LAW OFFICES
MILLER AND NEELY, P. C.
SUITE 704
6900 WISCONSIN AVENUE
BETHESDA, MD 20815

JERROLD D. MILLER
JOHN S. NEELY*

*ADMITTED PA AND DC ONLY

(301) 986-4160
FAX: (301) 986-4162

June 2, 2009

Secretary
Federal Communications Commission
Washington, DC 20554

ATTN: Audio Division (AM)

RE: KLVZ(AM) Brighton, Colorado
FAC: 35089

Dear Madam Secretary:

Transmitted herewith in triplicate on behalf of KLZ Radio, Inc., licensee of the above-referenced station is FCC Form 302-AM, an application for moment method modeling.

No filing fee is due with this application. Any questions concerning this matter should be addressed to the undersigned.

Sincerely,

John S. Neely

encs.

Federal Communications Commission
Washington, D. C. 20554

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

FOR FCC USE ONLY

DUPLICATE

FCC 302-AM
APPLICATION FOR AM BROADCAST STATION LICENSE

(Please read instructions before filling out form.

FOR COMMISSION USE ONLY
FILE NO. BmL-20090603AHB

SECTION I - APPLICANT FEE INFORMATION

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

KLZ Radio, Inc.

Copy notices and communications to:
Miller and Neely, PC
Suite 704
6900 Wisconsin Ave.
Bethesda, MD 20815

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

MAILING ADDRESS (Line 2) (Maximum 35 characters)

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

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
(215) 628-3500	KLVZ	FRN: 0003-2524-59

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

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

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

C. If Yes, provide the following information:

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

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

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
	0001	$	

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

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT KLZ Radio, Inc. FRN: 0003-2524-59		
MAILING ADDRESS P.O. Box 3003		
CITY Blue Bell	STATE PA	ZIP CODE 19422

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
FACID 35089 KLVZ	Brighton, CO	N/A	N/A	N/A

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

☐ Yes ☑ No

If No, explain in an Exhibit. Application for Moment Method modeling

Exhibit No. N/A

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. E-1

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	
Donald B. Crawford		
Title	Date	Telephone Number
President	06/01/2009	(215) 628-3500

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

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

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

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

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

SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant
KLZ Radio, 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
KLVZ	N/A	810	Unlimited	0.43	2.2

2. Station location

State	City or Town
Colorado	Brighton

3. Transmitter location

State	County	City or Town	Street address (or other identification)
CO	Weld	Brighton	12348 Weld Co. Rd. 6

4. Main studio location

State	County	City or Town	Street address (or other identification)
CO	Denver	Denver	2150 W. 29th Ave.

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

State	County	City or Town	Street address (or other identification)
CO	Denver	Denver	2150 W. 29th Ave.

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

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

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

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system	RF common point or antenna current (in amperes) without modulation for day system
3.05	6.89
Measured antenna or common point resistance (in ohms) at operating frequency	**Measured antenna or common point reactance (in ohms) at operating frequency**
Night: 50 Day: 50	Night: 0 Day: 0

Antenna indications for directional operation

Towers	Antenna monitor Phase reading(s) in degrees		Antenna monitor sample current ratio(s)		Antenna base currents	
	Night	Day	Night	Day	Night	Day
1	---	-128.9	---	0.492	---	---
2	---	0.0	---	1.000	---	---
3	---	+123.6	---	0.514	---	---

Manufacturer and type of antenna monitor: Potomac Instruments Type 1901

SECTION III - Page 2

9. Description of antenna system ((f directional antenna is used, the information requested below should be given for each element of the array. Use separate sheets if necessary.)

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded.	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit.
See E-1	See E-1	See E-1	See E-1	Exhibit No. N/A

Excitation ☑ Series ☐ Shunt

DAY TOWER T1 ASR 1024154
DAY TOWER T2 ASR 1024155
DAY TOWER T3 ASR 1024156

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

North Latitude 40 ° 01 ' 41 "	West Longitude 104 ° 49 ' 21 "

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. N/A

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

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

N/A

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

No change in common point resistance. Moment method daytime proof only.

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)
W.C. Alexander	
Address (include ZIP Code) 2150 W. 29th Ave. Suite 300 Denver, CO 80211	Date 05/29/2009
	Telephone No. (Include Area Code) (303) 433-0104

☑ Technical Director ☐ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☐ Other (specify)

EXHIBIT E-1

APPLICATION FOR LICENSE INFORMATION
RADIO STATION KLVZ
BRIGHTON, COLORADO

KLZ Radio, Inc.

May 29, 2009

810 kHz 2.2 kW-D/0.43 kW-N DA-2

EXECUTIVE SUMMARY

This engineering exhibit supports an application for license for the existing daytime directional antenna system of radio station KLVZ in Brighton, Colorado (FCC FID No. 35089) pursuant to the recently enacted AM technical rules permitting moment-method modeling of eligible AM directional arrays.

KLVZ operates on 810 kHz and has been operating pursuant to the terms of its license (BL-20070525AJP) using separate day and night sites. The instant application pertains only to the daytime site and directional antenna. No changes have been made or proposed to the night site or antenna.

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

Analysis of Tower Impedance Measurements to Verify Method of Moments Model

Tower base impedance measurements were made at the final J-plugs within the Antenna Tuning Units (ATUs) using a General Radio 1606B impedance bridge. The other towers were all open-circuited at the same points where the impedance measurements were made for them. The lighting chokes and static drain chokes at the ATU outputs were disconnected from all towers during the base impedance measurements. This arrangement left only the short feed tubing between the ATU outputs and the tower base in series in the impedance measurements.

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

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

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

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

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

Tower 3, while identical in electrical length, aperture and AMSL height, differs from the other two in that due to its location in a depression on the property, its base pier is elevated by twenty inches over that of the other two towers, putting the base plate at 75 inches above grade. This results in a higher measured base resistance than the other two towers. The ATU is also elevated and situated very close to the tower base, resulting in a lower series inductance. The model calibration process was able to compensate for these differences well within the allowable tolerances specified in the rules.

A circuit model was constructed for each tower using the assumed series feed tubing and shunt base region reactances. This model was used with the Westberg Circuit Analysis Program (WCAP) to determine the effects of these reactances on the ATU output impedance at each tower. In each of the WCAP tabulations, node 2 represents the ATU output reference point and node 3 represents the tower base. Node 0 represents ground potential. The ATU output impedances can be found in the "TO NODE IMPEDANCE" column of each WCAP tabulation, following the phantom 1.0 ohm resistor inserted in the model to provide a calculation point for the impedance. The complex base impedance of each tower from the moment method model is represented in each case by the complex load from node 3 to ground. A value of 80 pF was assumed for the base insulator, and this appears in the WCAP tabulation from node 3 to ground as 0.001 (microfarads) due to rounding. The WCAP circuit model tabulation immediately follows the model for each tower.

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

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

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

Twr.	Z_{BASE} (Modeled)	Z_{ATU} (Modeled)	Z_{ATU} (Measured)		Series L (uH)	Shunt C pF	Phys. Height (deg.)	Model Height (deg.)	% Phys. Height
1	29.6 –j24.0	29.0 +j6.1	29.0 +j6.1		5.96	80	77.0	81.575	105.9
2	29.6 –j21.3	29.1 +j6.1	29.0 +j6.1		5.41	80	77.0	82.290	106.9
3	32.4 –j11.6	32.1 –j3.7	32.0 –j3.7		1.62	80	77.0	83.920	109.0

Collins Matrix Lumped Loads

5.96 uH

$5.96\ 10^{-3}$ mH

0.00596 mH

****
ACSModel
(MININEC 3.1 Core)
05-13-2009 10:55:58
****

KLVZ-LIC
3-Tower Daytime Array
Tower 1 Driven, 2 & 3 Floated

Frequency = 0.810 MHz Wavelength = 370.12346 Meters

No. of Wires: 3

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
-59.77779	-50.15952	0		-1	
-59.77779	-50.15952	83.86895	0.2911	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-2	
0	0	84.56293	0.2911	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
59.77779	50.15952	0		-3	
59.77779	50.15952	86.27989	0.2911	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
-59.77779	-50.15952	0	0.2911	-1	1	1
-59.77779	-50.15952	4.193448	0.2911	1	1	2
-59.77779	-50.15952	8.386895	0.2911	1	1	3
-59.77779	-50.15952	12.58034	0.2911	1	1	4
-59.77779	-50.15952	16.77379	0.2911	1	1	5
-59.77779	-50.15952	20.96724	0.2911	1	1	6
-59.77779	-50.15952	25.16068	0.2911	1	1	7
-59.77779	-50.15952	29.35413	0.2911	1	1	8
-59.77779	-50.15952	33.54758	0.2911	1	1	9
-59.77779	-50.15952	37.74103	0.2911	1	1	10
-59.77779	-50.15952	41.93447	0.2911	1	1	11
-59.77779	-50.15952	46.12792	0.2911	1	1	12
-59.77779	-50.15952	50.32137	0.2911	1	1	13
-59.77779	-50.15952	54.51482	0.2911	1	1	14
-59.77779	-50.15952	58.70826	0.2911	1	1	15
-59.77779	-50.15952	62.90171	0.2911	1	1	16
-59.77779	-50.15952	67.09516	0.2911	1	1	17
-59.77779	-50.15952	71.2886	0.2911	1	1	18
-59.77779	-50.15952	75.48206	0.2911	1	1	19
-59.77779	-50.15952	79.6755	0.2911	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
0	0	0	0.2911	-2	2	21
0	0	4.228147	0.2911	2	2	22
0	0	8.456293	0.2911	2	2	23
0	0	12.68444	0.2911	2	2	24
0	0	16.91259	0.2911	2	2	25
0	0	21.14073	0.2911	2	2	26
0	0	25.36888	0.2911	2	2	27
0	0	29.59702	0.2911	2	2	28
0	0	33.82517	0.2911	2	2	29
0	0	38.05332	0.2911	2	2	30
0	0	42.28146	0.2911	2	2	31
0	0	46.50961	0.2911	2	2	32
0	0	50.73775	0.2911	2	2	33
0	0	54.9659	0.2911	2	2	34
0	0	59.19405	0.2911	2	2	35
0	0	63.42219	0.2911	2	2	36
0	0	67.65034	0.2911	2	2	37
0	0	71.87849	0.2911	2	2	38
0	0	76.10664	0.2911	2	2	39
0	0	80.33478	0.2911	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
59.77779	50.15952	0	0.2911	-3	3	41
59.77779	50.15952	4.313994	0.2911	3	3	42
59.77779	50.15952	8.627989	0.2911	3	3	43
59.77779	50.15952	12.94198	0.2911	3	3	44
59.77779	50.15952	17.25598	0.2911	3	3	45
59.77779	50.15952	21.56997	0.2911	3	3	46
59.77779	50.15952	25.88397	0.2911	3	3	47
59.77779	50.15952	30.19796	0.2911	3	3	48
59.77779	50.15952	34.51196	0.2911	3	3	49
59.77779	50.15952	38.82595	0.2911	3	3	50
59.77779	50.15952	43.13995	0.2911	3	3	51
59.77779	50.15952	47.45394	0.2911	3	3	52
59.77779	50.15952	51.76793	0.2911	3	3	53
59.77779	50.15952	56.08193	0.2911	3	3	54
59.77779	50.15952	60.39592	0.2911	3	3	55
59.77779	50.15952	64.70992	0.2911	3	3	56
59.77779	50.15952	69.02391	0.2911	3	3	57
59.77779	50.15952	73.33791	0.2911	3	3	58
59.77779	50.15952	77.6519	0.2911	3	3	59
59.77779	50.15952	81.9659	0.2911	3	0	60

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 1.0, 0.0

Number of Loads: 2
Pulse No., Resistance, Reactance: 21, 0, -10000
Pulse No., Resistance, Reactance: 41, 0, -10000

********** SOURCE DATA **********
Pulse 1 Voltage = (1.0, 0.0j)
Current = (0.0204, 0.0165j)
Impedance = (29.602, -24.0j)
Power = 0.010192 Watts

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = KLVZ-1.CIR

I	1.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	5.9600	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
R	29.6000	3	0	-24.1000	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .810

NODE	VOLT MAG	VOLT PHASE
1	30.5683	11.5253
2	29.5892	11.9122
3	37.7501	-39.9204

				BRANCH VOLTAGE		BRANCH CURRENT		FROM NODE IMPEDANCE		TO NODE IMPEDANCE	
				MAG	PHASE	MAG	PHASE	RESISTANCE	REACTANCE	RESISTANCE	REACTANCE
R	1-	2	1.000	1.00	.000	1.00	.000	29.95	6.11	28.95	6.11
L	2-	3	5.960	30.33	90.000	1.00	.000	28.95	6.11	28.95	-24.23
C	3-	0	.000	37.75	-39.920	.02	50.080	.00	-2183.20	.00	.00
R	3-	0	29.600	37.75	-39.920	.99	-.768	29.60	-24.10	.00	.00

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****************************************
                ACSModel
          (MININEC 3.1 Core)
     05-13-2009          10:56:54
****************************************
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KLVZ-LIC
3-Tower Daytime Array
Tower 2 Driven, 1 & 3 Floated

Frequency = 0.810 MHz Wavelength = 370.12346 Meters

No. of Wires: 3

Wire No. 1 X	Coordinates Y	Z	Radius	End Connection	No. of Segments
-59.77779	-50.15952	0		-1	
-59.77779	-50.15952	83.86895	0.2911	0	20

Wire No. 2 X	Coordinates Y	Z	Radius	End Connection	No. of Segments
0	0	0		-2	
0	0	84.60405	0.2911	0	20

Wire No. 3 X	Coordinates Y	Z	Radius	End Connection	No. of Segments
59.77779	50.15952	0		-3	
59.77779	50.15952	86.27989	0.2911	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 X	Coordinates Y	Z	Radius	Connection End1	End2	Pulse No.
-59.77779	-50.15952	0	0.2911	-1	1	1
-59.77779	-50.15952	4.193448	0.2911	1	1	2
-59.77779	-50.15952	8.386895	0.2911	1	1	3
-59.77779	-50.15952	12.58034	0.2911	1	1	4
-59.77779	-50.15952	16.77379	0.2911	1	1	5
-59.77779	-50.15952	20.96724	0.2911	1	1	6
-59.77779	-50.15952	25.16068	0.2911	1	1	7
-59.77779	-50.15952	29.35413	0.2911	1	1	8
-59.77779	-50.15952	33.54758	0.2911	1	1	9
-59.77779	-50.15952	37.74103	0.2911	1	1	10
-59.77779	-50.15952	41.93447	0.2911	1	1	11
-59.77779	-50.15952	46.12792	0.2911	1	1	12
-59.77779	-50.15952	50.32137	0.2911	1	1	13
-59.77779	-50.15952	54.51482	0.2911	1	1	14
-59.77779	-50.15952	58.70826	0.2911	1	1	15
-59.77779	-50.15952	62.90171	0.2911	1	1	16
-59.77779	-50.15952	67.09516	0.2911	1	1	17
-59.77779	-50.15952	71.2886	0.2911	1	1	18
-59.77779	-50.15952	75.48206	0.2911	1	1	19
-59.77779	-50.15952	79.6755	0.2911	1	0	20

Wire No. 2 Coordinates

X	Y	Z	Radius	Connection End1	Connection End2	Pulse No.
0	0	0	0.2911	-2	2	21
0	0	4.230203	0.2911	2	2	22
0	0	8.460405	0.2911	2	2	23
0	0	12.69061	0.2911	2	2	24
0	0	16.92081	0.2911	2	2	25
0	0	21.15101	0.2911	2	2	26
0	0	25.38121	0.2911	2	2	27
0	0	29.61142	0.2911	2	2	28
0	0	33.84162	0.2911	2	2	29
0	0	38.07182	0.2911	2	2	30
0	0	42.30202	0.2911	2	2	31
0	0	46.53223	0.2911	2	2	32
0	0	50.76243	0.2911	2	2	33
0	0	54.99263	0.2911	2	2	34
0	0	59.22283	0.2911	2	2	35
0	0	63.45304	0.2911	2	2	36
0	0	67.68324	0.2911	2	2	37
0	0	71.91344	0.2911	2	2	38
0	0	76.14365	0.2911	2	2	39
0	0	80.37385	0.2911	2	0	40

Wire No. 3 Coordinates

X	Y	Z	Radius	Connection End1	Connection End2	Pulse No.
59.77779	50.15952	0	0.2911	-3	3	41
59.77779	50.15952	4.313994	0.2911	3	3	42
59.77779	50.15952	8.627989	0.2911	3	3	43
59.77779	50.15952	12.94198	0.2911	3	3	44
59.77779	50.15952	17.25598	0.2911	3	3	45
59.77779	50.15952	21.56997	0.2911	3	3	46
59.77779	50.15952	25.88397	0.2911	3	3	47
59.77779	50.15952	30.19796	0.2911	3	3	48
59.77779	50.15952	34.51196	0.2911	3	3	49
59.77779	50.15952	38.82595	0.2911	3	3	50
59.77779	50.15952	43.13995	0.2911	3	3	51
59.77779	50.15952	47.45394	0.2911	3	3	52
59.77779	50.15952	51.76793	0.2911	3	3	53
59.77779	50.15952	56.08193	0.2911	3	3	54
59.77779	50.15952	60.39592	0.2911	3	3	55
59.77779	50.15952	64.70992	0.2911	3	3	56
59.77779	50.15952	69.02391	0.2911	3	3	57
59.77779	50.15952	73.33791	0.2911	3	3	58
59.77779	50.15952	77.6519	0.2911	3	3	59
59.77779	50.15952	81.9659	0.2911	3	0	60

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 1.0, 0.0

Number of Loads: 2
Pulse No., Resistance, Reactance: 1, 0, -10000
Pulse No., Resistance, Reactance: 41, 0, -10000

********** SOURCE DATA **********
Pulse 21 Voltage = (1.0, 0.0j)
Current = (0.0223, 0.016j)
Impedance = (29.592, -21.267j)
Power = 0.011142 Watts

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = KLVZ-2.CIR

I	1.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	5.4100	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
R	29.6000	3	0	-21.3000	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .810

NODE	VOLT MAG	VOLT PHASE
1	30.6950	11.4039
2	29.7154	11.7851
3	36.1510	-36.4231

				BRANCH VOLTAGE		BRANCH CURRENT	FROM NODE IMPEDANCE		TO NODE IMPEDANCE	
				MAG	PHASE	MAG	PHASE	RESISTANCE	REACTANCE	RESISTANCE	REACTANCE
R	1-	2	1.000	1.00	.000	1.00	.000	30.09	6.07	29.09	6.07
L	2-	3	5.410	27.53	90.000	1.00	.000	29.09	6.07	29.09	-21.46
C	3-	0	.000	36.15	-36.423	.01	53.577	.00	-2456.09	.00	.00
R	3-	0	29.600	36.15	-36.423	.99	-.685	29.60	-21.30	.00	.00

****
ACSModel
(MININEC 3.1 Core)
05-13-2009 10:57:37
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KLVZ-LIC
3-Tower Daytime Array
Tower 3 Driven, 1 & 2 Floated

Frequency = 0.810 MHz Wavelength = 370.12346 Meters

No. of Wires: 3

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
-59.77779	-50.15952	0		-1	
-59.77779	-50.15952	83.86895	0.2911	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-2	
0	0	84.60405	0.2911	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
59.77779	50.15952	0		-3	
59.77779	50.15952	86.27989	0.2911	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
-59.77779	-50.15952	0	0.2911	-1	1	1
-59.77779	-50.15952	4.193448	0.2911	1	1	2
-59.77779	-50.15952	8.386895	0.2911	1	1	3
-59.77779	-50.15952	12.58034	0.2911	1	1	4
-59.77779	-50.15952	16.77379	0.2911	1	1	5
-59.77779	-50.15952	20.96724	0.2911	1	1	6
-59.77779	-50.15952	25.16068	0.2911	1	1	7
-59.77779	-50.15952	29.35413	0.2911	1	1	8
-59.77779	-50.15952	33.54758	0.2911	1	1	9
-59.77779	-50.15952	37.74103	0.2911	1	1	10
-59.77779	-50.15952	41.93447	0.2911	1	1	11
-59.77779	-50.15952	46.12792	0.2911	1	1	12
-59.77779	-50.15952	50.32137	0.2911	1	1	13
-59.77779	-50.15952	54.51482	0.2911	1	1	14
-59.77779	-50.15952	58.70826	0.2911	1	1	15
-59.77779	-50.15952	62.90171	0.2911	1	1	16
-59.77779	-50.15952	67.09516	0.2911	1	1	17
-59.77779	-50.15952	71.2886	0.2911	1	1	18
-59.77779	-50.15952	75.48206	0.2911	1	1	19
-59.77779	-50.15952	79.6755	0.2911	1	0	20

Wire No. 2 Coordinates

X	Y	Z	Radius	Connection End1	Connection End2	Pulse No.
0	0	0	0.2911	-2	2	21
0	0	4.230203	0.2911	2	2	22
0	0	8.460405	0.2911	2	2	23
0	0	12.69061	0.2911	2	2	24
0	0	16.92081	0.2911	2	2	25
0	0	21.15101	0.2911	2	2	26
0	0	25.38121	0.2911	2	2	27
0	0	29.61142	0.2911	2	2	28
0	0	33.84162	0.2911	2	2	29
0	0	38.07182	0.2911	2	2	30
0	0	42.30202	0.2911	2	2	31
0	0	46.53223	0.2911	2	2	32
0	0	50.76243	0.2911	2	2	33
0	0	54.99263	0.2911	2	2	34
0	0	59.22283	0.2911	2	2	35
0	0	63.45304	0.2911	2	2	36
0	0	67.68324	0.2911	2	2	37
0	0	71.91344	0.2911	2	2	38
0	0	76.14365	0.2911	2	2	39
0	0	80.37385	0.2911	2	0	40

Wire No. 3 Coordinates

X	Y	Z	Radius	Connection End1	Connection End2	Pulse No.
59.77779	50.15952	0	0.2911	-3	3	41
59.77779	50.15952	4.313994	0.2911	3	3	42
59.77779	50.15952	8.627989	0.2911	3	3	43
59.77779	50.15952	12.94198	0.2911	3	3	44
59.77779	50.15952	17.25598	0.2911	3	3	45
59.77779	50.15952	21.56997	0.2911	3	3	46
59.77779	50.15952	25.88397	0.2911	3	3	47
59.77779	50.15952	30.19796	0.2911	3	3	48
59.77779	50.15952	34.51196	0.2911	3	3	49
59.77779	50.15952	38.82595	0.2911	3	3	50
59.77779	50.15952	43.13995	0.2911	3	3	51
59.77779	50.15952	47.45394	0.2911	3	3	52
59.77779	50.15952	51.76793	0.2911	3	3	53
59.77779	50.15952	56.08193	0.2911	3	3	54
59.77779	50.15952	60.39592	0.2911	3	3	55
59.77779	50.15952	64.70992	0.2911	3	3	56
59.77779	50.15952	69.02391	0.2911	3	3	57
59.77779	50.15952	73.33791	0.2911	3	3	58
59.77779	50.15952	77.6519	0.2911	3	3	59
59.77779	50.15952	81.9659	0.2911	3	0	60

Sources: 1
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 1.0, 0.0

Number of Loads: 2
Pulse No., Resistance, Reactance: 1, 0, -10000
Pulse No., Resistance, Reactance: 21, 0, -10000

********** SOURCE DATA **********
Pulse 41 Voltage = (1.0, 0.0j)
Current = (0.0274, 0.0098j)
Impedance = (32.402, -11.563j)
Power = 0.013688 Watts

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = KLVZ-3.CIR

I	1.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	1.6200	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
R	32.4000	3	0	-11.6000	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .810

NODE	VOLT MAG	VOLT PHASE
1	33.2992	-6.4176
2	32.3057	-6.6159
3	34.2492	-20.4509

				BRANCH VOLTAGE		BRANCH CURRENT		FROM NODE IMPEDANCE		TO NODE IMPEDANCE	
				MAG	PHASE	MAG	PHASE	RESISTANCE	REACTANCE	RESISTANCE	REACTANCE
VSWR											
R	1-	2	1.000	1.00	.000	1.00	.000	33.09	-3.72	32.09	-3.72
L	2-	3	1.620	8.24	90.000	1.00	.000	32.09	-3.72	32.09	-11.97
C	3-	0	.000	34.25	-20.451	.01	69.549	.00	-2456.09	.00	.00
R	3-	0	32.400	34.25	-20.451	1.00	-.752	32.40	-11.60	.00	.00

Derivation of Operating Parameters for Daytime Directional Antenna

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

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

A circuit model was constructed to determine the effect of the series feed inductance, shunt lighting choke reactance and shunt base region capacitance on the ATU output current. The 3-wire lighting chokes exhibit a manufacturer-specified reactance of +j3,200 at 810 kHz, and the circuit model for each tower is essentially the circuit model used for model verification above with the +j3,200 lighting chokes added in and using the model-predicted operating impedance for each tower. Again, this model was used with the Westberg Circuit Analysis Program (WCAP).

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

Twr.	Node	Current Magnitude (amperes)	Current Phase (degrees)	WCAP Current Offset for Unity I_{BASE}	WCAP Phase Offset for Unity $Ø_{BASE}$ (degrees)	Antenna Monitor Ratio	Antenna Monitor Phase (degrees)
1	1	6.9047	-126.9	1.004	+0.06	0.492	-128.9
2	21	13.9544	+1.9	1.010	+0.11	1.000	0.0
3	41	7.1972	125.5	1.006	+0.06	0.514	+123.5

****
ACSModel
(MININEC 3.1 Core)
05-13-2009 11:42:54
****

KLVZ-LIC
3-Tower Daytime Array
Daytime Directional Pattern

Frequency = 0.810 MHz Wavelength = 370.12346 Meters

No. of Wires: 3

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
-59.77779	-50.15952	0		-1	
-59.77779	-50.15952	83.86895	0.2911	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-2	
0	0	84.60405	0.2911	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
59.77779	50.15952	0		-3	
59.77779	50.15952	86.27989	0.2911	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
-59.77779	-50.15952	0	0.2911	-1	1	1
-59.77779	-50.15952	4.193448	0.2911	1	1	2
-59.77779	-50.15952	8.386895	0.2911	1	1	3
-59.77779	-50.15952	12.58034	0.2911	1	1	4
-59.77779	-50.15952	16.77379	0.2911	1	1	5
-59.77779	-50.15952	20.96724	0.2911	1	1	6
-59.77779	-50.15952	25.16068	0.2911	1	1	7
-59.77779	-50.15952	29.35413	0.2911	1	1	8
-59.77779	-50.15952	33.54758	0.2911	1	1	9
-59.77779	-50.15952	37.74103	0.2911	1	1	10
-59.77779	-50.15952	41.93447	0.2911	1	1	11
-59.77779	-50.15952	46.12792	0.2911	1	1	12
-59.77779	-50.15952	50.32137	0.2911	1	1	13
-59.77779	-50.15952	54.51482	0.2911	1	1	14
-59.77779	-50.15952	58.70826	0.2911	1	1	15
-59.77779	-50.15952	62.90171	0.2911	1	1	16
-59.77779	-50.15952	67.09516	0.2911	1	1	17
-59.77779	-50.15952	71.2886	0.2911	1	1	18
-59.77779	-50.15952	75.48206	0.2911	1	1	19
-59.77779	-50.15952	79.6755	0.2911	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
0	0	0	0.2911	-2	2	21
0	0	4.230203	0.2911	2	2	22
0	0	8.460405	0.2911	2	2	23
0	0	12.69061	0.2911	2	2	24
0	0	16.92081	0.2911	2	2	25
0	0	21.15101	0.2911	2	2	26
0	0	25.38121	0.2911	2	2	27
0	0	29.61142	0.2911	2	2	28
0	0	33.84162	0.2911	2	2	29
0	0	38.07182	0.2911	2	2	30
0	0	42.30202	0.2911	2	2	31
0	0	46.53223	0.2911	2	2	32
0	0	50.76243	0.2911	2	2	33
0	0	54.99263	0.2911	2	2	34
0	0	59.22283	0.2911	2	2	35
0	0	63.45304	0.2911	2	2	36
0	0	67.68324	0.2911	2	2	37
0	0	71.91344	0.2911	2	2	38
0	0	76.14365	0.2911	2	2	39
0	0	80.37385	0.2911	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
59.77779	50.15952	0	0.2911	-3	3	41
59.77779	50.15952	4.313994	0.2911	3	3	42
59.77779	50.15952	8.627989	0.2911	3	3	43
59.77779	50.15952	12.94198	0.2911	3	3	44
59.77779	50.15952	17.25598	0.2911	3	3	45
59.77779	50.15952	21.56997	0.2911	3	3	46
59.77779	50.15952	25.88397	0.2911	3	3	47
59.77779	50.15952	30.19796	0.2911	3	3	48
59.77779	50.15952	34.51196	0.2911	3	3	49
59.77779	50.15952	38.82595	0.2911	3	3	50
59.77779	50.15952	43.13995	0.2911	3	3	51
59.77779	50.15952	47.45394	0.2911	3	3	52
59.77779	50.15952	51.76793	0.2911	3	3	53
59.77779	50.15952	56.08193	0.2911	3	3	54
59.77779	50.15952	60.39592	0.2911	3	3	55
59.77779	50.15952	64.70992	0.2911	3	3	56
59.77779	50.15952	69.02391	0.2911	3	3	57
59.77779	50.15952	73.33791	0.2911	3	3	58
59.77779	50.15952	77.6519	0.2911	3	3	59
59.77779	50.15952	81.9659	0.2911	3	0	60

Sources: 3
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 194.3, -52.2
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 320.0, -33.0
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 208.3, 50.4

Number of Loads: 0

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

Pulse 1 Voltage = (119.1035, -153.5661j)
Current = (-4.1483, -5.5196j)
Impedance = (7.416, 27.152j)
Power = 176.78 Watts

Pulse 21 Voltage = (268.2465, -174.4348j)
Current = (13.9466, 0.4656j)
Impedance = (18.795, -13.135j)
Power = 1829.96 Watts

Pulse 41 Voltage = (132.7433, 160.547j)
Current = (-4.1769, 5.8611j)
Impedance = (7.462, -27.966j)
Power = 193.26 Watts

Total Power = 2200.000 Watts

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

Wire No. 1 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	-4.1483	-5.5196	6.9047	-126.9265
2	-4.2096	-5.5611	6.9747	-127.1245
3	-4.2195	-5.5506	6.9723	-127.2418
4	-4.1977	-5.5033	6.9215	-127.3347
5	-4.1467	-5.4214	6.8255	-127.4112
6	-4.0678	-5.3061	6.6859	-127.4749
7	-3.962	-5.1582	6.5042	-127.5281
8	-3.8302	-4.9785	6.2814	-127.5725
9	-3.6731	-4.7681	6.0189	-127.609
10	-3.4917	-4.5278	5.7178	-127.6385
11	-3.2869	-4.2586	5.3796	-127.6618
12	-3.0596	-3.9615	5.0055	-127.6795
13	-2.8106	-3.6376	4.5969	-127.6921
14	-2.541	-3.2877	4.1552	-127.7
15	-2.2516	-2.9128	3.6816	-127.7039
16	-1.9429	-2.5135	3.1769	-127.704
17	-1.6152	-2.0898	2.6412	-127.7008
18	-1.2678	-1.6406	2.0734	-127.6947
19	-0.8981	-1.1626	1.4691	-127.6861
20	-0.4987	-0.6458	0.8159	-127.6753
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	13.9466	0.4656	13.9544	1.9122
22	13.8251	0.3363	13.8292	1.3937
23	13.6593	0.2541	13.6617	1.0656
24	13.4276	0.1846	13.4288	0.7878
25	13.1282	0.1242	13.1288	0.5421
26	12.7612	0.0711	12.7614	0.3194
27	12.3276	0.0247	12.3277	0.1146
28	11.8289	-0.0156	11.8289	-0.0757
29	11.2667	-0.0499	11.2668	-0.2539
30	10.6433	-0.0784	10.6435	-0.4219
31	9.9609	-0.101	9.9614	-0.5811
32	9.222	-0.118	9.2228	-0.7329

$\frac{6.9047}{13.9544} = .495$ ✓

1.0 ✓

33	8.4291	-0.1292	8.4301	-0.8781
34	7.5847	-0.1347	7.5859	-1.0177
35	6.6909	-0.1346	6.6923	-1.1523
36	5.7493	-0.1287	5.7507	-1.2827
37	4.7603	-0.1171	4.7617	-1.4095
38	3.7219	-0.0996	3.7232	-1.5334
39	2.6266	-0.0759	2.6277	-1.6551
40	1.4526	-0.0451	1.4533	-1.7769
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	-4.1769	5.8611	7.1972	125.4756
42	-4.0876	5.7809	7.0801	125.2635
43	-4.0044	5.6931	6.9604	125.1217
44	-3.9071	5.5811	6.8128	124.9946
45	-3.7937	5.4432	6.6348	124.875
46	-3.6635	5.279	6.4257	124.7596
47	-3.5166	5.0889	6.1857	124.6462
48	-3.3535	4.8732	5.9156	124.5336
49	-3.1746	4.6328	5.6162	124.4209
50	-2.9808	4.3685	5.2886	124.3074
51	-2.7728	4.0812	4.934	124.1928
52	-2.5516	3.772	4.5539	124.0765
53	-2.3179	3.4419	4.1496	123.9584
54	-2.0728	3.0919	3.7224	123.8382
55	-1.8171	2.723	3.2736	123.716
56	-1.5514	2.3359	2.8041	123.5915
57	-1.2762	1.9307	2.3144	123.4648
58	-0.9912	1.5069	1.8037	123.3357
59	-0.6947	1.0614	1.2685	123.2039
60	-0.3813	0.5856	0.6988	123.0674
E	0.0	0.0	0.0	0.0

$\frac{7.1972\angle}{13.9544} = 0.516$ ✓

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

Twr.	Ratio	Phase
1	0.495	-128.8
2	1.000	0.0
3	0.516	123.6

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = KLVZ-1D.CIR

I	6.9349	0	1	-126.8625	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	628.8000	2	0	.0000	.0000	.0000
L	5.9600	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
R	7.4000	3	0	27.2000	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .810

NODE	VOLT MAG	VOLT PHASE
1	398.3787	-45.1908
2	397.4335	-44.2016
3	194.4352	-52.1452

				BRANCH VOLTAGE MAG	BRANCH VOLTAGE PHASE	BRANCH CURRENT MAG	BRANCH CURRENT PHASE	FROM NODE IMPEDANCE RESISTANCE	FROM NODE IMPEDANCE REACTANCE	TO NODE IMPEDANCE RESISTANCE	TO NODE IMPEDANCE REACTANCE	VSWR
R	1-	2	1.000	6.93	-126.863	6.93	-126.863	8.32	56.84	7.32	56.84	
L	2-	0	628.800	397.43	-44.202	.12	-134.202	.00	3200.20	.00	.00	
L	2-	3	5.960	206.62	-36.729	6.81	-126.729	7.59	57.85	7.59	27.52	
C	3-	0	.000	194.44	-52.145	.09	37.855	.00	-2183.20	.00	.00	
R	3-	0	7.400	194.44	-52.145	6.90	-126.926	7.40	27.20	.00	.00	

FILE NAME = KLVZ-2D.CIR

I	14.0900	0	1	2.0170	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	628.8000	2	0	.0000	.0000	.0000
L	5.4100	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
R	18.8000	3	0	-13.1000	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .810

NODE	VOLT MAG	VOLT PHASE
1	340.8310	38.5625
2	329.6181	40.0210
3	319.6956	-32.9568

				BRANCH VOLTAGE MAG	BRANCH VOLTAGE PHASE	BRANCH CURRENT MAG	BRANCH CURRENT PHASE	FROM NODE IMPEDANCE RESISTANCE	FROM NODE IMPEDANCE REACTANCE	TO NODE IMPEDANCE RESISTANCE	TO NODE IMPEDANCE REACTANCE	VSWR
R	1-	2	1.000	14.09	2.017	14.09	2.017	19.43	14.40	18.43	14.40	
L	2-	0	628.800	329.62	40.021	.10	-49.979	.00	3200.20	.00	.00	
L	2-	3	5.410	386.21	92.349	14.03	2.349	18.60	14.36	18.60	-13.17	
C	3-	0	.000	319.70	-32.957	.13	57.043	.00	-2456.09	.00	.00	
R	3-	0	18.800	319.70	-32.957	13.95	1.912	18.80	-13.10	.00	.00	

FILE NAME = KLVZ-3D.CIr

I	7.2374	0	1	125.5166	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	628.8000	2	0	.0000	.0000	.0000
L	1.6200	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
R	7.5000	3	0	-28.0000	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .810

NODE	VOLT MAG	VOLT PHASE
1	154.1523	58.8075
2	151.4366	56.2916
3	208.6939	50.4708

				BRANCH VOLTAGE MAG	BRANCH VOLTAGE PHASE	BRANCH CURRENT MAG	BRANCH CURRENT PHASE	FROM NODE IMPEDANCE RESISTANCE	FROM NODE IMPEDANCE REACTANCE	TO NODE IMPEDANCE RESISTANCE	TO NODE IMPEDANCE REACTANCE	VSWR
R	1-	2	1.000	7.24	125.517	7.24	125.517	8.42	-19.56	7.42	-19.56	
L	2-	0	628.800	151.44	56.292	.05	-33.708	.00	3200.20	.00	.00	
L	2-	3	1.620	60.04	-144.351	7.28	125.649	7.33	-19.46	7.33	-27.71	
C	3-	0	.000	208.69	50.471	.08	140.471	.00	-2456.09	.00	.00	
R	3-	0	7.500	208.69	50.471	7.20	125.476	7.50	-28.00	.00	.00	

Summary of Post Construction Certified Array Geometry

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

Tower No.	ASRN	Height above base insulator (meters)	Height above ground w/o obst. lighting (meters)	Overall height above ground (meters)
1	1024154	79.3	80.7	81.6
2	1024155	79.3	80.7	81.6
3	1024156	79.3	81.2*	82.1*

* See explanation on page 2 – AMSL height and G identical to towers 1 and 2

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

The tower relative distances provided in feet on the Certified Survey drawing attached hereto were converted to electrical degrees at 810 kHz and used along with the survey tower azimuths relative to True North to calculate the X-Y coordinates of each tower with reference to the reference tower (#2). Likewise, the distances in electrical degrees and azimuths with reference to True North specified in the theoretical directional antenna pattern array geometry were used to calculate the X-Y coordinates of the specified tower locations. The differences in X and Y for the surveyor-measured and the specified coordinates of each tower were calculated, and each difference was used as a side of a right triangle. The square root of the sum of the squares of the sides was calculated to determine the positional error of each tower in electrical degrees.

Below is a tabulation showing those distances and other data that is relevant to their determination.

Twr.	Specified Array Geometry		Post-Construction Certification		Distance From Specified Base Location
	Spacing (degrees)	Azimuth (deg. T.)	Spacing (degrees)	Azimuth (deg. T.)	(deg.)
1	75.9	220	76.2	220.39	0.519
2	0	0	0	0	0
3	75.9	40	75.7	40.41	0.536

The as-built tower displacements from their specified locations expressed in electrical degrees at 810 kHz, which corresponds to space phasing differences in the far-field radiation pattern of the array, are well below the ±3 degree operating phase range specified for antenna monitor parameters by the FCC.

Sampling System

The sampling system consists of Delta Electronics TCT-2 current transformers installed at the output of each antenna tuning unit, immediately adjacent to the final J-plug. Samples from the current transformers are fed to the antenna monitor via equal lengths of 3/8-inch foam-dielectric coaxial transmission lines. The antenna monitor is a Potomac Instruments Type 1901.

Impedance measurements were made of the antenna sampling system using an Agilent E5061A network analyzer. The measurements were made looking into the antenna monitor ends of the sample lines with the tower ends of the sample lines open-circuited.

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

Twr.	Sample Line Open-Circuited Resonance Below 810 kHz (kHz)	Sample Line Open-Circuited Resonance Above 810 kHz (kHz)	Sample Line Calculated Electrical Length At 810 kHz (deg.)
1	335.544	1033.416	211.6
2	335.544	1033.416	211.6
3	335.544	1033.416	211.6

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

To determine the characteristic impedance values of the sample lines, open-circuited measurements were made with frequencies offset to produce ± 45 degrees of electrical length from resonance.

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

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

Twr.	+ 45 Deg. Offset Frequency (kHz)	+45 Deg. Measured Impedance (ohms)	- 45 Deg. Offset Frequency (kHz)	-45 Deg. Measured Impedance (ohms)	Calculated Characteristic Impedance (ohms)
1	1205.652	8.5 +j50.0	861.180	5.6 –j49.0	50.0
2	1205.652	8.3 +j50.0	861.180	5.6 –j49.0	50.0
3	1205.652	8.3 +j49.0	861.180	5.6 –j49.0	49.5

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

The calibration of the Delta TCT-2 current transformers was verified by removing them all from the ATUs and installing them on a test jig so that each was located very close together (spacing of less than two inches). Short transmission lines of equal length were connected between the outputs of all four current transformers and the inputs of the antenna monitor. The Potomac 1901 antenna monitor was calibrated using the internal calibration function. A single source of RF current on the carrier frequency was fed through a conductor passing through all of the current transformers, and the differential phases and ratios were noted on the antenna monitor as follows:

Twr.	Serial No.	Ratio	Phase (deg.)
1	1909	1.003	0.0
2	1911	Ref.	Ref.
3	1906	1.002	-0.2

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

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

Twr.	R (ohms)	X (ohms)
1	53.9	-j1.2
2	53.6	-j0.1
3	53.9	-j0.8

Direct Measurement of Power

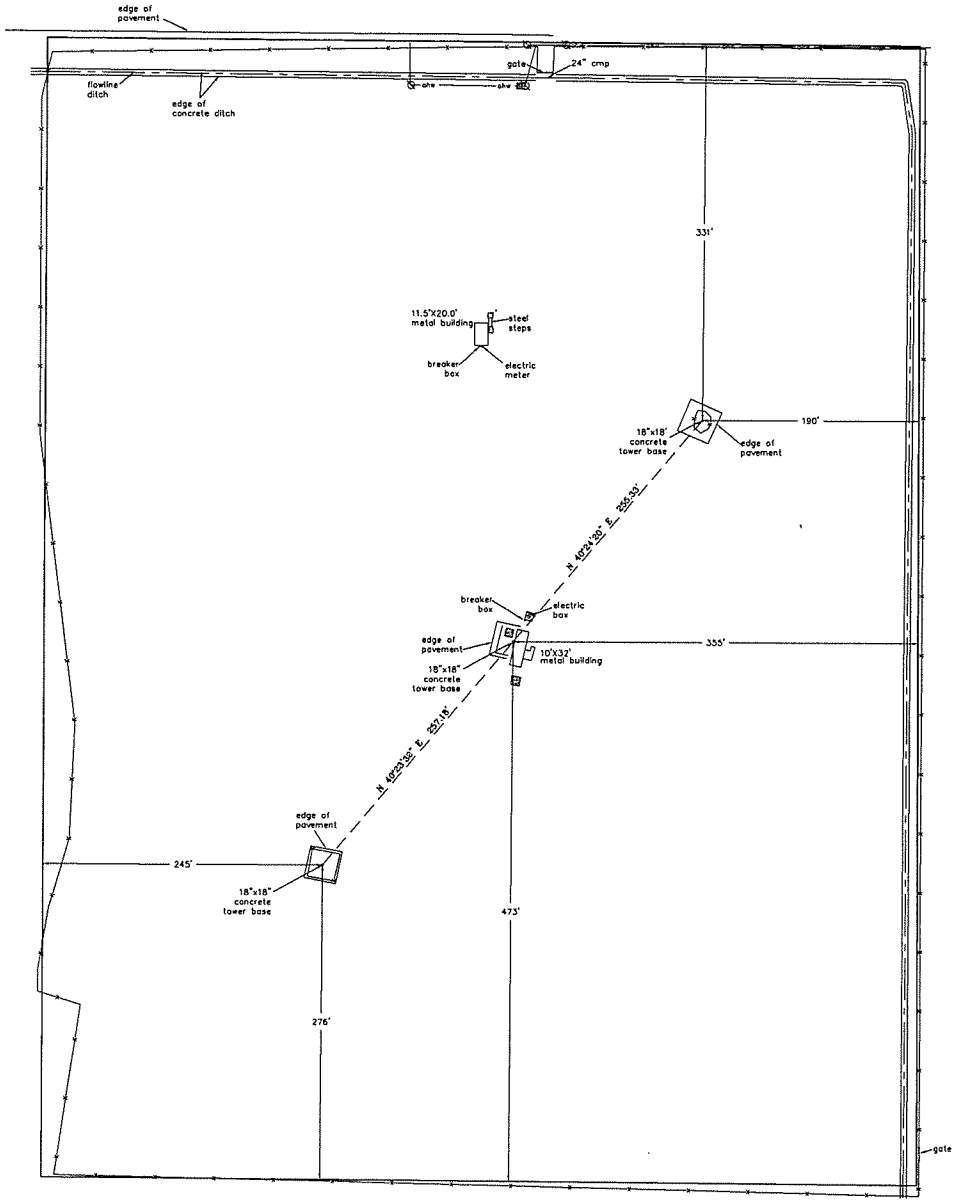
Common point impedance measurements were made using a Delta CPB-1A common point bridge installed in the common point bus of the phasing and coupling system. The resistance value was adjusted to 50 ohms and the reactance value was adjusted to zero.

Appendix A

Certified Post-Construction Array Geometry Survey

Tower Location Exhibit

Section 30, T1N, R66W 6th PM
Weld County, Colorado



Scale 1 inch = 50 feet

50 0 25 50 100

NOTES:

- This is not a monumented land survey.
- No improvements, other than those shown, were located this date.

Legend:

- denotes fence
- ohw denotes overhead wire
- denotes utility pole
- denotes telephone riser

NOTICE: According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you first discover such defect. In no event, may any action based upon any defect in this survey be commenced more than ten years from the date of the certification shown hereon.

CLIENT: Sterling Design Associates, LLC	TITLE: Tower Location Exhibit Crawford Broadcasting Shelter Section 30, Twp 1 N, Rng 66 W, 6PM, Weld County, Colorado				
REVISIONS Date ___ By ___ Description ___ Date ___ By ___ Description ___ Date ___ By ___ Description ___	Frederick Land Surveying, Inc. 6853 North Franklin Avenue, Loveland, Colorado 80538 Phone: (970) 669-2100 Fax: (970) 669-3725	Field Date 2-2-09 ST lek Party Chief dch PM bar Scale 1"=50' PLS bar	PROJECT NO. 08105.001	SHEET NO. 1	NO. OF SHEETS 1

Appendix B

Reference Field Strength Measurements

Reference field strength measurements were made on May 28, 2009 using a Potomac Instruments FIM-41 field intensity meter of known calibration at three locations along radials at the azimuths with radiation values specified on the construction permit and, additionally, on the major lobe radial. The measured field strengths and descriptions and NAD-83 GPS coordinates for the reference measurement points are shown in the following tables.

Radial 15°

Point No.	Dist. km	Latitude	Longitude	Time	Field mV/m
1	4.01	40-03-46.4	104-48-37.4	1333	4.0
2	5.17	40-04-22.6	104-48-24.8	1336	6.8
3	5.99	40-04-48.4	104-48-15.8	1342	6.0

Radial 65°

Point No.	Dist. km	Latitude	Longitude	Time	Field mV/m
1	0.42	40-01-47.0	104-49-4.8	1321	39
2	1.12	40-01-56.6	104-48-38.0	1327	19
3	2.92	40-02-21.1	104-47-29.5	1251	9.2

Radial 99.5°

Point No.	Dist. km	Latitude	Longitude	Time	Field mV/m
1	1.04	40-01-35.3	104-48-37.6	1316	45
2	4.30	40-01-17.9	104-46-21.9	1300	20
3	7.06	40-01-03.1	104-44-26.9	1307	4.1

Radial 220°

Point No.	Dist. km	Latitude	Longitude	Time	Field mV/m
1	2.42	40-00-41.0	104-50-26.9	1420	350
2	4.01	40-00-01.5	104-51-09.9	1424	190
3	6.00	39-59-12.4	104-52-03.5	1411	120

Radial 340.5°

Point No.	Dist. km	Latitude	Longitude	Time	Field mV/m
1	1.86	40-02-37.8	104-49-47.1	1400	11
2	6.13	40-04-48.3	104-50-47.2	1350	3.2
3	6.74	40-05-06.8	104-50-55.9	1354	2.0