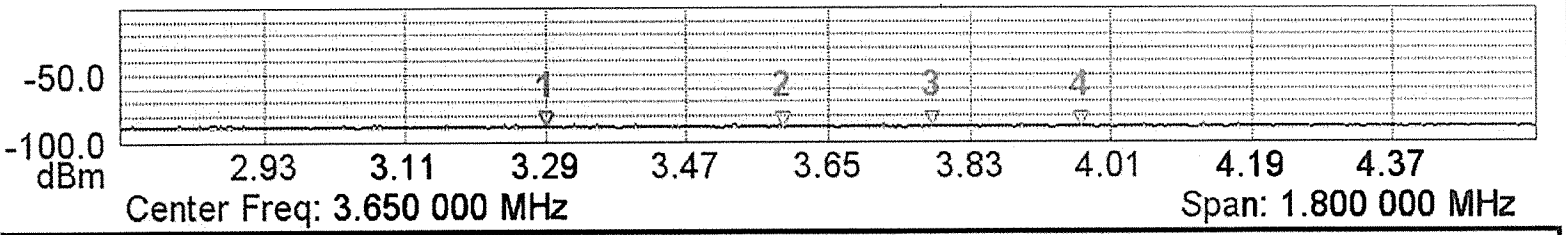
Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	■	□	**2.038 5 MHz**	**-87.944000244 dBm**	- -	- -
2	■	□	2.231 6 MHz	-88.025993347 dBm	- -	- -
3	■	□	2.421 5 MHz	-87.636001587 dBm	- -	- -
4	■	□	2.611 3 MHz	-87.823989868 dBm	- -	- -
5	■	□	2.909 1 MHz	-86.926063538 dBm	- -	- -
6	■	□	3.098 9 MHz	-87.960998535 dBm	- -	- -

Trace Mode = Average	VBW = 3.0 MHz	Operator Name =
Trace Average = 100	Detection = Sample	Tower =
Trace Mode = Average	Center Frequency = 2.500 000 MHz	Serial Number = 623020
Preamp = ON	Start Frequency = 1.600 000 MHz	Base Ver. = V1.78
Min Sweep Time = 5E-05 S	Stop Frequency = 3.400 000 MHz	App Ver. = V1.79
Reference Level Offset = -55.6 dB	Frequency Span = 1.800 000 MHz	Date = 2/7/2011 3:35:22 PM
Input Attenuation = 0.0 dB	Reference Level = -55.600 dBm	Device Name = Willoughby-Voss
RBW = 300.0 Hz	Scale = 10.0 dB/div	

Spectrum Analyzer Data

kesj_nite_hi-third (2/7/2011 3:41:40 PM)

Spectrum Analyzer



Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	■	□	3.290 0 MHz	-87.784004211 dBm	- -	- -
2	■	□	3.591 1 MHz	-88.364997864 dBm	- -	- -
3	■	□	3.780 9 MHz	-87.793006897 dBm	- -	- -
4	■	□	3.970 7 MHz	-88.09198761 dBm	- -	- -
5	□	□	- -	- -	- -	- -
6	□	□	- -	- -	- -	- -

Trace Mode = Average
Trace Average = 100
Trace Mode = Average
Preamp = ON
Min Sweep Time = 5E-05 S
Reference Level Offset = -55.6 dB
Input Attenuation = 0.0 dB
RBW = 300.0 Hz

VBW = 3.0 MHz
Detection = Sample
Center Frequency = 3.650 000 MHz
Start Frequency = 2.750 000 MHz
Stop Frequency = 4.550 000 MHz
Frequency Span = 1.800 000 MHz
Reference Level = -55.600 dBm
Scale = 10.0 dB/div

Operator Name =
Tower =
Serial Number = 623020
Base Ver. = V1.78
App Ver. = V1.79
Date = 2/7/2011 3:41:40 PM
Device Name = Willoughby-Voss