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WASHINGTON DC
WISCONSIN

October 14, 2010

Federal Communications Commission
P.O. Box 979089
SL-MO-C2-GL
1005 Convention Plaza
St. Louis, MO 63101

Re: KGAB(AM), Orchard Valley, WY, Facility No. 30224

Dear Sir or Madam:

On behalf of Townsquare Media Cheyenne License, LLC (formerly GAP Broadcasting Cheyenne License, LLC), the licensee of KGAB(AM), Orchard Valley, WY, enclosed are the original and two copies of an application for modification of KGAB's license. This application is submitted on FCC Form 302-AM.

Also enclosed is a $1,320.00 check, payable to the Commission, for payment of the $615.00 station licensee fee and the $705.00 AM directional antenna fee associated with this application, as well as an FCC Form 159.

Please address any questions concerning this application to Howard Liberman of this firm at (202) 842-8876 or to me.

Sincerely,

Alisa R. Lahey

DC01/2580110.1

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-20101015ACO

SECTION I - APPLICANT FEE INFORMATION

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

GAP BROADCASTING CHEYENNE LICENSE, LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)
C/O TOWNSQUARE MEDIA, INC.

MAILING ADDRESS (Line 2) (Maximum 35 characters)
60 ARCH STREET

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
GREENWICH	CT	06830

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
(203) 861-0900	KGAB	30224

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
MMR	0001	$ 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
MOR	0001	$ 705.00	

	TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
ADD ALL AMOUNTS SHOWN IN COLUMN C, AND ENTER THE TOTAL HERE. THIS AMOUNT SHOULD EQUAL YOUR ENCLOSED REMITTANCE.	$ 1,320.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT GAP Broadcasting Cheyenne License, LLC		
MAILING ADDRESS c/o Townsquare Media, Inc.; 60 Arch Street		
CITY Greenwich	STATE CT	ZIP CODE 06830

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
KGAB	Orchard Valley, WY	N/A	N/A	N/A

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

☐ Yes ☐ No

If No, explain in an Exhibit.

Exhibit No. 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. 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.

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

☐ Yes ☑ No

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

Exhibit No.

8. Does the applicant, or any party to the application, have a petition on file to migrate to the expanded band (1605-1705 kHz) or a permit or license either in the existing band or expanded band that is held in combination (pursuant to the 5 year holding period allowed) with the AM facility proposed to be modified herein?

☐ Yes ☑ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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

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

CERTIFICATION

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

☑ Yes ☐ No

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

Name	Signature	
Stuart Rosenstein		
Title Executive Vice President and CFO	Date October 12, 2010	Telephone Number (203) 861-0900

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

GAP BROADCASTING CHEYENNE LICENSE, LLC

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

☑ Station License ☐ Direct Measurement of Power

1. Facilities authorized in construction permit

Call Sign	File No. of Construction Permit (if applicable)	Frequency (kHz)	Hours of Operation	Power in kilowatts	
				Night	Day
KGAB		650	UNLIMITED	0.5	8.5

2. Station location

State	City or Town
WYOMING	ORCHARD VALLEY

3. Transmitter location

State	County	City or Town	Street address (or other identification)
WY	LARAMIE	CHEYENNE	2002 TERRY RANCH RD

4. Main studio location

State	County	City or Town	Street address (or other identification)
WY	LARAMIE	CHEYENNE	1912 CAPITAL AVENUE

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

State	County	City or Town	Street address (or other identification)
WY	LARAMIE	CHEYENNE	1912 CAPITAL AVENUE

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

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

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

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system	RF common point or antenna current (in amperes) without modulation for day system
3.28	21.2

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	19.0	0	-J76.3

Antenna indications for directional operation

Towers	Antenna monitor Phase reading(s) in degrees		Antenna monitor sample current ratio(s)		Antenna base currents	
	Night	Day	Night	Day	Night	Day
1 EAST	+131.2		0.578			
2 CENTER	0.0 REF		1.00 REF			
3 WEST	-133.1		0.486			

Manufacturer and type of antenna monitor: POTOMAC INSTRUMENTS AM19 (TYPE 204)

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

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded.	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit.
GUYED TOWER	ALL 85.2M	ALL 86.0M	ALL 86.8M	Exhibit No.

Excitation ☑ Series ☐ Shunt

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

North Latitude	West Longitude
41 ° 03 ' 11 "	104 ° 49 ' 57 "

If not fully described above, attach as an Exhibit further details and dimensions including any other antenna mounted on tower and associated isolation circuits. Exhibit No.

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

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

NONE

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

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)
TIMOTHY C CUTFORTH	Timothy C Cutforth
Address (include ZIP Code) VIR JAMES ENGINEERS 965 S. IRVING STREET DENVER, CO 80219	Date 10/01/2010 Telephone No. (Include Area Code) 303-937-1900

☐ Technical Director

☑ Registered Professional Engineer

☐ Chief Operator

☐ Technical Consultant

☐ Other (specify)

From: Origin ID: JPNA (202) 842-8851
Alisa Lahey
Drinker Biddle & Reath LLP
1500 K Street, NW
Suite 1100
Washington, DC 20005

J10301010040225

Ship Date: 14OCT10
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CAD: 2845817/WBUS0200

Delivery Address Bar Code

Ref # 200419.412764-RENNANAF
Invoice #
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Dept #

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Federal Communications Commission
SL-MO-C2-GL
1005 Convention Plz

Saint Louis, MO 63101

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XX CPSA

50AG1/26EF/278D

FOLD on this line and place in shipping pouch with **bar code and delivery address** visible

1. Fold the first printed page in half and use as the shipping label.
2. Place the label in a waybill pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.
3. Keep the second page as a receipt for your records. The receipt contains the terms and conditions of shipping and information useful for tracking your package.

EXHIBIT E-1

APPLICATION FOR LICENSE INFORMATION
RADIO STATION KGAB
CHEYENNE, WYOMING

GAP BROADCASTING CHEYENNE LICENSE, LLC.

October 7, 2010

650 kHz 8.5 kW-D/0.5 kW-N DA-N

EXECUTIVE SUMMARY

This engineering exhibit supports an application for modification of license for the existing nighttime directional antenna system of radio station KGAB in Cheyenne, Wyoming (FCC FID No. 30224) pursuant to the recently enacted AM technical rules permitting moment-method modeling of eligible AM directional arrays.

KGAB operates on 650 kHz and has been operating pursuant to the terms of its license (BL-20080313ADW). The instant application Proposes only to change to Method of Moment (MoM) proof of performance for the KGAB nighttime array. No changes have been made or proposed to the night site or antenna or to the day or night operating system previously described.

Information is provided herein showing that the directional antenna parameters for the nighttime 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 nighttime 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 Delta OIB-1 impedance bridge. The other towers were all open-circuited at the same points where the impedance measurements were made for them. The static drain chokes at the ATU outputs were reconnected inside the ATU after the sample transformer and were therefore not part of the model. This arrangement left only the short feed tubing between the ATU outputs and the tower base in series in the impedance measurements except on towers 1 and 4 which have an FM isocoupler across the base of the tower.

ACSModel (MININEC 3.1 core) was used to model the KGAB nighttime 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.

Towers 1, 2, and 3 are physically 85.3m tall (86.8m overall AGL) for an electrical height of 66.5degrees and tower 4 is 58.5m tall (59.5m overall AGL) for an electrical height of 45.6 degrees. All towers are base insulated. Tower 4 is not used for the KGAB AM array and has an FM isocoupler across the base that was used for a temporary emergency antenna for KLEN (FM) when the number 1 tower for KGAB which supported the KLEN (FM) main antenna fell some time back. This extra tower is quite short and is effectively detuned in its normal mode with the base open circuited and has no effect on the KGAB array and is therefore not shown in the modeling.

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 radius for each tower is the physical radius of the tower as determined by the formula $3T/2\pi$, where T is the tower face width in meters. The KGAB radiators are uniform cross-section triangular towers and tower 1 has a face width of 24 inches, towers 2 and 3 have face widths of 18 inches.The tower radius computes to 0.2917 meter for tower 1, and 0.2188 meter for towers 2 and 3. Towers 1, 2, and 3 are 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.

The tower measured reactances differ significantly due to significantly different ATU mounting locations relative to the tower base pier. Towers 1 and 2 have 2 turn drip loops from the tower base to the antenna tuning unit bowl insulator. Tower 1 ATU is elevated so that the input to the bowl insulator is located higher than the other two ATU's and with a larger diameter feed tubing routed directly to the ATU with no loop resulting in a lower series inductance. Tower 4 does not have a feed to an ATU and the impedance was measured to verify the detuning by connecting directly from thetop of the base insulator of the tower to the ground strap on the concrete base and there are no other connections to the tower with the exception of the ERI FM isocoupler. Tower 1 has the KLEN (FM) main antenna mounted atop the tower and has an ERI FM isocoupler permanently mounted across the base. 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 includes the relatively small shunt capacitance of the base insulator shown as 0.0001mfd. 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. 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)	Phys. Height (deg.)	Model Height (deg.)	% Phys. Height
1	17.94 –j95.5	15.66 –j60.84	16.0 -j59.1	7	66.5	69.0	103.8
2	20.09 –j84.92	18.77 – j76.09	19.0 -j76.3	1.5	66.5	72.0	108.3
3	20.03 –j84.26	18.97 –j76.00	19.5 –j76.0	1.5	66.5	72.0	108.3

****

ACSModel
(MININEC 3.1 Core)
01-21-2010 16:49:07
****

KGAB Tower 1 fed and Towers 2 & 3 floated

Frequency = 0.650 MHz Wavelength = 461.23079 Meters

No. of Wires: 3

Wire No. 1	Coordinates			End	No. of
X	Y	Z	Radius	Connection	
Segments					
0	0	0		-1	
0	0	88.40257	0.2917	0	20

Wire No. 2	Coordinates			End	No. of
X	Y	Z	Radius	Connection	
Segments					
55.34171	-65.95368	0		-2	
55.34171	-65.95368	92.24615	0.2188	0	20

Wire No. 3	Coordinates			End	No. of
X	Y	Z	Radius	Connection	
Segments					
110.6834	-131.9074	0		-3	
110.6834	-131.9074	92.24615	0.2188	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1	Coordinates			Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
0	0	0	0.2917	-1	1	1
0	0	4.420128	0.2917	1	1	2
0	0	8.840257	0.2917	1	1	3
0	0	13.26039	0.2917	1	1	4
0	0	17.68051	0.2917	1	1	5
0	0	22.10064	0.2917	1	1	6
0	0	26.52077	0.2917	1	1	7
0	0	30.9409	0.2917	1	1	8
0	0	35.36103	0.2917	1	1	9
0	0	39.78115	0.2917	1	1	10
0	0	44.20128	0.2917	1	1	11
0	0	48.62141	0.2917	1	1	12
0	0	53.04154	0.2917	1	1	13
0	0	57.46167	0.2917	1	1	14
0	0	61.88179	0.2917	1	1	15
0	0	66.30193	0.2917	1	1	16
0	0	70.72205	0.2917	1	1	17
0	0	75.14218	0.2917	1	1	18
0	0	79.56231	0.2917	1	1	19
0	0	83.98244	0.2917	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
55.34171	-65.95368	0	0.2188	-2	2	21
55.34171	-65.95368	4.612308	0.2188	2	2	22
55.34171	-65.95368	9.224615	0.2188	2	2	23
55.34171	-65.95368	13.83692	0.2188	2	2	24
55.34171	-65.95368	18.44923	0.2188	2	2	25
55.34171	-65.95368	23.06154	0.2188	2	2	26
55.34171	-65.95368	27.67385	0.2188	2	2	27
55.34171	-65.95368	32.28616	0.2188	2	2	28
55.34171	-65.95368	36.89846	0.2188	2	2	29
55.34171	-65.95368	41.51077	0.2188	2	2	30
55.34171	-65.95368	46.12308	0.2188	2	2	31
55.34171	-65.95368	50.73539	0.2188	2	2	32
55.34171	-65.95368	55.34769	0.2188	2	2	33
55.34171	-65.95368	59.96	0.2188	2	2	34
55.34171	-65.95368	64.57231	0.2188	2	2	35
55.34171	-65.95368	69.18462	0.2188	2	2	36
55.34171	-65.95368	73.79692	0.2188	2	2	37
55.34171	-65.95368	78.40923	0.2188	2	2	38
55.34171	-65.95368	83.02154	0.2188	2	2	39
55.34171	-65.95368	87.63385	0.2188	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
110.6834	-131.9074	0	0.2188	-3	3	41
110.6834	-131.9074	4.612308	0.2188	3	3	42
110.6834	-131.9074	9.224615	0.2188	3	3	43
110.6834	-131.9074	13.83692	0.2188	3	3	44
110.6834	-131.9074	18.44923	0.2188	3	3	45
110.6834	-131.9074	23.06154	0.2188	3	3	46
110.6834	-131.9074	27.67385	0.2188	3	3	47
110.6834	-131.9074	32.28616	0.2188	3	3	48
110.6834	-131.9074	36.89846	0.2188	3	3	49
110.6834	-131.9074	41.51077	0.2188	3	3	50
110.6834	-131.9074	46.12308	0.2188	3	3	51
110.6834	-131.9074	50.73539	0.2188	3	3	52
110.6834	-131.9074	55.34769	0.2188	3	3	53
110.6834	-131.9074	59.96	0.2188	3	3	54
110.6834	-131.9074	64.57231	0.2188	3	3	55
110.6834	-131.9074	69.18462	0.2188	3	3	56
110.6834	-131.9074	73.79692	0.2188	3	3	57
110.6834	-131.9074	78.40923	0.2188	3	3	58
110.6834	-131.9074	83.02154	0.2188	3	3	59
110.6834	-131.9074	87.63385	0.2188	3	0	60

Sources: 3
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 758.8, -89.4
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 1351.3, 142.7
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 560.7, 5.9

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

```
********************     SOURCE DATA     ********************
Pulse  1       Voltage = (8.3169, -758.8018j)
               Current = (7.6906, -1.3574j)
               Impedance = (17.938, -95.5j)
               Power = 547.0 Watts

Pulse  21      Voltage = (-1074.8504, 819.0352j)
               Current = (-0.0883, -0.1161j)
               Impedance = (-7.802, -9263.01j)
               Power = -0.083021 Watts

Pulse  41      Voltage = (557.7054, 58.0271j)
               Current = (-0.0143, 0.0551j)
               Impedance = (-1471.46, -9746.447j)
               Power = -2.380806 Watts

Total Power = 544.531 Watts

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

Wire No.  1 :
```

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	7.6906	-1.3574	7.8095	-10.0099
2	7.3729	-1.3572	7.4967	-10.4302
3	7.13	-1.3487	7.2564	-10.7113
4	6.8837	-1.3328	7.0116	-10.9576
5	6.6251	-1.3096	6.7533	-11.182
6	6.3505	-1.2794	6.4781	-11.3905
7	6.0582	-1.2421	6.1843	-11.5867
8	5.7478	-1.1979	5.8714	-11.7727
9	5.4192	-1.147	5.5393	-11.9501
10	5.0726	-1.0893	5.1882	-12.1202
11	4.7083	-1.0252	4.8186	-12.2837
12	4.3268	-0.9546	4.4309	-12.4417
13	3.9287	-0.8778	4.0256	-12.5947
14	3.5144	-0.7948	3.6031	-12.7434
15	3.0841	-0.7057	3.1638	-12.8882
16	2.638	-0.6105	2.7078	-13.0297
17	2.1756	-0.509	2.2344	-13.1683
18	1.6952	-0.4009	1.7419	-13.3047
19	1.1927	-0.285	1.2262	-13.4395
20	0.6574	-0.1587	0.6763	-13.575
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	-0.0883	-0.1161	0.1459	-127.2591
22	-0.111	-0.1469	0.1841	-127.0814
23	-0.1247	-0.1661	0.2076	-126.8967
24	-0.1347	-0.1808	0.2254	-126.6737
25	-0.1417	-0.1921	0.2388	-126.4133
26	-0.1462	-0.2004	0.2481	-126.1182
27	-0.1484	-0.2058	0.2537	-125.7907
28	-0.1484	-0.2085	0.2559	-125.4336
29	-0.1463	-0.2085	0.2547	-125.049
30	-0.1423	-0.2059	0.2503	-124.6394
31	-0.1365	-0.2008	0.2428	-124.2072
32	-0.129	-0.193	0.2322	-123.7546
33	-0.12	-0.1828	0.2187	-123.284
34	-0.1096	-0.17	0.2023	-122.798
35	-0.0978	-0.1547	0.1831	-122.2991
36	-0.0849	-0.1369	0.1611	-121.7896
37	-0.0708	-0.1166	0.1364	-121.272
38	-0.0556	-0.0935	0.1088	-120.7486
39	-0.0393	-0.0675	0.0782	-120.2205
40	-0.0216	-0.038	0.0437	-119.6844
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	-0.0143	0.0551	0.0569	104.5254
42	-0.0447	0.0524	0.0689	130.4485
43	-0.0641	0.0503	0.0815	141.8806
44	-0.0797	0.0483	0.0932	148.7927
45	-0.0924	0.0462	0.1033	153.4173
46	-0.1025	0.0441	0.1116	156.7308
47	-0.1102	0.0418	0.1179	159.2241
48	-0.1158	0.0395	0.1223	161.1703
49	-0.1192	0.037	0.1248	162.7336
50	-0.1205	0.0345	0.1253	164.0184
51	-0.1198	0.0319	0.1239	165.0942
52	-0.117	0.0292	0.1206	166.0092
53	-0.1123	0.0264	0.1154	166.7978
54	-0.1057	0.0235	0.1083	167.4851
55	-0.0972	0.0205	0.0993	168.0899
56	-0.0867	0.0174	0.0885	168.6267
57	-0.0744	0.0143	0.0757	169.1067
58	-0.06	0.0111	0.0611	169.5389
59	-0.0436	0.0077	0.0443	169.9309
60	-0.0246	0.0042	0.025	170.2916
E	0.0	0.0	0.0	0.0

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

Twr.	Ratio	Phase
1	1.000	0.0
2	0.019	-117.2
3	0.007	114.5

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = kgab-1.cir

I	1.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	7.0000	2	3	.0000	.0000	.0000
C	.0002	3	0	.0000	.0000	.0000
R	17.9380	3	0	-95.5000	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .650

NODE	VOLT MAG	VOLT PHASE
1	63.0793	-74.6864
2	62.8226	-75.5661
3	90.7888	-80.0679

				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	16.66	-60.84	15.66	-60.84
L	2-	3	7.000	28.59	90.000	1.00	.000	15.66	-60.84	15.66	-89.43
C	3-	0	.000	90.79	-80.068	.07	9.932	.00	-1360.30	.00	.00
R	3-	0	17.938	90.79	-80.068	.93	-.706	17.94	-95.50	.00	.00

****
ACSModel
(MININEC 3.1 Core)
01-21-2010 17:20:21
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KGAB Tower 2 fed Towers 1 & 3 floated

Frequency = 0.650 MHz Wavelength = 461.23079 Meters

No. of Wires: 3

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-1	
0	0	88.40257	0.2917	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
55.34171	-65.95368	0		-2	
55.34171	-65.95368	92.24615	0.2188	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
110.6834	-131.9074	0		-3	
110.6834	-131.9074	92.24615	0.2188	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
0	0	0	0.2917	-1	1	1
0	0	4.420128	0.2917	1	1	2
0	0	8.840257	0.2917	1	1	3
0	0	13.26039	0.2917	1	1	4
0	0	17.68051	0.2917	1	1	5
0	0	22.10064	0.2917	1	1	6
0	0	26.52077	0.2917	1	1	7
0	0	30.9409	0.2917	1	1	8
0	0	35.36103	0.2917	1	1	9
0	0	39.78115	0.2917	1	1	10
0	0	44.20128	0.2917	1	1	11
0	0	48.62141	0.2917	1	1	12
0	0	53.04154	0.2917	1	1	13
0	0	57.46167	0.2917	1	1	14
0	0	61.88179	0.2917	1	1	15
0	0	66.30193	0.2917	1	1	16
0	0	70.72205	0.2917	1	1	17
0	0	75.14218	0.2917	1	1	18
0	0	79.56231	0.2917	1	1	19
0	0	83.98244	0.2917	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
55.34171	-65.95368	0	0.2188	-2	2	21
55.34171	-65.95368	4.612308	0.2188	2	2	22
55.34171	-65.95368	9.224615	0.2188	2	2	23
55.34171	-65.95368	13.83692	0.2188	2	2	24
55.34171	-65.95368	18.44923	0.2188	2	2	25
55.34171	-65.95368	23.06154	0.2188	2	2	26
55.34171	-65.95368	27.67385	0.2188	2	2	27
55.34171	-65.95368	32.28616	0.2188	2	2	28
55.34171	-65.95368	36.89846	0.2188	2	2	29
55.34171	-65.95368	41.51077	0.2188	2	2	30
55.34171	-65.95368	46.12308	0.2188	2	2	31
55.34171	-65.95368	50.73539	0.2188	2	2	32
55.34171	-65.95368	55.34769	0.2188	2	2	33
55.34171	-65.95368	59.96	0.2188	2	2	34
55.34171	-65.95368	64.57231	0.2188	2	2	35
55.34171	-65.95368	69.18462	0.2188	2	2	36
55.34171	-65.95368	73.79692	0.2188	2	2	37
55.34171	-65.95368	78.40923	0.2188	2	2	38
55.34171	-65.95368	83.02154	0.2188	2	2	39
55.34171	-65.95368	87.63385	0.2188	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
110.6834	-131.9074	0	0.2188	-3	3	41
110.6834	-131.9074	4.612308	0.2188	3	3	42
110.6834	-131.9074	9.224615	0.2188	3	3	43
110.6834	-131.9074	13.83692	0.2188	3	3	44
110.6834	-131.9074	18.44923	0.2188	3	3	45
110.6834	-131.9074	23.06154	0.2188	3	3	46
110.6834	-131.9074	27.67385	0.2188	3	3	47
110.6834	-131.9074	32.28616	0.2188	3	3	48
110.6834	-131.9074	36.89846	0.2188	3	3	49
110.6834	-131.9074	41.51077	0.2188	3	3	50
110.6834	-131.9074	46.12308	0.2188	3	3	51
110.6834	-131.9074	50.73539	0.2188	3	3	52
110.6834	-131.9074	55.34769	0.2188	3	3	53
110.6834	-131.9074	59.96	0.2188	3	3	54
110.6834	-131.9074	64.57231	0.2188	3	3	55
110.6834	-131.9074	69.18462	0.2188	3	3	56
110.6834	-131.9074	73.79692	0.2188	3	3	57
110.6834	-131.9074	78.40923	0.2188	3	3	58
110.6834	-131.9074	83.02154	0.2188	3	3	59
110.6834	-131.9074	87.63385	0.2188	3	0	60

Sources: 3
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 758.8, -89.4
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 1351.3, 142.7
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 560.7, 5.9

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

```
********************    SOURCE DATA     ********************
Pulse  1       Voltage = (8.3169, -758.8018j)
               Current = (0.0696, 0.0236j)
               Impedance = (-3203.317, -9810.256j)
               Power = -8.660034 Watts

Pulse  21      Voltage = (-1074.8504, 819.0352j)
               Current = (-11.9701, -9.8255j)
               Impedance = (20.093, -84.916j)
               Power = 2409.34 Watts

Pulse  41      Voltage = (557.7054, 58.0271j)
               Current = (-0.0118, 0.0795j)
               Impedance = (-301.948, -6966.741j)
               Power = -0.976144 Watts

Total Power = 2399.702 Watts

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

Wire No.  1 :
```

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	0.0696	0.0236	0.0735	18.7112
2	0.0447	0.1127	0.1212	68.3364
3	0.0284	0.1668	0.1692	80.3247
4	0.0143	0.2096	0.2101	86.0968
5	0.0016	0.2438	0.2438	89.6213
6	-0.0099	0.2707	0.2709	92.0933
7	-0.0203	0.2911	0.2918	93.9915
8	-0.0296	0.3052	0.3066	95.5458
9	-0.0378	0.3134	0.3157	96.8805
10	-0.0448	0.3159	0.3191	98.0682
11	-0.0504	0.3131	0.3171	99.1542
12	-0.0547	0.3049	0.3098	100.1678
13	-0.0574	0.2917	0.2972	101.1285
14	-0.0584	0.2735	0.2797	102.0498
15	-0.0576	0.2505	0.2571	102.9407
16	-0.0548	0.2229	0.2295	103.8076
17	-0.0498	0.1906	0.197	104.6549
18	-0.0426	0.1536	0.1594	105.486
19	-0.0326	0.1115	0.1162	106.3047
20	-0.0195	0.0634	0.0663	107.1228
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	-11.9701	-9.8255	15.4863	-140.6197
22	-11.6439	-9.4128	14.9727	-141.0481
23	-11.3591	-9.0857	14.5458	-141.3451
24	-11.0483	-8.7551	14.0967	-141.6052
25	-10.7026	-8.4095	13.6112	-141.8419
26	-10.319	-8.0443	13.084	-142.0614
27	-9.8964	-7.6578	12.5132	-142.2675
28	-9.4347	-7.2494	11.8982	-142.4624
29	-8.9345	-6.8191	11.2395	-142.6479
30	-8.3966	-6.3675	10.5379	-142.8253
31	-7.822	-5.8952	9.7947	-142.9956
32	-7.2118	-5.403	9.0112	-143.1598
33	-6.5672	-4.8917	8.1889	-143.3185
34	-5.8894	-4.3623	7.329	-143.4724
35	-5.1791	-3.8153	6.4327	-143.6222
36	-4.4369	-3.2511	5.5006	-143.7683
37	-3.6624	-2.6695	4.532	-143.9113
38	-2.8532	-2.0691	3.5245	-144.0517
39	-2.0033	-1.4454	2.4703	-144.1903
40	-1.0955	-0.7864	1.3485	-144.3289
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	-0.0118	0.0795	0.0804	98.4218
42	-0.0335	0.1646	0.168	101.5023
43	-0.0481	0.2185	0.2237	102.4027
44	-0.0604	0.2609	0.2678	103.0251
45	-0.071	0.2946	0.303	103.5589
46	-0.0803	0.3206	0.3305	104.0624
47	-0.0882	0.3397	0.351	104.5594
48	-0.0948	0.3522	0.3648	105.0609
49	-0.0999	0.3585	0.3722	105.5723
50	-0.1035	0.3587	0.3734	106.096
51	-0.1055	0.3532	0.3686	106.633
52	-0.1058	0.3421	0.358	107.183
53	-0.1042	0.3255	0.3418	107.7453
54	-0.1006	0.3038	0.32	108.3185
55	-0.0948	0.277	0.2928	108.9009
56	-0.0868	0.2453	0.2602	109.4906
57	-0.0763	0.2087	0.2222	110.0857
58	-0.0632	0.1673	0.1788	110.6844
59	-0.047	0.1206	0.1294	111.2856
60	-0.0272	0.0676	0.0729	111.8935
E	0.0	0.0	0.0	0.0

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

Twr.	Ratio	Phase
1	1.000	0.0
2	210.607	-159.3
3	1.094	79.7

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = kgab-2.cir

I	1.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	1.5000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
R	20.0930	3	0	-84.9160	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .650

NODE	VOLT MAG	VOLT PHASE
1	78.6182	-75.4375
2	78.3728	-76.1451
3	84.3334	-77.1418

				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	19.77	-76.09	18.77	-76.09
L	2-	3	1.500	6.13	90.000	1.00	.000	18.77	-76.09	18.77	-82.22
C	3-	0	.000	84.33	-77.142	.03	12.858	.00	-2448.54	.00	.00
R	3-	0	20.093	84.33	-77.142	.97	-.454	20.09	-84.92	.00	.00

****
ACSModel
(MININEC 3.1 Core)
01-21-2010 17:41:11
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kgab

Frequency = 0.650 MHz Wavelength = 461.23079 Meters

No. of Wires: 3

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-1	
0	0	88.40257	0.2917	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
55.34171	-65.95368	0		-2	
55.34171	-65.95368	92.24615	0.2188	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
110.6834	-131.9074	0		-3	
110.6834	-131.9074	92.24615	0.2188	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
0	0	0	0.2917	-1	1	1
0	0	4.420128	0.2917	1	1	2
0	0	8.840257	0.2917	1	1	3
0	0	13.26039	0.2917	1	1	4
0	0	17.68051	0.2917	1	1	5
0	0	22.10064	0.2917	1	1	6
0	0	26.52077	0.2917	1	1	7
0	0	30.9409	0.2917	1	1	8
0	0	35.36103	0.2917	1	1	9
0	0	39.78115	0.2917	1	1	10
0	0	44.20128	0.2917	1	1	11
0	0	48.62141	0.2917	1	1	12
0	0	53.04154	0.2917	1	1	13
0	0	57.46167	0.2917	1	1	14
0	0	61.88179	0.2917	1	1	15
0	0	66.30193	0.2917	1	1	16
0	0	70.72205	0.2917	1	1	17
0	0	75.14218	0.2917	1	1	18
0	0	79.56231	0.2917	1	1	19
0	0	83.98244	0.2917	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
55.34171	-65.95368	0	0.2188	-2	2	21
55.34171	-65.95368	4.612308	0.2188	2	2	22
55.34171	-65.95368	9.224615	0.2188	2	2	23
55.34171	-65.95368	13.83692	0.2188	2	2	24
55.34171	-65.95368	18.44923	0.2188	2	2	25
55.34171	-65.95368	23.06154	0.2188	2	2	26
55.34171	-65.95368	27.67385	0.2188	2	2	27
55.34171	-65.95368	32.28616	0.2188	2	2	28
55.34171	-65.95368	36.89846	0.2188	2	2	29
55.34171	-65.95368	41.51077	0.2188	2	2	30
55.34171	-65.95368	46.12308	0.2188	2	2	31
55.34171	-65.95368	50.73539	0.2188	2	2	32
55.34171	-65.95368	55.34769	0.2188	2	2	33
55.34171	-65.95368	59.96	0.2188	2	2	34
55.34171	-65.95368	64.57231	0.2188	2	2	35
55.34171	-65.95368	69.18462	0.2188	2	2	36
55.34171	-65.95368	73.79692	0.2188	2	2	37
55.34171	-65.95368	78.40923	0.2188	2	2	38
55.34171	-65.95368	83.02154	0.2188	2	2	39
55.34171	-65.95368	87.63385	0.2188	2	0	40
Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
110.6834	-131.9074	0	0.2188	-3	3	41
110.6834	-131.9074	4.612308	0.2188	3	3	42
110.6834	-131.9074	9.224615	0.2188	3	3	43
110.6834	-131.9074	13.83692	0.2188	3	3	44
110.6834	-131.9074	18.44923	0.2188	3	3	45
110.6834	-131.9074	23.06154	0.2188	3	3	46
110.6834	-131.9074	27.67385	0.2188	3	3	47
110.6834	-131.9074	32.28616	0.2188	3	3	48
110.6834	-131.9074	36.89846	0.2188	3	3	49
110.6834	-131.9074	41.51077	0.2188	3	3	50
110.6834	-131.9074	46.12308	0.2188	3	3	51
110.6834	-131.9074	50.73539	0.2188	3	3	52
110.6834	-131.9074	55.34769	0.2188	3	3	53
110.6834	-131.9074	59.96	0.2188	3	3	54
110.6834	-131.9074	64.57231	0.2188	3	3	55
110.6834	-131.9074	69.18462	0.2188	3	3	56
110.6834	-131.9074	73.79692	0.2188	3	3	57
110.6834	-131.9074	78.40923	0.2188	3	3	58
110.6834	-131.9074	83.02154	0.2188	3	3	59
110.6834	-131.9074	87.63385	0.2188	3	0	60

Sources: 3
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 758.8, -89.4
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 1351.3, 142.7
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 560.7, 5.9

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

```
********************    SOURCE DATA     ********************
Pulse  1       Voltage = (8.3169, -758.8018j)
               Current = (0.0758, -0.0062j)
               Impedance = (918.813, -9941.73j)
               Power = 2.65 Watts

Pulse  21      Voltage = (-1074.8504, 819.0352j)
               Current = (-0.0727, -0.1122j)
               Impedance = (-769.144, -10080.034j)
               Power = -6.871667 Watts

Pulse  41      Voltage = (557.7054, 58.0271j)
               Current = (0.8374, 6.4196j)
               Impedance = (20.03, -84.263j)
               Power = 419.75 Watts

Total Power = 415.536 Watts

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

Wire No.  1 :
```

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	0.0758	-0.0062	0.076	-4.6523
2	0.0751	-0.0336	0.0822	-24.1155
3	0.0742	-0.0504	0.0897	-34.2074
4	0.0729	-0.0638	0.0969	-41.1988
5	0.0713	-0.0747	0.1033	-46.3315
6	0.0693	-0.0834	0.1085	-50.2603
7	0.067	-0.0901	0.1123	-53.3649
8	0.0644	-0.095	0.1148	-55.8815
9	0.0614	-0.0981	0.1157	-57.9651
10	0.0581	-0.0995	0.1152	-59.7209
11	0.0544	-0.0991	0.1131	-61.2232
12	0.0505	-0.0971	0.1094	-62.5256
13	0.0462	-0.0934	0.1042	-63.6678
14	0.0417	-0.0881	0.0975	-64.6799
15	0.0369	-0.0812	0.0892	-65.585
16	0.0318	-0.0727	0.0793	-66.4015
17	0.0264	-0.0625	0.0679	-67.1441
18	0.0207	-0.0507	0.0548	-67.8251
19	0.0146	-0.0371	0.0398	-68.4555
20	0.0081	-0.0212	0.0227	-69.0509
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	-0.0727	-0.1122	0.1337	-122.9439
22	-0.0393	-0.1286	0.1345	-107.0094
23	-0.0173	-0.1382	0.1393	-97.154
24	0.0009	-0.1448	0.1448	-89.6248
25	0.0166	-0.1491	0.15	-83.6596
26	0.0299	-0.1511	0.1541	-78.804
27	0.0412	-0.1513	0.1568	-74.7584
28	0.0506	-0.1495	0.1578	-71.3161
29	0.058	-0.1461	0.1572	-68.3309
30	0.0636	-0.1409	0.1546	-65.6973
31	0.0674	-0.1343	0.1503	-63.3381
32	0.0694	-0.1262	0.1441	-61.1959
33	0.0696	-0.1168	0.136	-59.2277
34	0.0679	-0.1062	0.1261	-57.4007
35	0.0645	-0.0945	0.1144	-55.6896
36	0.0592	-0.0817	0.1009	-54.0751
37	0.0521	-0.0679	0.0856	-52.5418
38	0.043	-0.0532	0.0684	-51.0772
39	0.0319	-0.0376	0.0493	-49.6694
40	0.0184	-0.0206	0.0276	-48.2974
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	0.8374	6.4196	6.474	82.5684
42	0.856	6.202	6.2608	82.1415
43	0.8629	6.0218	6.0833	81.8456
44	0.8627	5.8329	5.8963	81.5866
45	0.8563	5.6293	5.694	81.3511
46	0.8438	5.4087	5.4742	81.1326
47	0.8256	5.1704	5.2359	80.9277
48	0.8017	4.9141	4.9791	80.734
49	0.7723	4.6401	4.7039	80.5497
50	0.7376	4.3486	4.4107	80.3736
51	0.6975	4.0403	4.1	80.2046
52	0.6524	3.7155	3.7724	80.0418
53	0.6021	3.3751	3.4284	79.8845
54	0.547	3.0195	3.0687	79.732
55	0.487	2.6492	2.6936	79.5839
56	0.4222	2.2644	2.3034	79.4394
57	0.3525	1.865	1.898	79.2982
58	0.2776	1.4498	1.4761	79.1596
59	0.197	1.0158	1.0347	79.0229
60	0.1089	0.5543	0.5649	78.8863
E	0.0	0.0	0.0	0.0

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

Twr.	Ratio	Phase
1	1.000	0.0
2	1.759	-118.3
3	85.178	87.2

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = kgab-3.cir

I	1.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	1.5000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
R	20.0300	3	0	-84.2630	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .650

NODE	VOLT MAG	VOLT PHASE
1	78.5801	-75.2774
2	78.3319	-75.9848
3	84.2887	-76.9934

				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	19.97	-76.00	18.97	-76.00
L	2-	3	1.500	6.13	90.000	1.00	.000	18.97	-76.00	18.97	-82.13
C	3-	0	.000	84.29	-76.993	.03	13.007	.00	-3060.67	.00	.00
R	3-	0	20.030	84.29	-76.993	.97	-.365	20.03	-84.26	.00	.00

Derivation of Operating Parameters for Nighttime Directional Antenna

Once calibrated against the measured individual open-circuited base impedances, the moment method model was utilized for nighttime 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 KHNC towers are base sampled, which is permitted for towers of 120 electrical degrees or less. As such, the first (ground) segment of each tower was used to determine the model operating parameters of the array.

A circuit model was constructed to determine the effect of the series feed inductance, and shunt static drain choke reactance on the ATU output current. The static drain chokes are 630 microhenry and the circuit model for each tower is essentially the circuit model used for model verification above with the inductance of the static drain 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 nighttime array.

Twr	Node	Current Magnitude (amperes)	Current Magnitude Ratio	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	5.3905	0.554	132.1	1.076	+0.07	0.578	+131.2
2	21	9.7355	1.00 Ref	0.9	1.032	+0.24	1.000	0.0
3	41	4.7882	0.492	-132.0	1.019	+0.07	0.486	-133.2

****
ACSModel
(MININEC 3.1 Core)
01-21-2010 20:14:51
****

KGAB Directional nighttime ALL Towers driven

Frequency = 0.650 MHz Wavelength = 461.23079 Meters

No. of Wires: 3

Wire No. 1 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
0	0	0		-1	
0	0	88.40257	0.2917	0	20

Wire No. 2 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
55.34171	-65.95368	0		-2	
55.34171	-65.95368	92.24615	0.2188	0	20

Wire No. 3 Coordinates X	Y	Z	Radius	End Connection	No. of Segments
110.6834	-131.9074	0		-3	
110.6834	-131.9074	92.24615	0.2188	0	20

**** ANTENNA GEOMETRY ****

Wire No. 1 Coordinates X	Y	Z	Radius	Connection End1	End2	Pulse No.
0	0	0	0.2917	-1	1	1
0	0	4.420128	0.2917	1	1	2
0	0	8.840257	0.2917	1	1	3
0	0	13.26039	0.2917	1	1	4
0	0	17.68051	0.2917	1	1	5
0	0	22.10064	0.2917	1	1	6
0	0	26.52077	0.2917	1	1	7
0	0	30.9409	0.2917	1	1	8
0	0	35.36103	0.2917	1	1	9
0	0	39.78115	0.2917	1	1	10
0	0	44.20128	0.2917	1	1	11
0	0	48.62141	0.2917	1	1	12
0	0	53.04154	0.2917	1	1	13
0	0	57.46167	0.2917	1	1	14
0	0	61.88179	0.2917	1	1	15
0	0	66.30193	0.2917	1	1	16
0	0	70.72205	0.2917	1	1	17
0	0	75.14218	0.2917	1	1	18
0	0	79.56231	0.2917	1	1	19
0	0	83.98244	0.2917	1	0	20

Wire No. 2 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
55.34171	-65.95368	0	0.2188	-2	2	21
55.34171	-65.95368	4.612308	0.2188	2	2	22
55.34171	-65.95368	9.224615	0.2188	2	2	23
55.34171	-65.95368	13.83692	0.2188	2	2	24
55.34171	-65.95368	18.44923	0.2188	2	2	25
55.34171	-65.95368	23.06154	0.2188	2	2	26
55.34171	-65.95368	27.67385	0.2188	2	2	27
55.34171	-65.95368	32.28616	0.2188	2	2	28
55.34171	-65.95368	36.89846	0.2188	2	2	29
55.34171	-65.95368	41.51077	0.2188	2	2	30
55.34171	-65.95368	46.12308	0.2188	2	2	31
55.34171	-65.95368	50.73539	0.2188	2	2	32
55.34171	-65.95368	55.34769	0.2188	2	2	33
55.34171	-65.95368	59.96	0.2188	2	2	34
55.34171	-65.95368	64.57231	0.2188	2	2	35
55.34171	-65.95368	69.18462	0.2188	2	2	36
55.34171	-65.95368	73.79692	0.2188	2	2	37
55.34171	-65.95368	78.40923	0.2188	2	2	38
55.34171	-65.95368	83.02154	0.2188	2	2	39
55.34171	-65.95368	87.63385	0.2188	2	0	40

Wire No. 3 Coordinates				Connection		Pulse
X	Y	Z	Radius	End1	End2	No.
110.6834	-131.9074	0	0.2188	-3	3	41
110.6834	-131.9074	4.612308	0.2188	3	3	42
110.6834	-131.9074	9.224615	0.2188	3	3	43
110.6834	-131.9074	13.83692	0.2188	3	3	44
110.6834	-131.9074	18.44923	0.2188	3	3	45
110.6834	-131.9074	23.06154	0.2188	3	3	46
110.6834	-131.9074	27.67385	0.2188	3	3	47
110.6834	-131.9074	32.28616	0.2188	3	3	48
110.6834	-131.9074	36.89846	0.2188	3	3	49
110.6834	-131.9074	41.51077	0.2188	3	3	50
110.6834	-131.9074	46.12308	0.2188	3	3	51
110.6834	-131.9074	50.73539	0.2188	3	3	52
110.6834	-131.9074	55.34769	0.2188	3	3	53
110.6834	-131.9074	59.96	0.2188	3	3	54
110.6834	-131.9074	64.57231	0.2188	3	3	55
110.6834	-131.9074	69.18462	0.2188	3	3	56
110.6834	-131.9074	73.79692	0.2188	3	3	57
110.6834	-131.9074	78.40923	0.2188	3	3	58
110.6834	-131.9074	83.02154	0.2188	3	3	59
110.6834	-131.9074	87.63385	0.2188	3	0	60

Sources: 3
Pulse No., Voltage Magnitude, Phase (Degrees): 1, 555.8, 43.1
Pulse No., Voltage Magnitude, Phase (Degrees): 21, 782.4, -81.6
Pulse No., Voltage Magnitude, Phase (Degrees): 41, 261.2, 135.9

Number of Loads: 0

```
********************    SOURCE DATA     ********************
Pulse  1       Voltage = (406.0396, 379.6024j)
               Current = (-3.6141, 3.9995j)
               Impedance = (1.747, -103.101j)
               Power = 25.38 Watts

Pulse  21      Voltage = (114.4814, -774.01j)
               Current = (9.7343, 0.1544j)
               Impedance = (10.497, -79.68j)
               Power = 497.46 Watts

Pulse  41      Voltage = (-187.546, 181.746j)
               Current = (-3.2043, -3.5579j)
               Impedance = (-1.992, -54.507j)
               Power = -22.838527 Watts

Total Power = 500.000 Watts
 ********************    CURRENT DATA     ********************
 Wire No.  1 :
```

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
1	-3.6141	3.9995	5.3905	132.1019
2	-3.4555	3.8297	5.1582	132.0593
3	-3.3352	3.7007	4.9818	132.0267
4	-3.2141	3.5704	4.804	131.9939
5	-3.0877	3.4341	4.6181	131.9596
6	-2.9541	3.2897	4.4214	131.9229
7	-2.8127	3.1366	4.213	131.8835
8	-2.6632	2.9743	3.9924	131.8412
9	-2.5056	2.8028	3.7595	131.7957
10	-2.3402	2.6222	3.5146	131.747
11	-2.1671	2.4327	3.258	131.695
12	-1.9867	2.2346	2.99	131.6397
13	-1.7994	2.028	2.7112	131.5809
14	-1.6054	1.8133	2.4218	131.5189
15	-1.405	1.5906	2.1223	131.4536
16	-1.1983	1.36	1.8126	131.3851
17	-0.9854	1.1211	1.4926	131.3135
18	-0.7654	0.8731	1.1611	131.2387
19	-0.5368	0.614	0.8156	131.1606
20	-0.2949	0.3383	0.4488	131.0782
E	0.0	0.0	0.0	0.0

Wire No. 2 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
21	9.7343	0.1544	9.7355	0.9085
22	9.4299	0.1128	9.4306	0.6852
23	9.1729	0.085	9.1733	0.5311
24	8.8991	0.0616	8.8993	0.3967
25	8.6004	0.0412	8.6005	0.2748
26	8.2737	0.0234	8.2737	0.1621
27	7.918	0.0078	7.918	0.0568
28	7.5332	-0.0056	7.5332	-0.0426
29	7.1196	-0.017	7.1196	-0.1368
30	6.6779	-0.0264	6.6779	-0.2267
31	6.209	-0.0339	6.2091	-0.3128
32	5.7138	-0.0395	5.714	-0.3956
33	5.1935	-0.0431	5.1936	-0.4755
34	4.6488	-0.0449	4.649	-0.5528
35	4.0807	-0.0447	4.0809	-0.628
36	3.4895	-0.0427	3.4898	-0.7012
37	2.8751	-0.0388	2.8754	-0.7729
38	2.2358	-0.0329	2.2361	-0.8433
39	1.567	-0.025	1.5672	-0.9128
40	0.8553	-0.0147	0.8554	-0.9824
E	0.0	0.0	0.0	0.0

Wire No. 3 :

Pulse No.	Real (Amps)	Imaginary (Amps)	Magnitude (Amps)	Phase (Degrees)
41	-3.2043	-3.5579	4.7882	-132.0069
42	-3.1303	-3.481	4.6815	-131.9631
43	-3.0622	-3.4093	4.5826	-131.9292
44	-2.985	-3.3274	4.4701	-131.8954
45	-2.8969	-3.2331	4.3411	-131.8605
46	-2.7973	-3.126	4.1948	-131.8236
47	-2.686	-3.0058	4.031	-131.7844
48	-2.5632	-2.8725	3.8498	-131.7426
49	-2.429	-2.7264	3.6515	-131.6983
50	-2.2839	-2.5678	3.4365	-131.6511
51	-2.1282	-2.397	3.2054	-131.6013
52	-1.9624	-2.2143	2.9587	-131.5487
53	-1.7869	-2.0201	2.697	-131.4934
54	-1.602	-1.8149	2.4208	-131.4356
55	-1.4083	-1.5987	2.1305	-131.3754
56	-1.2058	-1.3719	1.8265	-131.3128
57	-0.9946	-1.1342	1.5085	-131.248
58	-0.7742	-0.885	1.1759	-131.1812
59	-0.5431	-0.6223	0.826	-131.1124
60	-0.2967	-0.3408	0.4519	-131.0408
E	0.0	0.0	0.0	0.0

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

Twr.	Ratio	Phase
1	0.554	131.2
2	1.000	0.0
3	0.492	-132.9

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = kgab-1n.cir

I	5.7960	0	1	132.1700	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	7.0000	2	3	.0000	.0000	.0000
C	.0002	3	0	.0000	.0000	.0000
R	1.7470	3	0	-103.1010	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .650

NODE	VOLT MAG	VOLT PHASE
1	390.0553	44.3071
2	389.8822	43.4559
3	555.5518	43.0724

				BRANCH VOLTAGE		BRANCH CURRENT		FROM NODE IMPEDANCE		TO NODE IMPEDANCE	
				MAG	PHASE	MAG	PHASE	RESISTANCE	REACTANCE	RESISTANCE	REACTANCE
R	1-	2	1.000	5.80	132.170	5.80	132.170	2.51	-67.25	1.51	-67.25
L	2-	3	7.000	165.70	-137.830	5.80	132.170	1.51	-67.25	1.51	-95.84
C	3-	0	.000	555.55	43.072	.41	133.072	.00	-1360.30	.00	.00
R	3-	0	1.747	555.55	43.072	5.39	132.102	1.75	-103.10	.00	.00

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = kgab-2n.cir

I	9.7550	0	1	.9195	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	1.5000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
R	10.4970	3	0	-79.6800	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .650

NODE	VOLT MAG	VOLT PHASE
1	701.4445	-80.4055
2	700.0396	-81.1948
3	759.2790	-81.8135

				BRANCH VOLTAGE		BRANCH CURRENT		FROM NODE IMPEDANCE		TO NODE IMPEDANCE	
				MAG	PHASE	MAG	PHASE	RESISTANCE	REACTANCE	RESISTANCE	REACTANCE
VSWR											
R	1-	2	1.000	9.75	.920	9.75	.920	10.85	-71.08	9.85	-71.08
L	2-	3	1.500	59.76	90.919	9.76	.919	9.85	-71.08	9.85	-77.21
C	3-	0	.000	759.28	-81.813	.31	8.187	.00	-2448.54	.00	.00
R	3-	0	10.497	759.28	-81.813	9.45	.682	10.50	-79.68	.00	.00

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = kgab-3n.cir

I	4.7882	0	1	-132.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	1.5000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
R	-1.9920	3	0	-54.5070	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .650

NODE	VOLT MAG	VOLT PHASE
1	227.1397	136.8852
2	227.2832	135.6783
3	256.5950	135.9436

				BRANCH VOLTAGE		BRANCH CURRENT		FROM NODE IMPEDANCE		TO NODE IMPEDANCE	
				MAG	PHASE	MAG	PHASE	RESISTANCE	REACTANCE	RESISTANCE	REACTANCE
VSWR											
R	1-	2	1.000	4.79	-132.000	4.79	-132.000	-.92	-47.43	-1.92	-47.43
L	2-	3	1.500	29.33	-42.000	4.79	-132.000	-1.92	-47.43	-1.92	-53.55
C	3-	0	.000	256.59	135.944	.08	-134.056	.00	-3060.67	.00	.00
R	3-	0	-1.992	256.59	135.944	4.70	-131.963	-1.99	-54.51	.00	.00

Sampling System

The sampling system consists of three identical Delta Electronics 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 AM19 Type 204. The monitor calibration was verified using the internal calibrator according to the operating manual.

Impedance measurements were made of the antenna sampling system using an AIM 4170 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 90 degree Resonance Below 650 kHz (kHz)	Sample Line Open-Circuited 270 degree Resonance Above 650 kHz (kHz)	Sample Line Calculated Electrical Length At 650 kHz (deg.)
1	286.2	867.2	202.4
2	285.6	865.9	202.7
3	286.2	866.1	202.6

Because the electrical lengths were found to have a maximum variation between lines of 0.3 electrical degrees, 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	1010	6.8 +j51.2	722	5.7 –j50.5	51.2
2	1010	7.1 +j51.8	722	5.7 –j49.8	51.2
3	1010	7.0 +j52.5	722	5.4 –j48.8	51.0

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

The calibration of the Delta 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 to the adjacent transformer (spacing of less than two inches). Short transmission lines of equal length were connected between the outputs of the current transformers and the inputs of the antenna monitor. The Potomac AM19 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	2002	1.010	0.0
2	1526	Ref.	Ref.
3	1636	1.000	+0.5

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 at the operating frequency with the sample current transformers attached. These impedances are tabulated below:

Twr.	R (ohms)	X (ohms)
1	52.7	+j1.9
2	52.8	+j1.9
3	52.6	+j1.4

Direct Measurement of Power

Common point impedance measurements were made using a Delta OIB-1 bridge installed in the j-plug adjacent to the common point ammeter on 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.

KGAB Field Intensity Measurments

650 KHZ, 500 watts Night, Directional. 8500 watts ND Day

All measuremnts made on Potomac Fim-41. Serial Number # 2115
This unit was calibrated 10-2-07

Radial Bearing	Distance	Location Coordinants		Measurment	Notes
310 degrees. Main Lob	.5 mi/.805km	41*-03'-20" N	104*-50'-24" W	450 mV	Open Field N of hwy223
310 degrees. Main Lob	2.04 mi/3.28km	41*-04'-40" N	104*-51'-45" W	108 mV	North Bound shoulder I-25
310 degrees. Main Lob	2.33 mi/3.75km	41*-04'-29" N	104*-52'-00" W	90 mV	in field West of I-25
73 Degrees. Null	.67 mi/1.08km	41*-03'-21" N	104*-49'-13" W	3.2 mV	new Subdivision East of KGAB
73 Degrees. Null	1.0 mi/1.61km	41*-03'-25" N	104*-48'-51" W	1.8 mV	new Subdivision East of KGAB
73 Degrees. Null	1.91 mi/3.07km	41*-03'-40" N	104*-47'-50" W	2.1 mV	East shoulder of Highway223
103 Degrees. Null	2.57 mi/4.14km	41*-02'-39" N	104*-47'-05" W	1.3 mV	South Shoulder of CR203
103 Degrees. Null	3.42 mi/5.50km	41*-02'-31" N	104*-46'-07" W	.88 mV	On unnamed Gravel road
103 Degrees. Null	5.63 mi/9.06km	41*-02'-03" N	104*-43'-39" W	.48 mV	On unnamed Gravel road
157 Degrees. Null	.52 mi/0.84km	41*-02'-46" N	104*-49'-44" W	45 mV	On Terry Ranch pasture trail
157 Degrees. Null	.75 mi/1.21km	41*-02'-35" N	104*-49'-38" W	25 mV	Walk from Terry Ranch access trail
157 Degrees. Null	6.04 mi/9.72	40*-58'-20" N	104*-47'-16" W	.8 mV	East shoulder of US85 2 mi South of Wyoming border
187 Degrees. Null	.8 mi/1.29km	41*-02'-29" N	104*-50'-04" W	90 mV	On Terry Ranch pasture trail
187 Degrees. Null	1.3 mi/2.09km	41*-02'-03" N	104*-50'-08" W	41 mV	On Terry Ranch pasture trail
187 Degrees. Null	1.8 mi/2.90km	41*-01'-37" N	104*-50'-12" W	25 mV	On Terry Ranch pasture trail

Measurements were made between 10 am to 4 pm from August 3rd through the 6th, 2010.
All measurments were conducted by Jim Mross.