

READ INSTRUCTIONS CAREFULLY
BEFORE PROCEEDING

FEDERAL COMMUNICATIONS COMMISSION
REMITTANCE ADVICE

100104908989001
DUPLICATE

Approved by OMB
3060-0589

Page 1 of 1

(1) LOCK BOX #
979089

60293

SPECIAL USE ONLY
FCC USE ONLY

SECTION A - PAYER INFORMATION

(2) PAYER NAME (if paying by credit card enter name exactly as it appears on the card)
Jerrold D Miller
(3) TOTAL AMOUNT PAID (U.S. Dollars and cents)
\$1,320.00
(4) STREET ADDRESS LINE NO. 1
3005 S. Leisure World Blvd.
(5) STREET ADDRESS LINE NO. 2
(6) CITY
Silver Spring
(7) STATE
MD
(8) ZIP CODE
20906
(9) DAYTIME TELEPHONE NUMBER (include area code)
301-986-4160
(10) COUNTRY CODE (if not in U.S.A.)

FCC REGISTRATION NUMBER (FRN) REQUIRED

(11) PAYER (FRN)
0008190472
(12) FCC USE ONLY

IF MORE THAN ONE APPLICANT, USE CONTINUATION SHEETS (FORM 159-C)
COMPLETE SECTION BELOW FOR EACH SERVICE. IF MORE BOXES ARE NEEDED, USE CONTINUATION SHEET

(13) APPLICANT NAME
Krol Communications Inc.
(14) STREET ADDRESS LINE NO. 1
103 North Washington St.
(15) STREET ADDRESS LINE NO. 2

(16) CITY
Owosso
(17) STATE
MI
(18) ZIP CODE
48867
(19) DAYTIME TELEPHONE NUMBER (include area code)
989-725-1925
(20) COUNTRY CODE (if not in U.S.A.)

FCC REGISTRATION NUMBER (FRN) REQUIRED

(21) APPLICANT (FRN)
0014509764
(22) FCC USE ONLY

COMPLETE SECTION C FOR EACH SERVICE. IF MORE BOXES ARE NEEDED, USE CONTINUATION SHEET

(23A) CALL SIGN/OTHER ID
WMLM
(24A) PAYMENT TYPE CODE
MMR
(25A) QUANTITY
1
(26A) FEE DUE FOR (PTC)
\$615.00
(27A) TOTAL FEE
\$615.00
(28A) FCC CODE 1
60293
(29A) FCC CODE 2

(23B) CALL SIGN/OTHER ID
WMLM
(24B) PAYMENT TYPE CODE
MOR
(25B) QUANTITY
1
(26B) FEE DUE FOR (PTC)
\$705.00
(27B) TOTAL FEE
\$705.00
(28B) FCC CODE 1
60293
(29B) FCC CODE 2

SECTION D - CERTIFICATION

I certify that the foregoing and supporting information is true and correct to

PAID BY CREDIT CARD

SIGNATURE

SEE PUBLIC BURDEN ON REVERSE

FCC FORM 159



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. *Bmmk-20100106AGL*

SECTION I - APPLICANT FEE INFORMATION

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

Krol Communications Inc.

MAILING ADDRESS (Line 1) (Maximum 35 characters)
103 North Washington St.

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY
Owosso

STATE OR COUNTRY (if foreign address)
MI

ZIP CODE
48867

TELEPHONE NUMBER (include area code)
989-725-1925

CALL LETTERS
WMLM

OTHER FCC IDENTIFIER (if applicable)
FAC ID 60293

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 1.1112).

☐ 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		
M	M	R

(B) FEE MULTIPLE			
0	0	0	1

(C) FEE DUE FOR FEE TYPE CODE IN COLUMN (A)
\$615.00

FOR FCC USE ONLY

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

(A)		
M	O	R

(B)			
0	0	0	1

(C)
\$705.00

FOR FCC USE ONLY

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

TOTAL AMOUNT REMITTED WITH THIS APPLICATION
\$1,320.00

FOR FCC USE ONLY



SECTION II - APPLICANT INFORMATION

1. NAME OF APPLICANT Krol Communications Inc.			0014-5097-64		
MAILING ADDRESS 103 North Washington St.					
CITY Owosso			STATE MI		ZIP CODE 48867

2. This application is for: **MOMENT METHOD MODELING**

- ☒ Commercial
 ☐ Noncommercial
☒ AM Directional
 ☐ AM Non-Directional

Call letters WMLM	Community of License St. Louis, MI	Construction Permit File No. n/a	Modification of Construction Permit File No(s).	Expiration Date of Last Construction Permit
----------------------	---------------------------------------	-------------------------------------	--	--

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

☐ Yes ☐ No

If No, explain in an Exhibit.

Exhibit No.

4. Have all the terms, conditions, and obligations set forth in the above described construction permit been fully met? N/A

☐ Yes ☐ No

If No, state exceptions in an Exhibit.

Exhibit No.

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

N/A

If Yes, explain in an Exhibit.

Exhibit No.

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

☐ Yes ☐ No

If No, explain in an Exhibit.

☒ Does not apply

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 <i>ROD KROL</i>	Signature <i>[Signature]</i>	
Title <i>PRESIDENT</i>	Date <i>1-5-10</i>	Telephone Number <i>989-725-1925</i>

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 (3050-0627), 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. 93-573, DECEMBER 31, 1974, 50 U.S.C. 3616(a)(4), 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

KROL COMMUNICATIONS, INC.

PURPOSE OF AUTHORIZATION APPLIED FOR. (check one)



MOMENT METHOD

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	
WMLM	N/A	1520	UNLIMITED	Night 1.0	Day 1.0

2. Station location

State MICHIGAN	City or Town ST. LOUIS
--------------------------	----------------------------------

3. Transmitter location

State MI	County GRATIOT	City or Town ALMA	Street address (or other identification) 4170 STATE ROAD
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4. Main studio location

State MI	County GRATIOT	City or Town ALMA	Street address (or other identification) 4170 STATE ROAD
--------------------	--------------------------	-----------------------------	--

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

State N/A	County	City or Town	Street address (or other identification)
---------------------	--------	--------------	--

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.
See Statement

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system 4.65	RF common point or antenna current (in amperes) without modulation for day system 4.65
Measured antenna or common point resistance (in ohms) at operating frequency Night 50 Day 50	Measured antenna or common point reactance (in ohms) at operating frequency Night +j0 Day +j0

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	115.4	0.0	0.581	1.000	---	---
2	0.0	-75.6	1.000	0.723	---	---
3	-105.9	---	0.470	---	---	---
4	118.8	3.0	0.607	0.877	---	---
5	5.8	-68.1	0.947	0.643	---	---
6	-102.1	---	0.352	---	---	---

Manufacturer and type of antenna monitor:

POTOMAC INSTRUMENTS AM-19 (204)



SECTION III - Page 2

9. Description of antenna system (If 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 the loaded or sectionized describe fully in an Exhibit
Uniform Cross section guyed steel towers	60.27	60.88	60.88	Exhibit No. N/A

Excitation: ☒ Series ☐ Shunt

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

North Latitude	43	°	21	'	08	"	West Longitude	084	°	36	'	15	"
----------------	----	---	----	---	----	---	----------------	-----	---	----	---	----	---

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. N/A

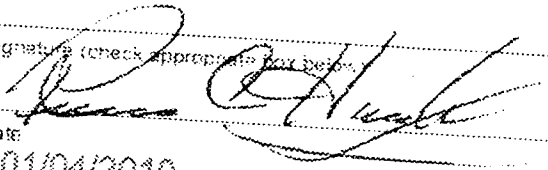
10. In what respect, if any, does the apparatus constructed differ from that described in the application for construction permit or in the permit?

See attached statement

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

N/A

I certify that I represent the applicant in the capacity indicated below and that I have examined the foregoing statement of technical information and that it is true to the best of my knowledge and belief.

Name (Please Print or Type) Russell C. Harbaugh, Jr.	Signature (check appropriate box below) 
Address (include ZIP Code) Media Control, Incorporated 27451 Everett Street Southfield, MI 48076	Date 01/04/2010
	Telephone No. (include Area Code) 248-557-7274

☐ Technical Director

☒ Registered Professional Engineer

☐ Chief Operator

☐ Technical Consultant

☐ Other (specify):



MEDIA CONTROL, INCORPORATED
COMMUNICATIONS ENGINEERING SERVICES

APPLICATION FOR
~~**DIRECT MEASUREMENT OF POWER**~~
MOMENT METHOD
RADIO STATION WMLM-AM
ST. LOUIS, MICHIGAN

December 29, 2009

WMLM-AM 1520 KHZ 1KW DA-2



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PAGE 13	NIGHTTIME ARRAY SUMMARY SHEET
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**APPLICATION FOR
DIRECT MEASUREMENT OF POWER
RADIO STATION WMLM-AM
ST. LOUIS, MICHIGAN**

WMLM-AM 1520 KHZ 1KW DA-2

PROJECT OVERVIEW

BACKGROUND

The following statements and exhibits are presented in support of an application for Direct Measurement of Power for the directional antenna system (DA-D and DA-N) for radio station WMLM-AM, 1520 kHz, St. Louis, Michigan. WMLM-AM is requesting operation under the latest method of moment rules for AM stations.

WMLM-AM OPERATIONS

WMLM-AM is licensed to operate on 1520 kHz with 1.0 kW into a daytime four (4) directional antenna array and nighttime six (6) tower directional antenna array. The daytime array uses four (4) towers of the nighttime array with two (2) towers detuned. No changes were made to the towers, transmission lines and ground system. The components in the daytime and nighttime phasors and antenna tuning units were checked for their specified values and all connections tightened.

All six (6) are uniform cross section steel towers are guyed and series excited. All six (6) towers are 60.27 meters above base insulator and 60.88 meters above ground level. Each tower is surrounded by 120-162 equally spaced copper wire radials. Intersecting radials are shortened and bonded to copper straps midway between elements.

The daytime and nighttime directional antenna parameters are presented to demonstrate compliance with the requirements of Section 73.151 (c) of the FCC Rules. As required in the Rules, the daytime and nighttime antenna monitor parameters were adjusted to within +/- 5 percent in ratio and +/- 3 degrees in phase, when referenced to the modeled parameters.

METHOD OF MOMENTS MODELING

The operating parameters for the daytime and nighttime patterns have been determined in accordance with the requirements of Section 73.151 (c) of the Commissions Rules. The daytime and nighttime antenna systems were adjusted to within $\pm 5\%$ of sample ratios and ± 3 degrees in phase of the modeled values, per Commission rules.

A Hewlett Packard 8753C Network Analyzer and a Tunwall Radio directional coupler with associated calibration accessories were used for tower base impedance and Antenna Tuning Unit (ATU) output impedance measurements. The output of the ATU, at a point adjacent to the toroidal transformer, was the measurement point for the tower base and ATU output impedances. The static drain chokes were left in the circuit because of its very high impedance making their impact insignificant to the moments model calculations. The base impedance of each tower was measured with the other five (5) towers open circuited at their measurement points. A second measurement was obtained with its tower base insulator shorted to ground with two (2) copper straps that were two (2) inches wide. The X_{oc} , depicted on the following sketch, was calculated from the assumed stray capacitance and used as the load to ground in the open circuit method of moments model.

As demonstrated, the measured and modeled base impedance at the ATU output jack with the other towers open circuited at their respective ATU output jacks agree within ± 2 Ohms resistance and ± 4 percent reactance, as required in the FCC Rules.

MEDIA CONTROL, INCORPORATED
COMMUNICATIONS ENGINEERING SERVICES

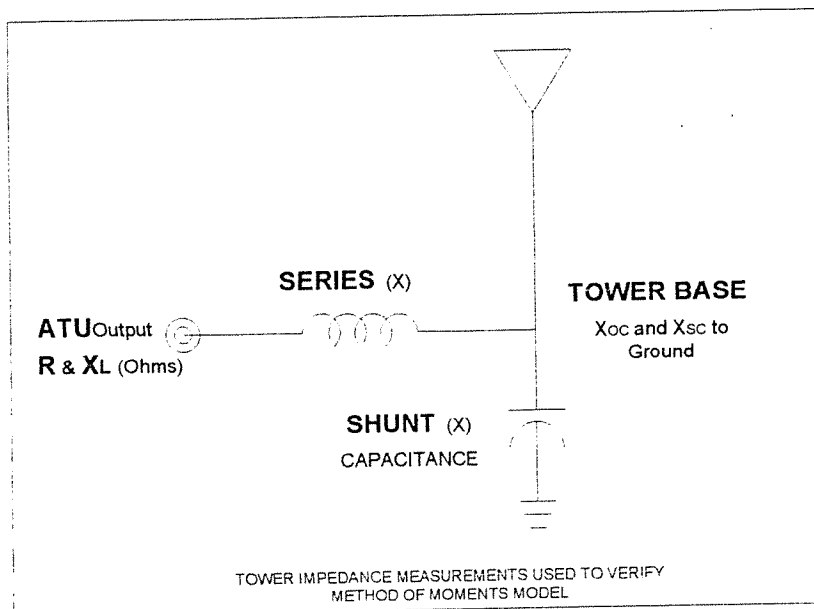
METHOD OF MOMENTS CALCULATION DETAILS

Expert MININEC Broadcast Professional Version 14.5 was used in the modeling process. Each tower was modeled using a single wire and 20 wire segments. The physical height of the towers is 110 electrical degrees. Therefore, the length of each segment was 5.5 electrical degrees.

Method of Moments Modeling Summary Data						
TOWER	Electrical Height (Degrees)	Number of Faces	Face Width (Inches)	Equivalent Radius (Meters)	Number of Segments	Adjusted Height (Degrees)
1	110	3	12	0.146	20	115.60
2	110	3	12	0.146	20	115.60
3	110	3	12	0.146	20	115.80
4	110	3	12	0.146	20	115.60
5	110	3	12	0.146	20	116.10
6	110	3	12	0.146	20	114.20

The modeled height of each tower relative to its physical electrical height falls within the required range of 75 to 125 percent. The modeled radius falls within the required range of 80 percent to 150 percent of the radius of a circle having a circumference equal to the sum of the tower faces.

MESUREMENTS AND MODELING



MEDIA CONTROL, INCORPORATED
COMMUNICATIONS ENGINEERING SERVICES

Method of Moments Modeling Summary Data						
TOWER	Mininec		Stray Impedances		Calculated ATU Impedance	
	R _B (Ohms)	X _B (Ohms)	Shunt X _s (Ohms)	Series X (Ohms)	R _{ATU} (Ohms)	X _{ATU} (Ohms)
1	122.63	184.98	-2100.00	49.00	146.86	242.44
2	98.34	185.21	-2100.00	59.00	117.98	256.07
3	115.92	188.30	-2100.00	56.00	139.37	254.40
4	114.45 ✓	186.93 ✓	-2100.00	61.00	137.42	257.97
5	100.98	187.65	-2100.00	58.00	121.43	257.65
6	115.07	174.81	-2100.00	57.00	136.43	239.53

$$R_{ATU} = R_B X_s^2 / (R_B^2 + (X_B + X_s)^2)$$

$$X_{ATU} = +jX_s (R_B^2 + X_B^2 + X_B X_s) / (R_B^2 + (X_B + X_s)^2) + jX_L$$

The following table is a comparison of the measured and modeled impedances.

Method of Moments Modeling Results				
TOWER	Measured ATU Output Impedance		Calculated ATU Output Impedance	
	Open Circuit R (Ohms)	Open Circuit X (Ohms)	Open Circuit R _{ATU} (Ohms)	Open Circuit X _{ATU} (Ohms)
1	146.60	242.50	146.86	242.44
2	118.20	256.30	117.98	256.07
3	139.30	254.40	139.37	254.40
4	137.20	257.70	137.42	257.97
5	121.80	257.20	121.43	257.65
6	136.50	239.50	136.43	239.53

The above results indicate that the modeled impedances and the measured impedances agree within +/- 2 Ohms resistance and +/- 4 percent in reactance per Section 73.151 (c)(2)(ii) of the Rules.

These derived values were used in the calculation of the tower drive points and the operating parameters of the daytime and nighttime antenna arrays. The method on moment modeling for each driven tower is detailed on the following pages.

DAYTIME MININEC MODEL PRINTOUT

GEOMETRY

Wire coordinate in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	0.1456	20
		0	0	115.6		
2	none	90	340	0	0.1456	20
		90	340	115.6		
3	none	180	340	0	0.1456	20
		180	340	115.8		
4	none	188	95	0	0.1456	20
		188	95	115.6		
5	none	169.71	67.08	0	0.1456	20
		169.71	67.08	116.1		
6	none	194.41	40.16	0	0.1456	20
		194.41	40.16	114.2		

Number of wires = 6
Current nodes = 120

	minimum		maximum	
	wire	value	wire	value
Individual wires	6	5.71	5	5.805
segment length	1	0.1456	1	0.1456
radius				

ELECTRICAL DESCRIPTION

Frequencies (KHz)

no.	frequency	step	no. of segment length (wavelength)		
	lowest		steps	minimum	maximum
1	1,520.00	0	1	0.0158611	0.016125

Sources

source	node	sector	magnitude	phase	type
1	1	1	410.936	84.4	voltage
2	21	1	499.246	331	voltage
3	61	1	403.115	78.1	voltage
4	81	1	517.945	325.2	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	41	0	440.12	0	0	0
2	101	0	440.23	0	0	0

IMPEDANCE

normalization = 50							
freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node = 1, sector 1							
1,520.00	17.562	134.97	136.1	82.6	23.902	-0.72723	-8.1197
source = 2; node = 21, sector 1							
1,520.00	148.76	169.41	225.45	48.7	7.0274	-2.4889	-3.603
source = 2; node = 61, sector 1							
source	=	3;	node	61,	sector	1	
1,520.00	41.859	145.53	151.43	74	12.068	-1.4428	-5.4873
source = 2; node = 81, sector 1							
source	=	4;	node	81,	sector	1	
1,520.00	210.94	160.18	264.86	37.2	6.7403	-2.5965	-3.4677

CURRENT rms

Frequency = 1520 KHz
Input power = 1,000.00 watts
Efficiency = 100%

coordinates in degrees

current

no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	2.1388	1.8	2.13773	0.0676891
2	0	0	5.78	2.29977	1.3	2.2992	0.0509918
3	0	0	11.56	2.38949	0.9	2.38916	0.0395808
4	0	0	17.34	2.44587	0.7	2.44569	0.0297395
5	0	0	23.12	2.47386	0.5	2.47377	0.0210081
6	0	0	28.9	2.47557	0.3	2.47553	0.0132185
7	0	0	34.68	2.45219	0.1	2.45218	6.30E-03
8	0	0	40.46	2.40468	0	2.40468	2.38E-04
9	0	0	46.24	2.33387	359.9	2.33387	-4.99E-03
10	0	0	52.02	2.24069	359.8	2.24067	-9.37E-03
11	0	0	57.8	2.12613	359.7	2.12609	-0.0129011
12	0	0	63.58	1.99127	359.6	1.99121	-0.0155824
13	0	0	69.36	1.83729	359.5	1.8372	-0.0174062
14	0	0	75.14	1.66544	359.4	1.66534	-0.0183698
15	0	0	80.92	1.47701	359.3	1.47689	-0.0184729
16	0	0	86.7	1.27325	359.2	1.27313	-0.0177172
17	0	0	92.48	1.05527	359.1	1.05515	-0.0161051
18	0	0	98.26	0.823745	359.1	0.823633	-0.0136358
19	0	0	104.04	0.578294	359	0.578202	-0.0102915
20	0	0	109.82	0.315511	358.9	0.315454	-6.00E-03
END	0	0	115.6	0	0	0	0
GND	84.5723	30.7818	0	1.56868	282.3	0.33381	-1.53276
22	84.5723	30.7818	5.78	1.72331	277.8	0.233256	-1.70745
23	84.5723	30.7818	11.56	1.81789	275.2	0.165071	-1.81038
24	84.5723	30.7818	17.34	1.88519	273.2	0.106834	-1.88216
25	84.5723	30.7818	23.12	1.92883	271.7	0.0557906	-1.92802
26	84.5723	30.7818	28.9	1.95016	270.3	0.0109463	-1.95013
27	84.5723	30.7818	34.68	1.94983	269.2	-0.0280861	-1.94963
28	84.5723	30.7818	40.46	1.92834	268.2	-0.0614562	-1.92736
29	84.5723	30.7818	46.24	1.88616	267.3	-0.0892175	-1.88405

30	84.5723	30.7818	52.02	1.82385	266.5	-0.111392	-1.82044
31	84.5723	30.7818	57.8	1.74206	265.8	-0.128003	-1.73735
32	84.5723	30.7818	63.58	1.64158	265.1	-0.13909	-1.63568
33	84.5723	30.7818	69.36	1.5233	264.5	-0.144722	-1.51641
34	84.5723	30.7818	75.14	1.38818	264	-0.144995	-1.38059
35	84.5723	30.7818	80.92	1.23727	263.5	-0.140032	-1.22932
36	84.5723	30.7818	86.7	1.07159	263	-0.129973	-1.06368
37	84.5723	30.7818	92.48	0.892056	262.6	-0.114962	-0.884617
38	84.5723	30.7818	98.26	0.699245	262.2	-0.0951006	-0.692747
39	84.5723	30.7818	104.04	0.492834	261.8	-0.0703589	-0.487786
40	84.5723	30.7818	109.82	0.269907	261.4	-0.04029	-0.266883
END	84.5723	30.7818	115.6	0	0	0	0
GND	-16.3853	-187.285	0	1.88571	4.1	1.88077	0.136358
62	-16.3853	-187.285	5.78	2.03962	2.9	2.03708	0.101731
63	-16.3853	-187.285	11.56	2.12701	2.1	2.12558	0.0780336
64	-16.3853	-187.285	17.34	2.18374	1.5	2.18298	0.057566
65	-16.3853	-187.285	23.12	2.2144	1	2.21405	0.039384
66	-16.3853	-187.285	28.9	2.22095	0.6	2.22083	0.0231485
67	-16.3853	-187.285	34.68	2.20444	0.2	2.20442	8.73E-03
68	-16.3853	-187.285	40.46	2.1657	359.9	2.16569	-3.91E-03
69	-16.3853	-187.285	46.24	2.10548	359.6	2.10542	-0.0147713
70	-16.3853	-187.285	52.02	2.02456	359.3	2.02442	-0.0238507
71	-16.3853	-187.285	57.8	1.92383	359.1	1.92358	-0.0311268
72	-16.3853	-187.285	63.58	1.80423	358.8	1.80386	-0.0365819
73	-16.3853	-187.285	69.36	1.66683	358.6	1.66634	-0.0402024
74	-16.3853	-187.285	75.14	1.51274	358.4	1.51216	-0.0419797
75	-16.3853	-187.285	80.92	1.34311	358.2	1.34246	-0.0419105
76	-16.3853	-187.285	86.7	1.15908	358	1.15839	-0.0399958
77	-16.3853	-187.285	92.48	0.961642	357.8	0.960959	-0.036236
78	-16.3853	-187.285	98.26	0.751407	357.7	0.750783	-0.0306197
79	-16.3853	-187.285	104.04	0.528015	357.5	0.52751	-0.0230922
80	-16.3853	-187.285	109.82	0.288351	357.3	0.288036	-0.0134595
END	-16.3853	-187.285	115.6	0	0	0	0
GND	66.0928	-156.311	0	1.38525	288	0.427766	-1.31754
82	66.0928	-156.311	5.805	1.51957	281.6	0.304521	-1.48874
83	66.0928	-156.311	11.61	1.60627	277.9	0.220684	-1.59104
84	66.0928	-156.311	17.415	1.67065	275.1	0.148849	-1.664
85	66.0928	-156.311	23.22	1.71487	272.9	0.0856565	-1.71273
86	66.0928	-156.311	29.025	1.73953	271	0.0299001	-1.73927
87	66.0928	-156.311	34.83	1.74484	269.4	-0.0188804	-1.74474
88	66.0928	-156.311	40.635	1.73095	268	-0.0608518	-1.72988
89	66.0928	-156.311	46.44	1.69808	266.8	-0.0960612	-1.69536
90	66.0928	-156.311	52.245	1.64657	265.7	-0.124515	-1.64185
91	66.0928	-156.311	58.05	1.57688	264.7	-0.146217	-1.57009
92	66.0928	-156.311	63.855	1.48963	263.8	-0.161192	-1.48088
93	66.0928	-156.311	69.66	1.38553	263	-0.169496	-1.37513
94	66.0928	-156.311	75.465	1.26543	262.2	-0.171215	-1.25379
95	66.0928	-156.311	81.27	1.13021	261.5	-0.166469	-1.11789
96	66.0928	-156.311	87.075	0.980786	260.9	-0.155399	-0.968397
97	66.0928	-156.311	92.88	0.817984	260.3	-0.138143	-0.806235
98	66.0928	-156.311	98.685	0.642301	259.7	-0.114796	-0.631959
99	66.0928	-156.311	104.49	0.453445	259.2	-0.0852846	-0.445352
100	66.0928	-156.311	110.295	0.248714	258.6	-0.0490277	-0.243834
END	66.0928	-156.311	116.1	0	0	0	0

MEDIA CONTROL, INCORPORATED
COMMUNICATIONS ENGINEERING SERVICES

Daytime Array Moment Method Summary Sheet							
TOWER	Drive Point		Current		Shunt	ATU Output	
	R _D (Ohms)	X _D (Ohms)	Magnitude	Phase (Degrees)	X _s (Ohms)	IATU Magnitude	IATU Angle
1	17.56	134.97	2.1388	1.8	-2100	2.0014	2.312
2	148.76	169.41	1.5687	282.3	-2100	1.4464	286.708
3	Detuned						
4	41.86	145.53	1.8857	4.1	-2100	1.7554	5.327
5	210.94	160.18	1.3853	288.0	-2100	1.2871	294.510
6	Detuned						

IATU = ATU output current for unity base current with no phase shift

$$\text{IATU Magnitude} = ((1 + X_B / X_S)^2 + (R_B / X_S)^2)^{1/2}$$

$$\text{IATU Angle} = \arctan (-R_B / X_S) / (1 + X_B / X_S)$$

TOWER	Theoretical Parameters		Mininec Parameters	
	Ratio	Phase (Degrees)	Ratio	Phase (Degrees)
1	1.000	0.00	1.000	0.0
2	0.800	-91.40	0.723	-75.6
3			Detuned	Detuned
4	0.900	0.00	0.877	3.0
5	0.720	-91.40	0.643	-68.1
6			Detuned	Detuned

The antenna monitor readings, in the daytime mode, have been adjusted to within +/- 5 percent of the above ratios and to within +/- 3 degrees in phase.

NIGHTTIME MININEC MODEL PRINTOUT

GEOMETRY

Wire coordinate in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	0.1456	20
		0	0	115.6		
2	none	90	340	0	0.1456	20
		90	340	115.6		
3	none	180	340	0	0.1456	20
		180	340	115.8		
4	none	188	95	0	0.1456	20
		188	95	115.6		
5	none	169.71	67.08	0	0.1456	20
		169.71	67.08	116.1		
6	none	194.41	40.16	0	0.1456	20
		194.41	40.16	114.2		

Number of wires = 6
Current nodes = 120

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	6	5.71	5	5.805
radius	1	0.1456	1	0.1456

ELECTRICAL DESCRIPTION

Frequencies (KHz)

no.	frequency		no. of segment length (wavelength)		
	lowest	step	steps	minimum	maximum
1	1,520.00	0	1	0.0158611	0.016125

Sources

source	node	sector	magnitude	phase	type
1	1	1	288.79	211.6	voltage
2	21	1	577.908	80.3	voltage
3	41	1	457.935	307.9	voltage
4	61	1	266.361	204	voltage
5	81	1	653.339	73.8	voltage
6	101	1	575.607	314.5	voltage

IMPEDANCE

normalization = 50							
freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node = 1, sector 1							
1,520.00	-1.3345	169.45	169.46	90.5	****	****	****
source = 2; node = 21, sector 1							
1,520.00	47.232	189.29	195.09	76	17.116	-1.0161	-6.8067
source = 3; node = 41, sector 1							
1,520.00	187.82	257.72	318.9	53.9	11.004	-1.583	-5.1505
source = 4; node = 61, sector 1							
1,520.00	25.716	148.93	151.14	80.2	19.659	-0.88444	-7.3459
source = 5; node = 81, sector 1							
1,520.00	96.904	209.27	230.62	65.2	11.405	-1.5271	-5.2804
source = 6; node = 101, sector 1							
1,520.00	249.79	421.71	490.13	59.4	19.383	-0.89703	-7.2906

CURRENT rms

Frequency = 1520 KHz
Input power = 1,000.00 watts
Efficiency = 100%

coordinates in degrees

current

no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.20506	121.2	-0.624088	1.03086
2	0	0	5.78	1.31978	121.2	-0.684274	1.12854
3	0	0	11.56	1.38595	121.2	-0.718973	1.18487
4	0	0	17.34	1.43034	121.3	-0.742251	1.22268
5	0	0	23.12	1.45648	121.3	-0.75594	1.24494
6	0	0	28.9	1.46579	121.3	-0.760798	1.25289
7	0	0	34.68	1.45908	121.3	-0.757249	1.24719
8	0	0	40.46	1.43694	121.3	-0.745603	1.22836
9	0	0	46.24	1.3999	121.2	-0.726157	1.19684
10	0	0	52.02	1.34852	121.2	-0.699216	1.15309
11	0	0	57.8	1.28342	121.2	-0.665103	1.09764
12	0	0	63.58	1.20525	121.2	-0.624193	1.03103
13	0	0	69.36	1.11475	121.2	-0.57689	0.953867
14	0	0	75.14	1.0127	121.1	-0.523628	0.866815
15	0	0	80.92	0.899905	121.1	-0.464859	0.770542
16	0	0	86.7	0.777164	121.1	-0.401028	0.665704
17	0	0	92.48	0.645174	121	-0.332532	0.552876
18	0	0	98.26	0.504382	121	-0.259639	0.432422
19	0	0	104.04	0.354582	120.9	-0.182282	0.30414
20	0	0	109.82	0.193706	120.9	-0.0994363	0.166236
END	0	0	115.6	0	0	0	0
GND	84.5723	30.7818	0	2.09464	4.3	2.08873	0.157254
22	84.5723	30.7818	5.78	2.3189	2.9	2.31596	0.116769
23	84.5723	30.7818	11.56	2.45087	2.1	2.44925	0.089122
24	84.5723	30.7818	17.34	2.5423	1.5	2.54147	0.065306

25	84.5723	30.7818	23.12	2.5998	1	2.59942	0.044219
26	84.5723	30.7818	28.9	2.62607	0.6	2.62594	0.025465
27	84.5723	30.7818	34.68	2.62256	0.2	2.62254	8.90E-03
28	84.5723	30.7818	40.46	2.5903	359.9	2.5903	-5.54E-03
29	84.5723	30.7818	46.24	2.53024	359.6	2.53017	-0.017855
30	84.5723	30.7818	52.02	2.44331	359.3	2.44315	-0.028042
31	84.5723	30.7818	57.8	2.3306	359.1	2.33032	-0.036096
32	84.5723	30.7818	63.58	2.19325	358.9	2.19285	-0.042014
33	84.5723	30.7818	69.36	2.03258	358.7	2.03207	-0.045805
34	84.5723	30.7818	75.14	1.84997	358.5	1.84936	-0.047486
35	84.5723	30.7818	80.92	1.64686	358.4	1.64618	-0.047086
36	84.5723	30.7818	86.7	1.42467	358.2	1.42397	-0.044638
37	84.5723	30.7818	92.48	1.18464	358.1	1.18396	-0.04018
38	84.5723	30.7818	98.26	0.927589	357.9	0.926976	-0.033736
39	84.5723	30.7818	104.04	0.653103	357.8	0.652614	-0.025282
40	84.5723	30.7818	109.82	0.357327	357.7	0.357027	-0.014643
END	84.5723	30.7818	115.6	0	0	0	0
GND	169.145	61.5636	0	1.01541	254	-0.279612	-0.976148
42	169.145	61.5636	5.79	1.16949	248.6	-0.427174	-1.08868
43	169.145	61.5636	11.58	1.26735	245.7	-0.521717	-1.15498
44	169.145	61.5636	17.37	1.34123	243.6	-0.596706	-1.20119
45	169.145	61.5636	23.16	1.39475	241.9	-0.656329	-1.23068
46	169.145	61.5636	28.95	1.42925	240.6	-0.702186	-1.24486
47	169.145	61.5636	34.74	1.44534	239.4	-0.735003	-1.2445
48	169.145	61.5636	40.53	1.44344	238.5	-0.755184	-1.23013
49	169.145	61.5636	46.32	1.42394	237.6	-0.763019	-1.20225
50	169.145	61.5636	52.11	1.38727	236.8	-0.758776	-1.16137
51	169.145	61.5636	57.9	1.33393	236.2	-0.742753	-1.10801
52	169.145	61.5636	63.69	1.26452	235.6	-0.715275	-1.04279
53	169.145	61.5636	69.48	1.17975	235	-0.676756	-0.96634
54	169.145	61.5636	75.27	1.08039	234.5	-0.62763	-0.879387
55	169.145	61.5636	81.06	0.967253	234	-0.568386	-0.782634
56	169.145	61.5636	86.85	0.841182	233.6	-0.499517	-0.676808
57	169.145	61.5636	92.64	0.702913	233.2	-0.421473	-0.562537
58	169.145	61.5636	98.43	0.552931	232.8	-0.334546	-0.440241
59	169.145	61.5636	104.22	0.391	232.4	-0.238586	-0.30977
60	169.145	61.5636	110.01	0.214806	232	-0.132141	-0.169352
END	169.145	61.5636	115.8	0	0	0	0
GND	-16.3853	-187.285	0	1.2462	123.8	-0.693597	1.03534
62	-16.3853	-187.285	5.78	1.35013	123	-0.735887	1.13195
63	-16.3853	-187.285	11.56	1.40904	122.6	-0.758373	1.18755
64	-16.3853	-187.285	17.34	1.44728	122.2	-0.771143	1.22473
65	-16.3853	-187.285	23.12	1.46799	121.9	-0.775527	1.24641
66	-16.3853	-187.285	28.9	1.4725	121.6	-0.772112	1.25383
67	-16.3853	-187.285	34.68	1.46157	121.4	-0.761258	1.24766
68	-16.3853	-187.285	40.46	1.43576	121.2	-0.743248	1.22841
69	-16.3853	-187.285	46.24	1.3956	121	-0.718365	1.19651
70	-16.3853	-187.285	52.02	1.34163	120.8	-0.686911	1.15244
71	-16.3853	-187.285	57.8	1.27446	120.6	-0.649227	1.0967
72	-16.3853	-187.285	63.58	1.19476	120.5	-0.605677	1.02985
73	-16.3853	-187.285	69.36	1.10325	120.3	-0.556666	0.952516
74	-16.3853	-187.285	75.14	1.00073	120.1	-0.502624	0.865344
75	-16.3853	-187.285	80.92	0.887976	120	-0.443991	0.769008
76	-16.3853	-187.285	86.7	0.765798	119.9	-0.381202	0.664178

77	-16.3853	-187.285	92.48	0.634888	119.7	-0.314644	0.551436
78	-16.3853	-187.285	98.26	0.495695	119.6	-0.244582	0.431153
79	-16.3853	-187.285	104.04	0.348031	119.4	-0.170967	0.303143
80	-16.3853	-187.285	109.82	0.189885	119.3	-0.092863	0.165629
END	-16.3853	-187.285	115.6	0	0	0	0
GND	66.0928	-156.311	0	2.00323	8.6	1.98071	0.299527
82	66.0928	-156.311	5.805	2.24379	5.7	2.23265	0.223297
83	66.0928	-156.311	11.61	2.38912	4.1	2.38299	0.171087
84	66.0928	-156.311	17.415	2.49317	2.9	2.48998	0.125987
85	66.0928	-156.311	23.22	2.56254	1.9	2.56109	0.085929
86	66.0928	-156.311	29.025	2.59988	1.1	2.59939	0.050183
87	66.0928	-156.311	34.83	2.60652	0.4	2.60646	0.01848
88	66.0928	-156.311	40.635	2.58341	359.8	2.5834	-9.26E-03
89	66.0928	-156.311	46.44	2.5314	359.3	2.53118	-0.033041
90	66.0928	-156.311	52.245	2.45137	358.8	2.4508	-0.052834
91	66.0928	-156.311	58.05	2.34432	358.3	2.34331	-0.068605
92	66.0928	-156.311	63.855	2.2114	357.9	2.20994	-0.08033
93	66.0928	-156.311	69.66	2.05386	357.5	2.05198	-0.087995
94	66.0928	-156.311	75.465	1.8731	357.2	1.87086	-0.091608
95	66.0928	-156.311	81.27	1.67056	356.9	1.66807	-0.09119
96	66.0928	-156.311	87.075	1.44767	356.6	1.44507	-0.086777
97	66.0928	-156.311	92.88	1.20571	356.3	1.20316	-0.078403
98	66.0928	-156.311	98.685	0.945508	356	0.943197	-0.066076
99	66.0928	-156.311	104.49	0.666642	355.7	0.664786	-0.049708
100	66.0928	-156.311	110.295	0.365194	355.5	0.364049	-0.028904
END	66.0928	-156.311	116.1	0	0	0	0
GND	148.577	-125.38	0	0.830419	255.1	-0.213369	-0.802539
102	148.577	-125.38	5.71	1.03638	248.5	-0.380036	-0.964184
103	148.577	-125.38	11.42	1.17013	245.4	-0.487472	-1.06375
104	148.577	-125.38	17.13	1.27487	243.3	-0.573604	-1.13854
105	148.577	-125.38	22.84	1.35556	241.7	-0.643155	-1.19327
106	148.577	-125.38	28.55	1.4141	240.4	-0.697922	-1.22987
107	148.577	-125.38	34.26	1.45132	239.4	-0.738694	-1.24926
108	148.577	-125.38	39.97	1.46774	238.5	-0.765897	-1.25207
109	148.577	-125.38	45.68	1.46379	237.8	-0.779798	-1.23879
110	148.577	-125.38	51.39	1.43988	237.2	-0.78064	-1.2099
111	148.577	-125.38	57.1	1.39652	236.6	-0.76869	-1.16593
112	148.577	-125.38	62.81	1.33429	236.1	-0.744238	-1.10744
113	148.577	-125.38	68.52	1.25387	235.6	-0.707659	-1.03509
114	148.577	-125.38	74.23	1.15601	235.2	-0.659347	-0.949532
115	148.577	-125.38	79.94	1.04153	234.8	-0.599755	-0.85152
116	148.577	-125.38	85.65	0.911251	234.5	-0.529337	-0.741742
117	148.577	-125.38	91.36	0.765893	234.2	-0.448498	-0.620839
118	148.577	-125.38	97.07	0.605881	233.8	-0.357469	-0.489191
119	148.577	-125.38	102.78	0.43084	233.5	-0.255997	-0.346539
120	148.577	-125.38	108.49	0.238064	233.3	-0.142415	-0.190768
END	148.577	-125.38	114.2	0	0	0	0

MEDIA CONTROL, INCORPORATED
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Nighttime Array Moment Method Summary Sheet							
	Drive Point		Current		Shunt	ATU Output	
TOWER	R _D (Ohms)	X _D (Ohms)	Magnitude	Phase (Degrees)	X _s (Ohms)	IATU Magnitude	IATU Angle
1	-1.33	169.45	1.2051	121.2	-2100	1.1078	121.160
2	47.23	189.29	2.0946	4.3	-2100	1.9064	5.716
3	187.82	257.72	1.0154	254.0	-2100	0.8954	259.826
4	25.72	148.93	1.2462	123.8	-2100	1.1579	124.555
5	96.90	209.27	2.0032	8.6	-2100	1.8060	11.534
6	249.79	421.71	0.8304	255.1	-2100	0.6710	263.588

IATU = ATU output current for unity base current with no phase shift

$$\text{IATU Magnitude} = ((1 + X_B / X_s)^2 + (R_B / X_s)^2)^{1/2}$$

$$\text{IATU Angle} = \arctan (-R_B / X_s) / (1 + X_B / X_s)$$

	Theoretical Parameters		Mininec Model	
TOWER	Ratio	Phase (Degrees)	Ratio	Phase (Degrees)
1	0.555	121.20	0.581	115.4
2	1.000	0.00	1.000	0.0
3	0.555	-121.20	0.470	-105.9
4	0.555	121.20	0.607	118.8
5	1.000	0.00	0.947	5.8
6	0.555	-121.20	0.352	-102.1

The antenna monitor readings, in the nighttime mode, have been adjusted to within +/- 5 percent of the above ratios and to within +/- 3 degrees in phase.

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ANTENNA MONITOR AND SAMPLE LINES

The antenna monitor is a six (6) tower Potomac Instruments AM-19 (204) Serial #1950. This unit was returned to Potomac Instruments for calibration on May 30, 2008. The sample lines are 3/8" Cablewave foam heliax type FCC38-50J that were factory cut to equal lengths and assembled. The sample line characteristics were measured at the connector to the antenna monitor using an AIM 4170 Antenna and Lab Analyzer.

Sample Line Length Characteristics	Tower #1	Tower #2	Tower #3	Tower #4	Tower #5	Tower #6
Length (Feet)	311.212	311.645	311.212	311.212	311.212	311.212
Length (Meters)	94.882	95.014	94.882	94.882	94.882	94.882
Velocity Factor	0.81	0.81	0.81	0.81	0.81	0.81
Wavelength at 1520 kHz	0.594	0.595	0.594	0.594	0.594	0.594
Wavelength (Degrees)	213.84	214.20	213.84	213.84	213.84	213.84

The length of the sample lines meet the requirements by being within 1.0 electrical degree of each other.

SAMPLE LINES AND TOROID MEASUREMENTS

The tower base currents are sampled using Delta Electronics Type TCT-1 shielded toroidal transformers with an output sensitivity of 0.5 Volts/Ampere of RF current. These toroids are located at the output of each antenna tuning unit. The cables with the toroidal samplers were measured at the connector to the antenna monitor.

Sample Line with Toroid Characteristics	Tower #1	Tower #2	Tower #3	Tower #4	Tower #5	Tower #6
Resistance (Ohms)	52.07	51.07	52.23	52.28	52.17	51.89
Reactance (Ohms)	-j0.76	-j1.07	-j0.80	-j0.60	-j0.65	-j0.50

The impedance of the sample lines with Toroids connected meet the requirements by being within 2.0 Ohms of each other.

TOROIDAL TRANSFORMER CALIBRATION

The toroidal transformers were calibrated by measuring their output values using two inputs of a Potomac Instruments 19D (210) digital antenna monitor. All six (6) toroidal transformers were mounted side-by-side with a conductor passing through them. The toroids were aligned such that the current flow was in the direction indicated by the manufacturer. A 50 Ohms dummy load was connected to the output and the input was fed from a transmitter sample at the station's common point. The daytime array uses Tower #1 as reference. Therefore, the toroid for Tower #1 was fed to the reference port on the antenna monitor and the other phase and ratio of the output of the other toroids were observed. This same procedure was used for the nighttime array except that Tower #2 was used as the reference. The following results were noted:

DAY TOROID CALIBRATION USING TOWER #1 AS REFERENCE						
Daytime Toroid Calibration	Tower #1	Tower #2	Tower #3	Tower #4	Tower #5	Tower #6
Phase (Degrees)	0.0	0.1	Detuned	0.0	0.1	Detuned
Loop (Ratio)	Reference	1.001	Detuned	1.000	0.999	Detuned

NIGHT TOROID CALIBRATION USING TOWER #2 AS REFERENCE						
	Tower #1	Tower #2	Tower #3	Tower #4	Tower #5	Tower #6
Phase (Degrees)	0.0	0.1	0.1	0.0	0.1	0.1
Loop (Ratio)	0.999	Reference	1.000	0.999	0.998	0.999

The Delta TCT-1 toroidal transformer has an advertised magnitude accuracy of +/- 2% and a phase accuracy of +/- 3 degrees. Therefore, the toroid-to-toroid accuracy for all six (6) units exceeds that of the rated accuracies.

COMMON POINT IMPEDANCE MEASUREMENT

The common point impedance was measured using a Delta Electronics OIB-3 Impedance Bridge. Daytime and nighttime measurements were made at the "J" plug that is adjacent to Delta Electronics common point current metering unit. The common point impedance was adjusted to $50.0 + j0.0$ Ohms for the day and night directional antenna system inputs.

FIELD STRENGTH METER

A Potomac Instruments field strength meter, Model FIM-21, Serial Number 1222, calibrated November 19, 2008 was utilized for all reference field measurements.

REFERENCE FIELD STRENGTH MEASUREMENTS

Reference field strength measurements were made at three (3) locations along radials at azimuths specified on the present station license along with a major lobe radial for the daytime and nighttime antenna patterns. A tabulation of the radial azimuth, distance to the center of the transmitter site, field strength measurement, GPS coordinates (NAD 27) and a description of the reference location. The distances noted were measured in feet or miles and converted to meters or kilometers.

MEDIA CONTROL, INCORPORATED
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DAYTIME ANTENNA ARRAY

Radial (Azimuth)	Point #	Distance (km)	Field (mV/m)	GPS Coordinates (NAD27)		Description
004	1	2.18	76.0	N43-24-11.0	W084-35-57.5	North side of Oakridge Drive, 80 feet east of the intersection with Euclid Street
	2	3.33	40.0	N43-25-46.5	W084-35-48.2	Intersection of E McGregor and N Union Road on the North side
	3	4.90	21.5	N43-27-58.0	W084-35-35.5	N County Line Road, 0.2 miles west of intersection with S Coleman Road
079	1	1.79	7.2	N43-21-36.7	W084-32-52.8	West side of Baldwin Road 0.48 km (0.3 miles) south of Van Buren Road
	2	3.68	4.3	N43-22-06.6	W084-29-18.8	North Wisner Road 9 meters (30 feet) north of telephone box 5240 on north side of road
	3	4.93	1.6	N43-22-26.6	W084-26-58.9	At curb in front of front door to 5611 North Ransom Road on east side of road
090	1	1.76	7.6	N43-21-07.9	W084-32-52.8	West side of Baldwin Rd 1.4 km (0.85 miles) south of Van Buren Rd and 18 meters (60 feet) south of telephone pedestal
	2	3.62	3.1	N43-21-07.7	W084-29-18.6	North Wisner Rd on west side of road 10 meters (32 feet) south of telephone pedestal 4240
	3	4.79	2.1	N43-21-07.4	W084-26-58.6	East side of North Ransom Road and 0.21 km (700 feet) north of East Harrison Road
113	1	1.91	4.0	N43-20-04.7	W084-32-51.7	North Baldwin Road at southeast corner of the Emerson Township parking lot
	2	2.59	2.1	N43-19-43.0	W084-31-41.7	West side of North Crapo Road 0.7 km (0.45 mile) south of East Tyler Road
	3	3.46	1.8	N43-19-14.6	W084-30-09.0	North side of East Saint Charles and 1.06 km (0.7 miles) west of North 8th Street
258	1	2.00	5.0	N43-20-33.2	W084-40-00.3	North Alger Road 0.8 km (0.5 mile) south of West Harrison Road on the east side
	2	3.48	4.6	N43-20-21.1	W084-41-11.1	North Pingree Road in front of mail box 3265
	3	4.55	1.0	N43-19-47.9	W084-44-47.1	East side of North Luce Road across the street from mail box 2612
292	1	2.09	5.2	N43-22-13.9	W084-39-59.8	South Lincoln Avenue 67.7 meters (220 feet) north of West Elizabeth Street
	2	2.75	4.6	N43-22-36.0	W084-41-10.1	At curb in front of front door to 5811 North Luce Road
	3	4.12	2.5	N43-22-16.9	W084-43-36.2	North Rich Road across the street from mail box 6627

The daytime array field measurements were obtained on December 17, 2009 by Russell C. Harbaugh, Jr.

MEDIA CONTROL, INCORPORATED
COMMUNICATIONS ENGINEERING SERVICES

NIGHTTIME ANTENNA ARRAY

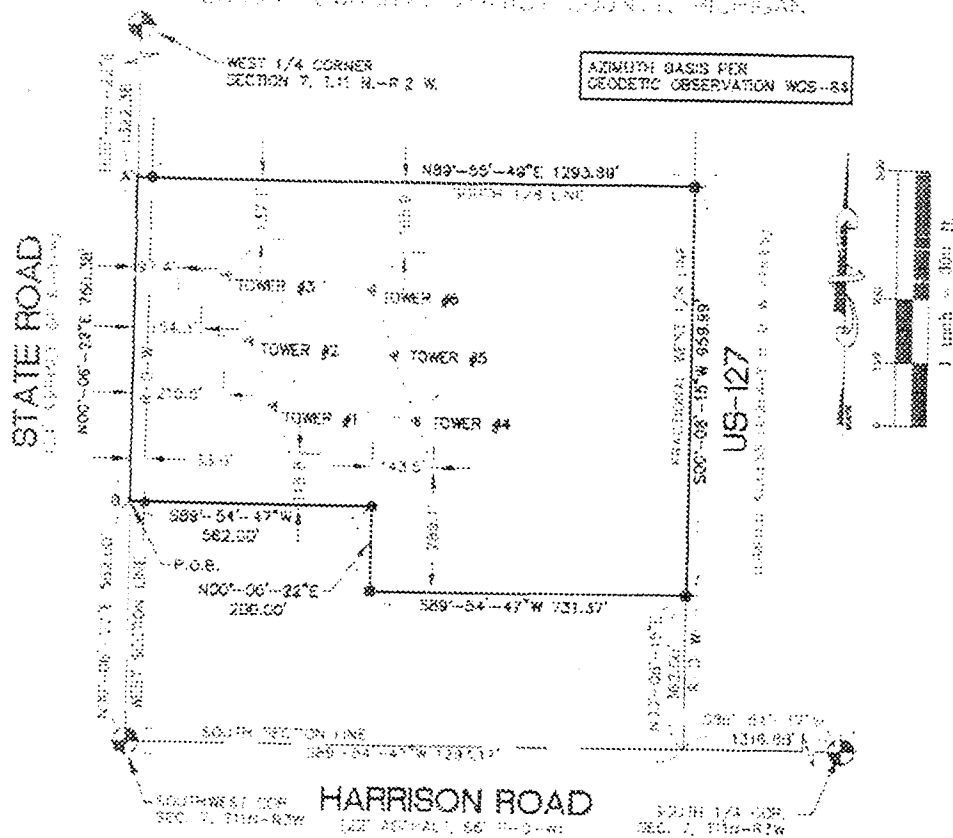
Radial (Azimuth)	Point #	Distance (km)	Field (mV/m)	GPS Coordinates (NAD27)		Description
000	1	2.13	95.0	N43-24-05.9	W084-36-09.9	Northeast corner of the intersection of Butternut Street and S East Street
	2	3.14	45.0	N43-25-31.9	W084-36-07.2	Riverside Drive in front of mail box 918
	3	4.39	24.0	N43-27-57.6	W084-36-03.5	North side of N County Line Road and 0.5 km (0.33 miles) east of SE County Line Road
78	1	2.50	3.2	N43-21-51.1	W084-31-33.7	South side of East Van Buren Road 0.15 km (500 feet) west of North Crapo Road
	2	3.70	1.15	N43-22-12.1	W084-29-18.4	East side of North Wisner Road 0.64 km (0.4 miles) north of East Van Buren Road
	3	4.29	0.71	N43-22-22.6	W084-28-11.1	West side of North 8th Street and 0.077 km (250 feet) north of Stoneman Livestock System sign
112	1	2.56	1.1	N43-19-47.8	W084-31-41.8	North Crapo Road west side 0.6 km (.4 miles) south of East Tyler Road
	2	3.65	1.0	N43-19-14.6	W084-29-44.8	East Polk Road at mail box 5576 and 1.0 km (0.6 mile) west of North Blair Road
	3	3.90	0.8	N43-19-05.6	W084-29-19.1	West side of North Wisner Road 0.3 km (0.17 mile) south of East Polk Road
140	1	1.77	1.6	N43-19-14.7	W084-34-08.0	South side of East Polk Road (6.0 meters) 20 feet west of North Bagley Road
	2	2.58	0.7	N43-18-22.1	W084-33-04.7	North side of Saint Charles Road 0.25 km (800 feet) west of east North Baldwin Road
	3	3.39	0.16	N43-17-29.7	W084-32-04.6	North side of East Washington Road 1.1 km (0.7 miles) east of North Baldwin Road
180	1	1.35	6.5	N43-19-14.8	W084-36-15.6	North side of East Polk Road and 0.05 km (180 feet) west of Route 127 south bound exit road
	2	2.13	3.6	N43-18-09.0	W084-36-15.5	Norton Gibbs Drive at mail box 324
	3	2.43	3.1	N43-17-44.6	W084-36-15.8	East Acadia Street on east side of driveway to garage to house #405 North Jeffery Avenue
228.5	1	1.78	2.2	N43-19-29.1	W084-38-45.5	East side of North Begole Road 0.45 km (0.3 miles) north of west Polk Road
	2	2.64	1.9	N43-18-40.5	W084-40-01.3	West side of North Alger Road 1.0 km (0.6 miles) south of West Polk Road at large culvert
	3	3.47	0.9	N43-17-53.9	W084-41-13.2	East side of North Luce Road at mail box 323 and 0.9 km (0.5 mile) south of West Saint Charles Rd
258	1	2.00	1.7	N43-20-33.2	W084-40-00.3	North Alger Road 0.8 km (0.5 mile) south of West Harrison Road on the east side
	2	2.62	1.5	N43-20-21.1	W084-41-11.1	North Pingree Road in front of mail box 3265
	3	4.55	0.7	N43-19-47.9	W084-44-47.1	East side of North Luce Road across the street from mail box 2612
292	1	2.09	2.64	N43-22-13.9	W084-39-59.8	South Lincoln Avenue 67.7 meters (220 feet) north of West Elizabeth Street
	2	2.75	2.85	N43-22-36.0	W084-41-10.1	At curb in front of front door to 5811 North Luce Road
	3	4.12	1.5	N43-22-16.9	W084-43-36.2	North Rich Road across the street from mail box 6627

The nighttime array field measurements were obtained on December 7, 2009 and December 8, 2009 by Russell C. Harbaugh, Jr.

RFR PROTECTION

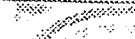
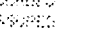
The operation of the WMLM-AM facility will not result in the exposure of workers or the general public to radio frequencies radiation levels in excess of the limits specified in 47 CFR 1.1310. Access is to areas around the towers where field levels might exceed limits are under the control of the owner. All towers are enclosed with fencing and locked gates. Within the studio/transmitter building, all antenna system equipment is in cabinet enclosures.

PART OF THE FRACATIONAL SOUTH-WEST 1/4
OF THE FRACITIONAL SOUTHWEST 1/4
FRACATIONAL SECTION 3, 11N-22W
FARMER TOWNSHIP, DEARBOROUGH COUNTY, IOWA



	AZIMUTH	DISTANCE
TOWER 1 - TOWER 2	AZ 339-27-22"	163.55'
TOWER 1 - TOWER 3	AZ 339-45-07"	325.25'
TOWER 1 - TOWER 4	AZ 34-42-05"	337.05'
TOWER 1 - TOWER 5	AZ 56-54-15"	308.73'
TOWER 1 - TOWER 6	AZ 39-04-11"	358.53'
TOWER 2 - TOWER 3	AZ 342-02-52"	162.71'
TOWER 4 - TOWER 5	AZ 333-55-43"	181.27'
TOWER 5 - TOWER 6	AZ 333-58-00"	162.24'
A-B	AZ 00-05-22"	782.26'
B-TOWER 1	AZ 55-02-32"	399.88'

10/10/10
10/10/10

R - RECORDED M - MEASURED ED - SET WOOD STAKE	O - POLE MON S - SET MON C - CONCRETE MONUMENT	* - ELECTRON CORNER * - 1/8 CORNER A - PEGGED STAKE								
 <h1 style="text-align: center;">CMS & D</h1> <h2 style="text-align: center;">SURVEYING ENGINEERING</h2> <p style="text-align: center;">2455 HAWKINS DRIVE, SUITE 4 4010 P. KAYLARK, MORGAN, WISCONSIN 53560 PHONE (262) 773-0720 FAX (262) 773-0722 2455 Hawkins Drive</p>		<table border="1"> <tr> <td>DATE 12-10-00</td> <td>DRAWN BY JRS</td> </tr> <tr> <td>CORREY DATE 7-18-01</td> <td>CHECKED BY JRS</td> </tr> <tr> <td>DATE 11-17-01</td> <td>JOB NUMBER 1001-0177</td> </tr> <tr> <td>PROJECT PENNED</td> <td>SHEET NUMBER 1 OF 1</td> </tr> </table>	DATE 12-10-00	DRAWN BY JRS	CORREY DATE 7-18-01	CHECKED BY JRS	DATE 11-17-01	JOB NUMBER 1001-0177	PROJECT PENNED	SHEET NUMBER 1 OF 1
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