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-20121005AGV

SECTION I - APPLICANT FEE INFORMATION

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

Tri-County Broadcasting Inc.

MAILING ADDRESS (Line 1) (Maximum 35 characters)
1010 Second Street North

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Sauk Rapids	MN	56379

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
(320) 252-6200	WBHR	Facility ID 26980

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
M M R	0 0 0 1	$ 635.00	

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

(A)	(B)	(C)	FOR FCC USE ONLY
M O R	0 0 0 1	$ 730.00	

	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.	$ 1365.00	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT	Tri-County Broadcasting Inc.	
MAILING ADDRESS	1010 Second Street North	
CITY Sauk Rapids	STATE MN	ZIP CODE 56379

2. This application is for:

☑ Commercial ☐ Noncommercial

☑ AM Directional ☐ AM Non-Directional

This license application includes a "method of moments" directional antenna proof.

Call letters	Community of License	Construction Permit File No.	Modification of Construction Permit File No(s).	Expiration Date of Last Construction Permit
WBHR	Sauk Rapids	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. DNA

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. DNA

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. DNA

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. DNA

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.
DNA

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	
Herbert M. Hoppe	Herbert M. Hoppe	
Title	Date	Telephone Number
Officer	09/29/2012	(320) 252-6200

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
Tri-County Broadcasting, Inc.

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

[X] 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
WBHR	n/a	660	Unlimited	0.5	10

2. Station location	
State	City or Town
Minnesota	Sauk Rapids

3. Transmitter location			
State	County	City or Town	Street address
MN	Benton	Sauk Rapids	10th Ave. NE, 0.6 KM north of Golden Spike Rd.

4. Main studio location			
State	County	City or Town	Street address (or other identification)
MN	Benton	Sauk Rapids	1010 Second St., North

5. Remote control point location (specify only if authorized directional antenna)			
State	County	City or Town	Street address (or other identification)
MN	Benton	Sauk Rapids	1010 Second St., North

6. Has type-approved stereo generating equipment been installed? [ ] Yes [X] No

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

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

8. Operating constants:	
RF common point or antenna current (in amperes) without modulation for night system: 3.29	RF common point or antenna current (in amperes) without modulation for day system: 14.51
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: 0 Day: 0

Antenna indications for directional operation

Towers	Antenna monitor Phase reading(s) in degrees		Antenna monitor sample current ratio(s)		Antenna base currents	
	Night	Day	Night	Day	Night	Day
1 (E) 1024199	0°	--	100%	--	(not required)	
2 (C) 1024200	--	-88.4°	--	75.2%		
3 (W) 1024201	-47.1°	-	67.9%	--		
4 (S) 1024202	-19.4°	0°	12.2%	100%		

Manufacturer and type of antenna monitor: Potomac Instruments AM-19 (204)

SECTION III - Page 2

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

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded.	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit.
Vertical uniform cross section triangular steel insulated towers	88.4	89.3	90.2	Exhibit No. n/a

Excitation [X] 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			
	°	'	"		°	'	"
	45	36	18		94	08	21

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

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

Tower numbers changed so all four stations on site use same numbering system.

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

No change

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)
Mark A. Mueller	Mark A. Mueller
Address (include ZIP Code) Mueller Broadcast Design 613 S. La Grange Rd. La Grange, IL 60525 mark@muellerbroadcastdesign.com	Date September 19, 2012
	Telephone No. (Include Area Code) (708) 352-2166

[ ] Technical Director

[ ] Registered Professional Engineer

[ ] Chief Operator

[X] Technical Consultant

[ ] Other (specify)

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Engineering Report For
Herbert M. Hoppe
W B H R (A M)
Sauk Rapids, Minnesota
July 2012

This engineering report documents the Directional Antenna Performance Verification measurements for WBHR (AM), FCC facility ID number 26980, Sauk Rapids, Minnesota. WBHR is authorized to operate on 660 KHz with 10 KW using a two tower directional antenna daytime and 0.5 KW nighttime using a three tower directional antenna. This Verification is for the purpose of relicensing the WBHR antenna system under the "model proof" rules. All measurements were made personally by the writer in accordance with the FCC rules at 47 CFR 73.151(c).

Eligibility for 73.151(c) Processing

The WBHR antenna system consists of four conventional uniform cross-section insulated steel radiators, series-fed with no top loading. They are 70° tall at the WBHR frequency (660 KHz) and are sampled at the base using Delta TCT-3 toroidal current transformers. The ground system is of standard design, consisting of 120 equally-spaced buried bare copper wire radials around each tower 113.4 meters long (90°) except for those which intersect, with 4" copper straps terminating the radial intersections and interconnecting the towers. A 4" strap interconnects the towers to each other and to the phasor and transmitter.

Background

The WBHR antenna system shares towers with WXYG (facility ID 161448), WVAL (facility ID 78917) and WMIN (facility ID 161428) all licensed to Sauk Rapids, Minnesota. The combining system was designed and constructed during implementation of the construction permits for WXYG and WMIN. Filters used to isolate each station are of a standard design and are documented later in this report. The antenna current sample elements are Delta Electronics TCT-3 current transformers and are located at the output from the series filters on the lead to the tower. There are no shunt

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elements between the filter and the tower except for the static drain or tower lighting choke which presents a high parallel reactance (more than 10 times the tower impedance) at 660 KHz. Equal lengths of Andrew 3/8" LDF2-50 Heliax foam coaxial cable are used as sample lines. A Potomac Instruments AM-19 (204) antenna monitor is used to keep tabs on the array. The monitor was recalibrated and checked for proper operation in accordance with the manufacturer's instructions.

Measurements

The WBHR system was modeled using Westberg Consulting's Phasor Professional 2.1.1 which calculates the tower matrix values as well as the proper operating parameters. The towers and sample lines were measured and documented using an Array Solutions PowerAIM-120 network analyzer serial number 1019 operated in accordance with the manufacturer's instructions. This analyzer has been used in several recent projects and exhibits excellent stability and field performance and since it operates "floating" via battery power and a Bluetooth radio connection to the associated computer no RF ground loop issues arise.

The four WBHR towers are identical and are base sampled using toroidal current transformers. Each tower was disconnected from its ATU at the sample transformer using the jack installed for this purpose and was measured at that point. The other towers were individually shorted and/or left floating for each measurement as required, plus additional measurements with the subject tower base insulator shorted to measure the feedline impedance and electrical length from the ATU to the tower as well as at the tower itself with the ATU disconnected. These measurements are documented below and show good agreement with the Westberg theoretical numbers. Three of the towers on-site are not used by WBHR are detuned using the appropriate reactance to ground.

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Theoretical Data:

TOWER MODEL INFORMATION

TOWER INFORMATION						
	Tower Height (°)	Spacing (°)	Orientation	Face Width (in.)	Radius (in.)	Velocity Factor
Tower 1	70.0000	0.0000	0.0000	14.0000 / 14.0000	6.4663 / 6.4663	0.925000
Tower 2	70.0000	66.0000	276.0000	14.0000 / 14.0000	6.4663 / 6.4663	0.925000
Tower 3	70.0000	132.0000	276.0000	14.0000 / 14.0000	6.4663 / 6.4663	0.925000
Tower 4	70.0000	119.6000	228.0000	14.0000 / 14.0000	6.4663 / 6.4663	0.925000
Tower 5	47.0600	39.0500	200.5000	12.0000 / 12.0000	5.5426 / 5.5426	0.830000
Tower 6	47.0600	95.9700	290.6000	12.0000 / 12.0000	5.5426 / 5.5426	0.810000
Tower 7	70.0000	92.6400	327.3000	14.0000 / 14.0000	6.4663 / 6.4663	0.880000

MATRIX INFORMATION [47 CFR 73.151(c)(1)]

MATRIX INFORMATION		
	Impedance (other towers open)	Impedance (measured)
Tower 1	22.39 - j68.88	22.4 - j71.7
Tower 2	22.13 - j70.03	22.6 - j70.0
Tower 3	22.40 - j68.80	21.8 - j71.2
Tower 4	22.60 - j68.30	22.5 - j68.8
Tower 5	10.60 - j198.69	10.8 - j192.6
Tower 6	11.38 - j188.95	12.9 - j187.9
Tower 7	26.01 - j45.31	25.7 - j46.1

The Westberg Phasor Professional method-of-moments model fully complies with all FCC requirements for tower radius, height, segment length, and calculation references points. No shunt capacitance was used. Towers were adjusted by varying the propagation velocity as shown above. The measured impedances agree with the model within +/- 2 ohms +/- 4%. Westberg's Phasor Professional uses a single wire of the desired effective radius divided into segments or no more than 10° electrical length each to model the tower.

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DETUNED TOWER CURRENTS from Westberg Phasor Professional

Tower 1
0.000000 > 0.000000 - 70.00° above ground
0.111735 > -98.631349 - 60.00° above ground
0.158142 > -101.479866 - 50.00° above ground
0.151180 > -104.988539 - 40.00° above ground
0.089748 > -111.493084 - 30.00° above ground
0.034567 > 99.848986 - 20.00° above ground
0.216521 > 76.991853 - 10.00° above ground
0.523356 > 72.795356 - 0.00° above ground
Tower 2
0.000000 > 0.000000 - 70.00° above ground
0.111399 > -98.331750 - 60.00° above ground
0.157668 > -101.203408 - 50.00° above ground
0.150804 > -104.776304 - 40.00° above ground
0.089725 > -111.462577 - 30.00° above ground
0.034455 > 101.031310 - 20.00° above ground
0.215889 > 77.260655 - 10.00° above ground
0.522855 > 72.857956 - 0.00° above ground
Tower 3
0.000000 > 0.000000 - 70.00° above ground
0.079673 > -162.383622 - 60.00° above ground
0.112950 > -162.207928 - 50.00° above ground
0.107744 > -161.988640 - 40.00° above ground
0.062981 > -161.530049 - 30.00° above ground
0.023243 > 16.126534 - 20.00° above ground
0.154625 > 17.869265 - 10.00° above ground
0.370977 > 18.218475 - 0.00° above ground
Tower 4
0.000000 > 0.000000 - 70.00° above ground
0.084609 > -150.805296 - 60.00° above ground
0.120214 > -150.884570 - 50.00° above ground
0.114892 > -151.002557 - 40.00° above ground

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0.067279 > -151.241741 - 30.00° above ground
0.024674 > 29.930057 - 20.00° above ground
0.164773 > 29.061651 - 10.00° above ground
0.395096 > 28.902232 - 0.00° above ground
Tower 5
0.000000 > 0.000000 - 47.06° above ground
0.097608 > -86.128347 - 37.65° above ground
0.110955 > -93.920750 - 28.24° above ground
0.054134 > -109.349073 - 18.82° above ground
0.085909 > 94.278034 - 9.41° above ground
0.350655 > 81.689854 - 0.00° above ground
Tower 6
0.000000 > 0.000000 - 47.06° above ground
0.072470 > -131.426119 - 37.65° above ground
0.084595 > -132.207294 - 28.24° above ground
0.041309 > -133.585517 - 18.82° above ground
0.063578 > 48.521534 - 9.41° above ground
0.269570 > 47.446571 - 0.00° above ground
Tower 7
0.000000 > 0.000000 - 70.00° above ground
0.103467 > -125.191826 - 60.00° above ground
0.147953 > -126.217030 - 50.00° above ground
0.142404 > -127.481131 - 40.00° above ground
0.084491 > -129.832880 - 30.00° above ground
0.029625 > 62.138877 - 20.00° above ground
0.203661 > 53.223065 - 10.00° above ground
0.490594 > 51.695769 - 0.00° above ground

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MATRIX CALCULATIONS from Westberg Phasor Professional

ZMatrix						
22.39 - j68.88	16.03 - j7.75	2.55 - j12.93	5.36 - j12.40	13.89 - j4.24	7.34 - j8.51	11.97 - j11.63
16.03 - j7.75	22.13 - j70.03	16.05 - j7.69	11.39 - j10.63	10.81 - j6.19	14.49 - j5.01	16.06 - j9.23
2.55 - j12.93	16.05 - j7.69	22.40 - j68.80	9.00 - j11.47	2.38 - j8.97	13.73 - j4.68	9.52 - j12.67
5.36 - j12.40	11.39 - j10.63	9.00 - j11.47	22.60 - j68.30	8.49 - j7.15	4.64 - j9.02	-3.46 - j12.01
13.89 - j4.24	10.81 - j6.19	2.38 - j8.97	8.49 - j7.15	10.60 - j198.69	4.26 - j6.33	3.91 - j9.51
7.34 - j8.51	14.48 - j5.01	13.73 - j4.68	4.64 - j9.02	4.26 - j6.33	11.38 - j188.95	13.31 - j5.67
11.97 - j11.63	16.06 - j9.23	9.52 - j12.67	-3.46 - j12.01	3.91 - j9.51	13.31 - j5.67	26.01 - j45.31

YMatrix						
0.003657 + j0.014388	0.001068 - j0.001490	-0.001928 - j0.001281	-0.000312 - j0.001616	0.000725 - j0.000274	-0.000138 - j0.000483	0.000226 - j0.003600
0.001068 - j0.001490	0.001983 + j0.013795	0.001140 - j0.001458	0.000572 - j0.001710	0.000245 - j0.000358	0.000388 - j0.000459	0.000998 - j0.003323
-0.001928 - j0.001281	0.001140 - j0.001458	0.003768 + j0.014422	0.000575 - j0.002071	-0.000348 - j0.000319	0.000548 - j0.000341	-0.000568 - j0.003196
-0.000312 - j0.001616	0.000572 - j0.001710	0.000575 - j0.002071	0.004339 + j0.013797	0.000331 - j0.000451	-0.000140 - j0.000380	-0.003956 + j0.000201
0.000725 - j0.000274	0.000245 - j0.000358	-0.000348 - j0.000319	0.000331 - j0.000451	0.000196 + j0.005039	-0.000048 - j0.000099	-0.000444 - j0.000621
-0.000138 - j0.000483	0.000388 - j0.000459	0.000548 - j0.000341	-0.000140 - j0.000380	-0.000048 - j0.000099	0.000143 + j0.005272	0.000571 - j0.000817
0.000226 - j0.003600	0.000998 - j0.003323	-0.000568 - j0.003196	-0.003956 + j0.000201	-0.000444 - j0.000621	0.000571 - j0.000817	0.008761 + j0.018989

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HMatrix - [I] = [H] X [F]						
0.017421 + j0.000571	0.000117 + j0.000427	0.000294 + j0.000108	0.000287 + j0.000170	-0.000104 + j0.000526	0.000244 + j0.000295	0.000227 + j0.000306
0.000116 + j0.000427	0.017420 + j0.000571	0.000117 + j0.000426	0.000220 + j0.000320	0.000127 + j0.000426	-0.000135 + j0.000532	0.000149 + j0.000396
0.000295 + j0.000108	0.000118 + j0.000428	0.017421 + j0.000572	0.000258 + j0.000256	0.000299 + j0.000132	-0.000026 + j0.000506	0.000258 + j0.000251
0.000287 + j0.000171	0.000221 + j0.000321	0.000258 + j0.000256	0.017421 + j0.000573	0.000216 + j0.000341	0.000285 + j0.000205	0.000270 - j0.000032
0.000033 + j0.000295	0.000091 + j0.000240	0.000169 + j0.000075	0.000129 + j0.000191	0.025849 + j0.000330	0.000158 + j0.000147	0.000165 + j0.000096
0.000149 + j0.000173	0.000025 + j0.000312	0.000044 + j0.000296	0.000169 + j0.000120	0.000165 + j0.000153	0.025068 + j0.000343	0.000071 + j0.000268
0.000247 + j0.000334	0.000158 + j0.000435	0.000280 + j0.000275	0.000295 - j0.000036	0.000318 + j0.000186	0.000069 + j0.000501	0.016143 + j0.000621

HMatrix-inverse - [F] = $[H]^{-1}$ X [I]						
57.318710 - j1.792192	-0.506017 - j1.280775	-1.021627 - j0.198197	-0.973799 - j0.423615	0.180063 - j1.111392	-0.639525 - j0.584817	-0.888705 - j0.953942
-0.505558 - j1.279969	57.227188 - j1.770327	-0.501545 - j1.281071	-0.801916 - j0.908270	-0.363883 - j0.863492	0.193166 - j1.157877	-0.655875 - j1.281233
-1.021619 - j0.198372	-0.501287 - j1.282567	57.325814 - j1.793077	-0.886835 - j0.716063	-0.703743 - j0.186164	-0.018397 - j1.098574	-0.984369 - j0.757674
-0.973383 - j0.424172	-0.802070 - j0.909198	-0.886602 - j0.716573	57.366096 - j1.809012	-0.512171 - j0.677529	-0.698894 - j0.367886	-0.953784 + j0.283238
-0.101730 - j0.613215	-0.245736 - j0.477128	-0.392710 - j0.103788	-0.301328 - j0.376094	38.666528 - j0.468719	-0.271438 - j0.186943	-0.416271 - j0.170059
-0.380008 - j0.334517	-0.122198 - j0.663479	-0.142186 - j0.629752	-0.407585 - j0.209694	-0.281673 - j0.193178	39.848407 - j0.522066	-0.220933 - j0.610787
-0.963298 - j1.042988	-0.697994 - j1.402819	-1.070530 - j0.828335	-1.042012 + j0.310479	-0.809937 - j0.337976	-0.269411 - j1.163377	61.833222 - j2.276591

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Tower Currents

Mode 1-Daytime
Tower 1
0.000000 > 0.000000 - 70.00° above ground
0.127656 > -169.586731 - 60.00° above ground
0.179456 > -171.060591 - 50.00° above ground
0.169650 > -172.912582 - 40.00° above ground
0.097867 > -176.461381 - 30.00° above ground
0.039573 > 19.650328 - 20.00° above ground
0.244606 > 8.125067 - 10.00° above ground
0.582002 > 5.927748 - 0.00° above ground
Tower 2
0.000000 > 0.000000 - 70.00° above ground
2.903229 > -93.871356 - 60.00° above ground
5.301155 > -93.304940 - 50.00° above ground
7.405030 > -92.678614 - 40.00° above ground
9.186575 > -91.960129 - 30.00° above ground
10.610216 > -91.106771 - 20.00° above ground
11.650408 > -90.048197 - 10.00° above ground
12.373677 > -88.432292 - 0.00° above ground
Tower 3
0.000000 > 0.000000 - 70.00° above ground
0.125428 > -160.910793 - 60.00° above ground
0.176329 > -162.505717 - 50.00° above ground
0.166714 > -164.513160 - 40.00° above ground
0.096207 > -168.384987 - 30.00° above ground
0.039121 > 29.197529 - 20.00° above ground
0.240410 > 16.622423 - 10.00° above ground
0.571614 > 14.188522 - 0.00° above ground
Tower 4
0.000000 > 0.000000 - 70.00° above ground
3.584445 > -2.698947 - 60.00° above ground
6.603254 > -2.347148 - 50.00° above ground

Mode 2-Nighttime
Tower 1
0.000000 > 0.000000 - 70.00° above ground
0.769203 > -3.069551 - 60.00° above ground
1.416193 > -2.699747 - 50.00° above ground
1.995909 > -2.308325 - 40.00° above ground
2.500647 > -1.880061 - 30.00° above ground
2.920914 > -1.396104 - 20.00° above ground
3.250469 > -0.825424 - 10.00° above ground
3.519667 > -0.000000 - 0.00° above ground
Tower 2
0.000000 > 0.000000 - 70.00° above ground
0.030170 > -119.317629 - 60.00° above ground
0.042739 > -122.134897 - 50.00° above ground
0.040924 > -125.625685 - 40.00° above ground
0.024401 > -132.115865 - 30.00° above ground
0.009211 > 79.798033 - 20.00° above ground
0.058538 > 56.358369 - 10.00° above ground
0.142100 > 52.098119 - 0.00° above ground
Tower 3
0.000000 > 0.000000 - 70.00° above ground
0.524597 > -53.920294 - 60.00° above ground
0.964993 > -53.127028 - 50.00° above ground
1.358912 > -52.275768 - 40.00° above ground
1.701338 > -51.331891 - 30.00° above ground
1.986093 > -50.253030 - 20.00° above ground
2.209321 > -48.970225 - 10.00° above ground
2.392480 > -47.105510 - 0.00° above ground
Tower 4
0.000000 > 0.000000 - 70.00° above ground
0.064740 > -49.398932 - 60.00° above ground
0.123002 > -44.711627 - 50.00° above ground

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9.311770 > -1.983876 - 40.00° above ground	0.180527 > -40.001989 - 40.00° above ground
11.673613 > -1.597035 - 30.00° above ground	0.238077 > -35.222674 - 30.00° above ground
13.643936 > -1.172384 - 20.00° above ground	0.296424 > -30.356094 - 20.00° above ground
15.192959 > -0.685854 - 10.00° above ground	0.357110 > -25.359825 - 10.00° above ground
16.463726 > -0.000000 - 0.00° above ground	0.434130 > -19.411438 - 0.00° above ground
Tower 5	Tower 5
0.000000 > 0.000000 - 47.06° above ground	0.000000 > 0.000000 - 47.06° above ground
0.086707 > -157.237986 - 37.65° above ground	0.015150 > -113.542869 - 37.65° above ground
0.099747 > -159.324938 - 28.24° above ground	0.018424 > -121.304870 - 28.24° above ground
0.047349 > -163.603772 - 18.82° above ground	0.010050 > -134.089607 - 18.82° above ground
0.076252 > 22.921453 - 9.41° above ground	0.013288 > 66.873877 - 9.41° above ground
0.314910 > 19.450859 - 0.00° above ground	0.060308 > 54.762099 - 0.00° above ground
Tower 6	Tower 6
0.000000 > 0.000000 - 47.06° above ground	0.000000 > 0.000000 - 47.06° above ground
0.112627 > -160.069319 - 37.65° above ground	0.024125 > -136.459244 - 37.65° above ground
0.126474 > -164.884914 - 28.24° above ground	0.027895 > -139.817788 - 28.24° above ground
0.058389 > -175.024003 - 18.82° above ground	0.013493 > -146.372405 - 18.82° above ground
0.099064 > 20.190680 - 9.41° above ground	0.021183 > 43.694357 - 9.41° above ground
0.395477 > 12.335817 - 0.00° above ground	0.088526 > 38.337829 - 0.00° above ground
Tower 7	Tower 7
0.000000 > 0.000000 - 70.00° above ground	0.000000 > 0.000000 - 70.00° above ground
0.131642 > 167.778141 - 60.00° above ground	0.025541 > -150.357113 - 60.00° above ground
0.186669 > 166.765476 - 50.00° above ground	0.036626 > -151.142197 - 50.00° above ground
0.177856 > 165.464935 - 40.00° above ground	0.035367 > -152.101272 - 40.00° above ground
0.103563 > 162.963203 - 30.00° above ground	0.021098 > -153.859935 - 30.00° above ground
0.039821 > -5.233566 - 20.00° above ground	0.007138 > 35.320657 - 20.00° above ground
0.255814 > -13.815190 - 10.00° above ground	0.050488 > 28.429397 - 10.00° above ground
0.608838 > -15.404746 - 0.00° above ground	0.122090 > 27.291749 - 0.00° above ground

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TOWER DRIVE INFORMATION - DAY

	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Antenna Monitor*	Power (W)
Tower 1	0.0000	0.0000	-28.35 - j794.41	0.58 ∠ 5.93	(detuned)	-9.6014
Tower 2	0.7800	0.0000	37.98 - j52.26	12.37 ∠ -88.43	75.2% ∠ -88.4°	5815.3140
Tower 3	0.0000	0.0000	-31.58 - j793.83	0.57 ∠ 14.19	(detuned)	-10.3177
Tower 4	1.0000	90.0000	15.59 - j78.46	16.46 ∠ 0.00	100.0% ∠ 0.0°	4226.1239
Tower 5	0.0000	0.0000	-31.06 - j1086.88	0.31 ∠ 19.45	(detuned)	-3.0802
Tower 6	0.0000	0.0000	-71.11 - j1054.38	0.40 ∠ 12.32	(detuned)	-11.1214
Tower 7	0.0000	0.0000	-19.74 - j764.44	0.61 ∠ -15.41	(detuned)	-7.3171

Towers 1, 3, 5-7 are detuned using the appropriate series reactance.

TOWER DRIVE INFORMATION – NIGHT

	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Antenna Monitor*	Power (W)
Tower 1	1.0000	0.0000	18.92 - j77.55	3.52 ∠ 0.00	100.0% ∠ 0.0°	234.3421
Tower 2	0.0000	0.0000	-54.31 - j811.06	0.14 ∠ 52.10	(detuned)	-1.0965
Tower 3	0.6800	-49.0000	42.78 - j78.18	2.39 ∠ -47.11	67.9% ∠ -47.1°	244.8501
Tower 4	0.1000	-30.0000	121.12 - j227.63	0.43 ∠ -19.41	12.2% ∠ -19.4°	22.8265
Tower 5	0.0000	0.0000	-97.62 - j1142.47	0.06 ∠ 54.75	(detuned)	-0.3552
Tower 6	0.0000	0.0000	-45.99 - j1074.89	0.09 ∠ 38.33	(detuned)	-0.3605
Tower 7	0.0000	0.0000	-13.86 - j775.57	0.12 ∠ 27.28	(detuned)	-0.2066

Towers 2, 5-7 are detuned using the appropriate series reactance.

*** = These are the pattern parameters used to tune the array and are on the Form 302.**

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Sample System Verification [47 CFR 73.151(c)(2)]

Sample Lines: Andrew 3/8" LDF2-50 foam dielectric Heliax coaxial cable

88% velocity factor, 50 +/-1 ohms

Lines were cut to equal electrical length and terminated with proper connectors. Short flexible jumpers run from the Heliax to the antenna monitor, and they are included in these measurements.

Sample Element Type: Delta Electronics TCT-3 Toroidal Current Transformers

Location: At output of antenna tuning network and diplex filter.

Operating Potential: Grounded

Antenna Monitor: Potomac Instruments AM-19 (204) s/n 2087

TCT-3 Serial Numbers & Z at 1200 KHz:

Tower 1 (E):	1907	50.1 +j1.02 ohms
Tower 2 (C):	1908	49.9 +j0.92 ohms
Tower 3 (W):	1899	50.2 +j0.86 ohms
Tower 4 (S):	1894	50.3 +j1.04 ohms

(Current Transformers are matched within 0.4 ohm resistance and j0.18 ohms reactance)

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TCT-3 Phase and Ratio Test (Tower 2 is reference):

Tower 1:	1.000/ +0.3°
Tower 3:	1.004/ +0.5°
Tower 4:	1.000/ +0.2°

(Current Transformers are matched within 0.4% ratio and 0.5° phase)

The phase and ratio calibration test was done with transformers removed from the ACUs and configured in pairs with the #2 transformer adjacent to each other reading RF current to tower #2 in day pattern at 500 watts. The cables used to connect the TCTs to the monitor are identical in electrical length and characteristic impedance and are maintained by the writer for this purpose.

Sample Line Length Test (see graph data which follows):

Tower 1 Closest Odd ¼ wave Resonant Frequency: 605.597 KHz (1218.6 feet)
294.08° at 660 KHz

Tower 2 Closest Odd ¼ wave Resonant Frequency: 606.225 KHz (1217.4 feet)
293.95° at 660 KHz

Tower 3 Closest Odd ¼ wave Resonant Frequency: 605.806 KHz (1218.2 feet)
294.15° at 660 KHz

Tower 4 Closest Odd ¼ wave Resonant Frequency: 606.091 KHz (1217.6 feet)
294.02° at 660 KHz

Maximum Difference in Electrical Length: 1.20 feet, 0.29° at 660 KHz

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Sample Line Impedance Test (see graph data which follows):

Tower 1 (East) Sample Line Mean Zmag:	50.453 ohms
Tower 2 (Center) Sample Line Mean Zmag:	50.328 ohms
Tower 3 (West) Sample Line Mean Zmag:	50.442 ohms
Tower 4 (South) Sample Line Mean Zmag:	50.644 ohms

Maximum Variation in Sample Line Impedance: 0.316 ohms

Sample Impedance From Monitor End (with sample element connected, see graph data):

Tower 1 (East) Sample Impedance:	49.622 -j3.70 ohms
Tower 2 (Center) Sample Impedance:	49.333 -j3.56 ohms
Tower 3 (West) Sample Impedance:	49.283 -j3.12 ohms
Tower 4 (South) Sample Impedance:	49.603 -j2.55 ohms

Maximum Variation in Sample Resistance: 0.34 ohms
Maximum Variation in Sample Reactance: j1.15 ohms

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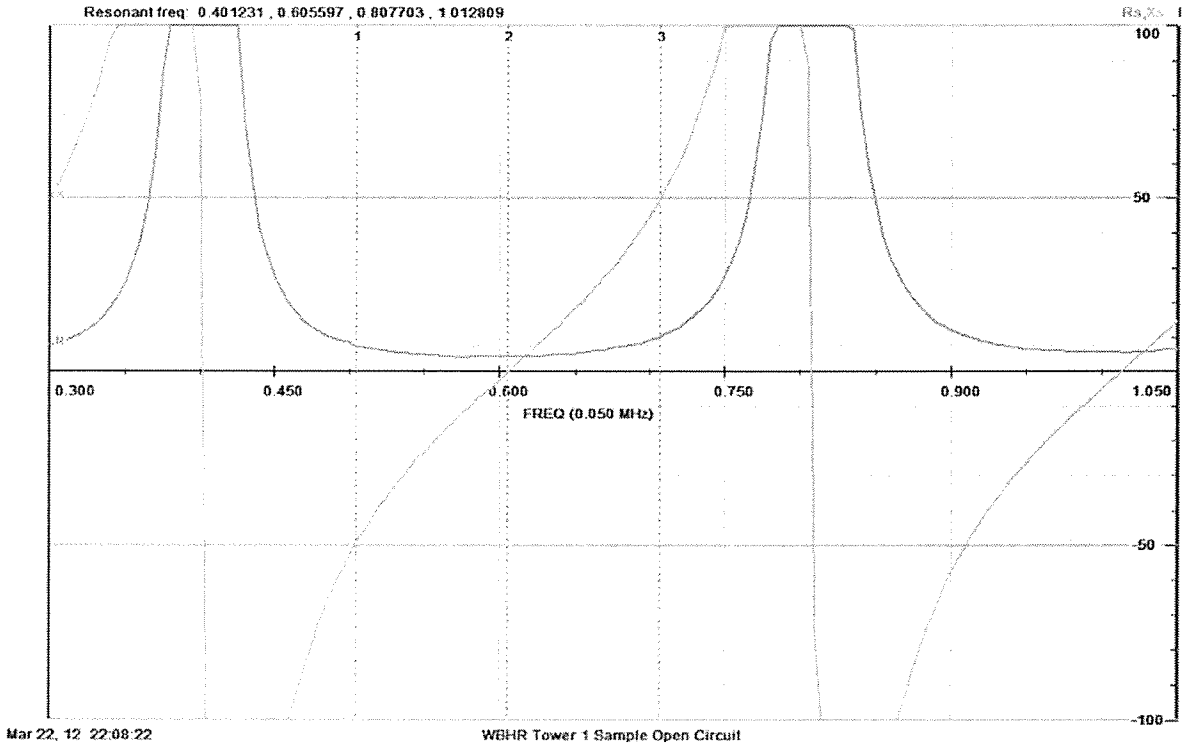
Tower 1 (East) Sample Line (open circuit)



Marker	Freq	Rs	Xs	Zmag
[1]	0.504664	7.446	-49.387	49.945
[2]	0.605597	4.535	-0.000	
[3]	0.706530	10.305	49.914	50.967

Markers: [1] = closest odd quarter wave minus 1/8 wavelength
[2] = closest odd quarter wave
[3] = closest odd quarter wave plus 1/8 wavelength

Mean Tower 1 Sample Line Zmag: 50.453 ohms

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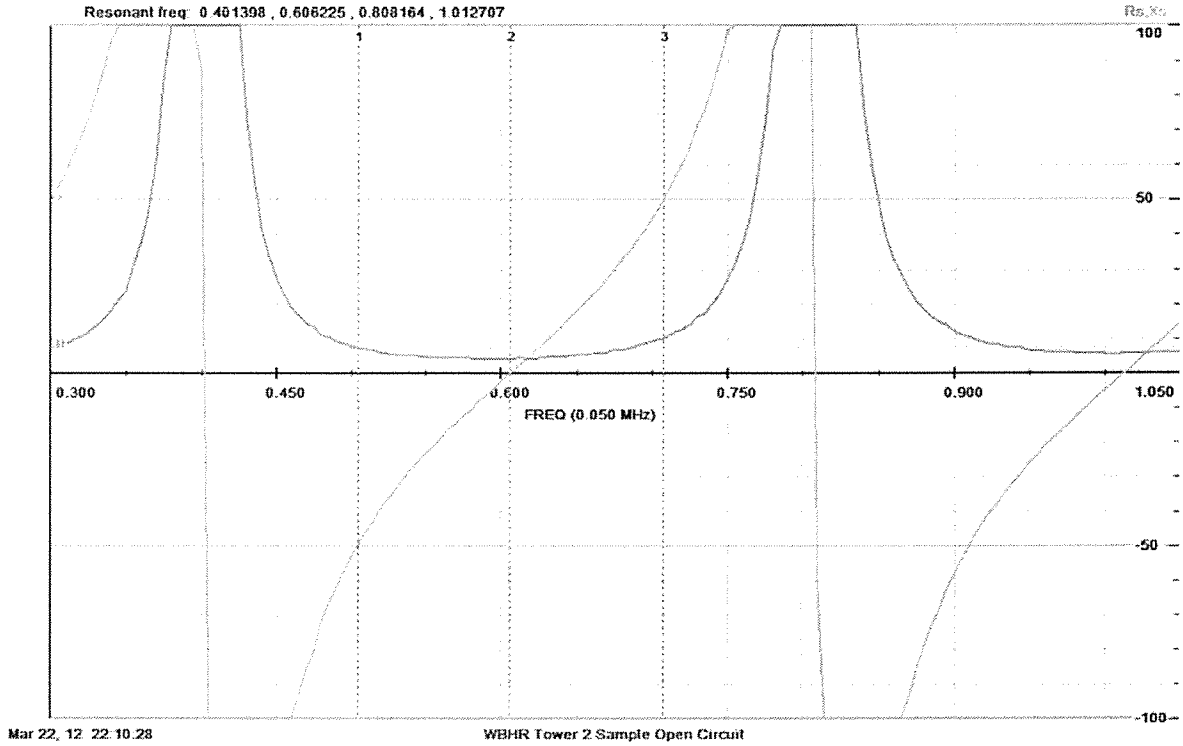
Tower 2 (Center) Sample Line (open circuit)



Marker	Freq	Rs	Xs	Zmag
[1]	0.505188	7.459	-49.228	49.790
[2]	0.606225	4.393	-0.000	
[3]	0.707263	10.314	49.815	50.871

Markers: [1] = closest odd quarter wave minus 1/8 wavelength
[2] = closest odd quarter wave
[3] = closest odd quarter wave plus 1/8 wavelength

Mean Tower 2 Sample Line Zmag: 50.328 ohms

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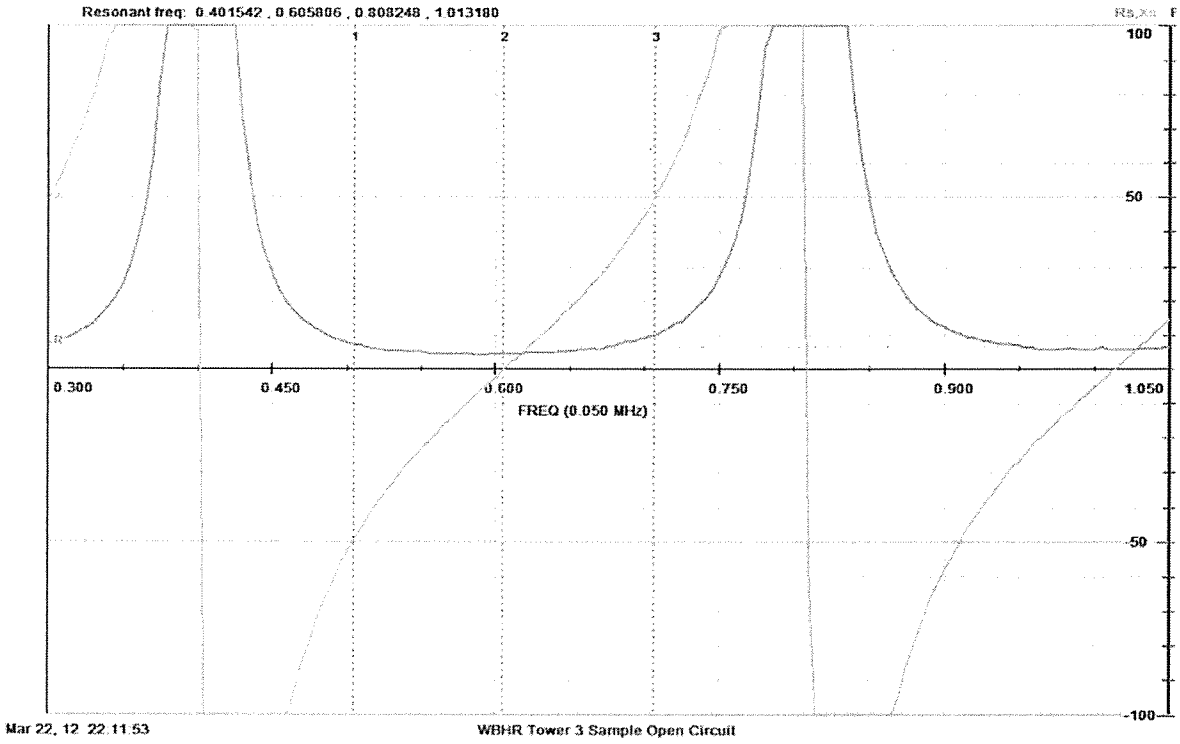
Tower 3 (West) Sample Line (open circuit)



Marker	Freq	Rs	Xs	Zmag
[1]	0.504838	7.492	-49.517	50.081
[2]	0.605806	4.552	-0.000	
[3]	0.706774	10.231	49.764	50.805

Markers: [1] = closest odd quarter wave minus 1/8 wavelength
[2] = closest odd quarter wave
[3] = closest odd quarter wave plus 1/8 wavelength

Mean Tower 3 Sample Line Zmag: 50.443 ohms

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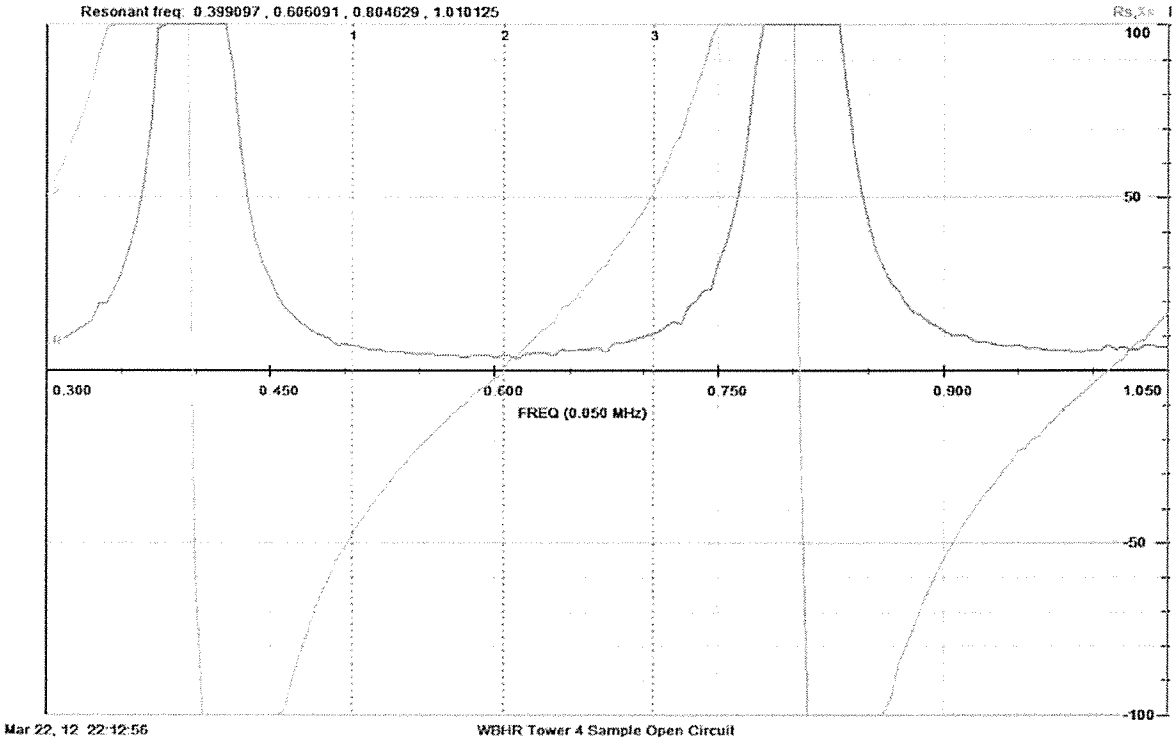
Tower 4 (North) Sample Line (open circuit)



Marker	Freq	Rs	Xs	Zmag
[1]	0.505076	7.453	-47.482	48.064
[2]	0.606091	4.797	-0.000	
[3]	0.707106	10.960	52.224	53.362

Markers: [1] = closest odd quarter wave minus 1/8 wavelength
[2] = closest odd quarter wave
[3] = closest odd quarter wave plus 1/8 wavelength

Mean Tower 4 Sample Line Zmag: 50.644 ohms

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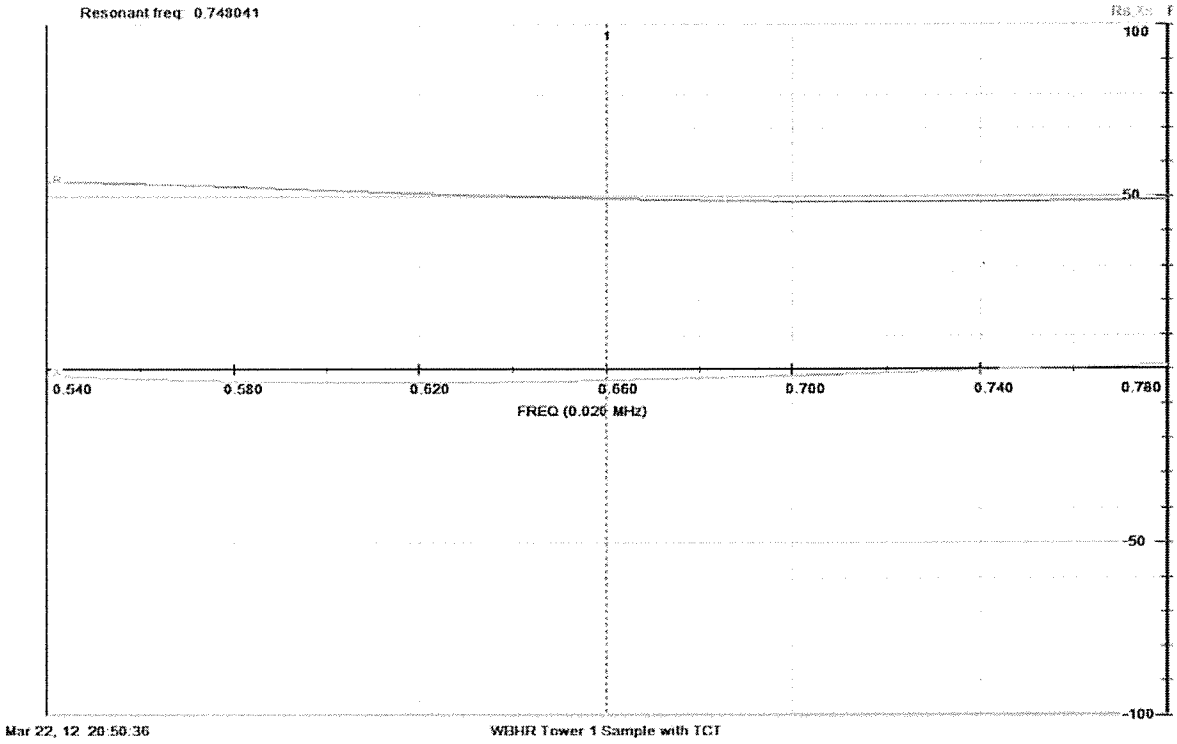
Sample lines from antenna monitor end with TCT-3s connected at towers as normal:

Tower 1 (East)



Impedance of Tower 1 line at 660 KHz, monitor end with transformer connected at other end:

49.622 -j3.70 ohms

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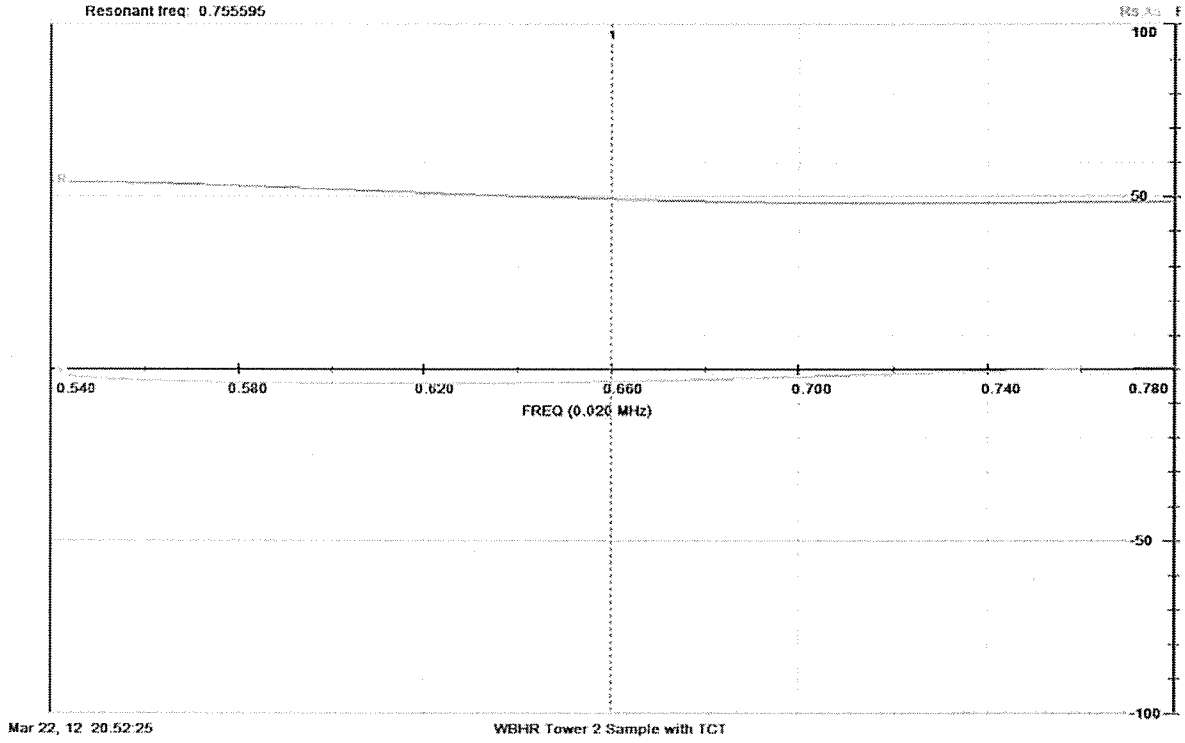
Tower 2 (Center)



Impedance of Tower 2 line at 660 KHz, monitor end with transformer connected at other end:

49.333 -j3.564 ohms

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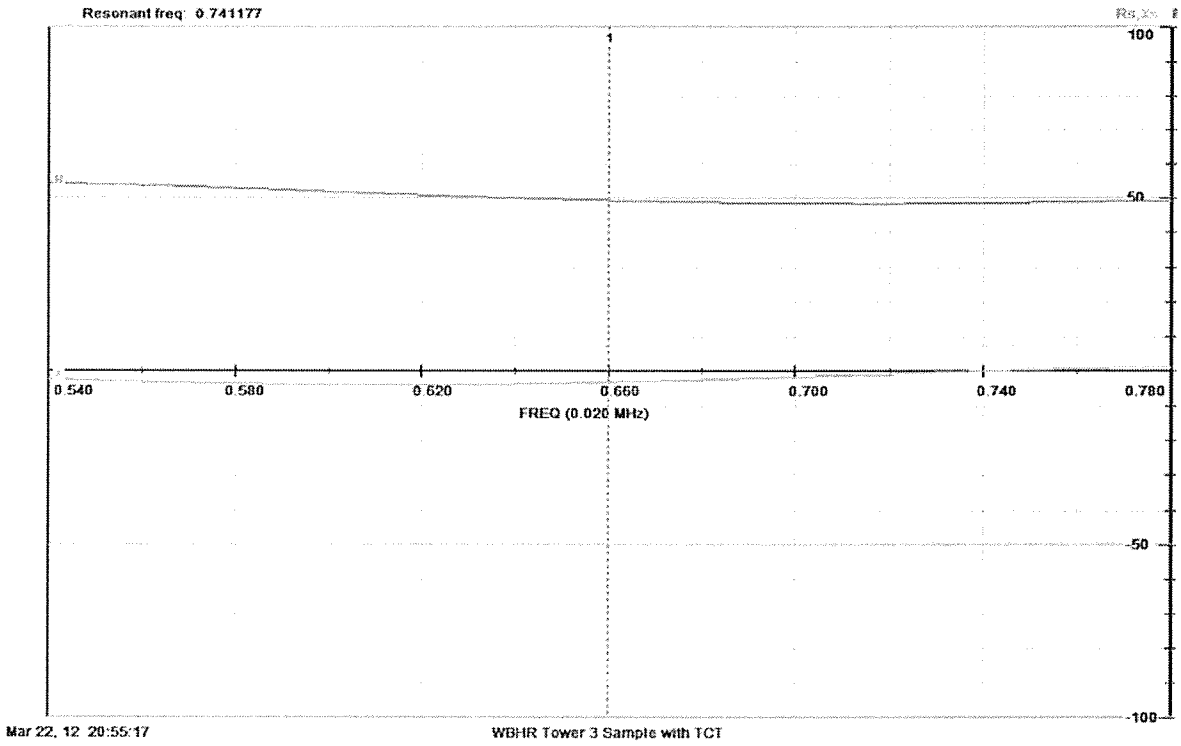
Tower 3 (West)



Impedance of Tower 3 line at 660 KHz, monitor end with transformer connected at other end:

49.283 –j3.12 ohms

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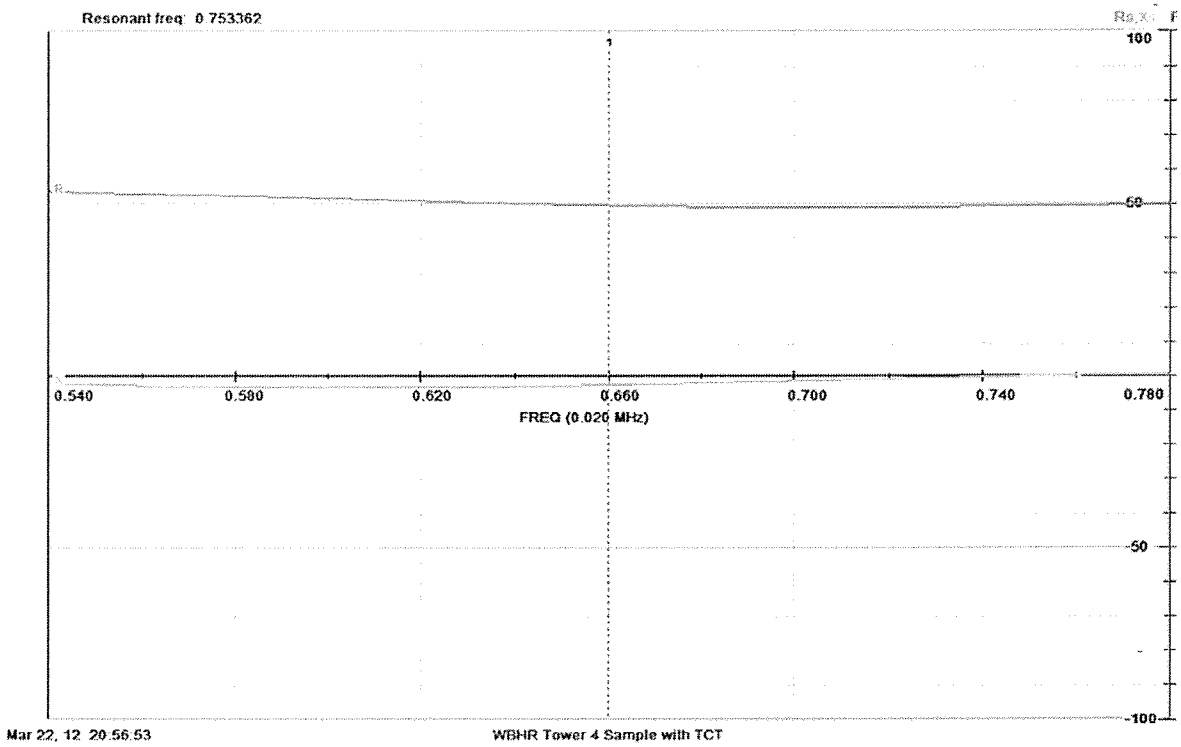
Tower 4 (South)



Impedance of Tower 4 line at 660 KHz, monitor end with transformer connected at other end:

49.603 -j2.55 ohms

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WBHR Daytime Reference Field Strength Measurements

[47 CFR 73.151(c)(3)]

Point	Distance	mv/m	Coordinates (NAD 83)	Description
15° True (Maxima)				
1:	3.14 km	330	45.632026, -94.128796	19: CR 15 at driveway
2:	4.89	200	45.647300, -94.122866	22: 55th St. NE between driveways
3:	6.58	165	45.661909, -94.117340	24: 65th St. NE at creek
195° True (Minima, monitor point radial)				
1:	2.37	65.0	45.58405, -94.14729	16*: 461 13th Ave. South at phone peds
2:	2.54	50.0	45.58311, -94.14896	17: 13th Ave. South at 5th St. South
3:	3.03	51.0	45.58082, -94.15909	20: Benton Dr. at divided hwy sign

WBHR Nighttime Reference Field Strength Measurements

[47 CFR 73.151(c)(3)]

84.5° True (Minima, monitor point radial)				
1:	3.78	8.5	45.608010, -94.091162	6*: 35th Ave NE at "narrow bridge" sign
2:	5.02	5.5	45.608732, -94.075506	7: 42nd Ave NE by marker at treeline
3:	6.62	4.0	45.601427, -94.054742	8: 52nd Ave NE
213° True (Maxima)				
1:	1.75	145	45.591700, -94.151579	5: HS parking lot off 1st Ave South
2:	2.16	100	45.588883, -94.154059	6: 308 9th Ave South
3:	2.38	105	45.587105, -94.155778	7: 8th Ave South at Linda Lane
273.5° True (Minima, monitor point radial)				
1:	4.19	82	45.605840, -94.164264	4*: 1300 9th Ave NE
2:	6.94	80	45.605974, -94.165661	5: 8th Ave N at cul-de-sac
3:	9.55	74	45.605934, -94.167231	6: 1246 7th Ave N at fireplug
330° True (Maxima)				
1:	2.34	115	45.623219, -94.154451	4: CR57 at field access drive
2:	3.01	75	45.628217, -94.158708	5: 43rd St. NE at field access drive
3:	5.73	40	45.649214, -94.176231	6: US 10 northbound at CR 33 exit sign

* - licensed monitor point
Numbers before description are antenna proof point numbers.

Measurements taken July 15, 2012.

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Tower Survey [47 CFR 73.151(c)(1)(ix)]

All seven towers were surveyed on June 15, 2010 by Timothy D. Larson, a licensed Professional Land Surveyor in the state of Minnesota (license number 43809), and were found to be as follows as shown on the report:

Tower 2 (C) to 1 (W): 272.9 feet (65.89°) at 276.09° True (theo. 66° at 276°T)

Tower 2 (C) to 3 (E): 272.5 feet (65.80°) at 96.04° True (theo. 66° at 96°T)

Tower 2 (C) to 4 (S): 372.1 feet (89.85°) at 195.05° True (theo. 90° at 195.0°T)

Tower 2 (C) to 5* (SE): 279.5 feet (67.56°) at 130.14° True

Tower 2 (C) to 6* (NW): 233.7 feet (52.76°) at 307.82° True

Tower 2 (C) to 7* (N): 303.8 feet (73.36°) at 12.91° True

* = tower is not used by WBHR

Tower numbers 1 and 3 are reversed on the surveyor report. For convenience in comparison with the numbering used on the Form 302, the tower spacings and bearings are recalculated below using actual tower 1 (E) as the reference:

Actual Tower Number	Survey Tower Number	Distance in Meters from Tower 1	Distance in Degrees from Tower 1	Licensed Distance in Degrees	Bearing, Degrees True from Tower 1	Licensed Bearing (degrees true)
1 (E)	3	(reference)	(reference)	(reference)	(ref.)	(reference)
2 (C)	2	83.08	65.80	66.0	276.1	276.0
3 (W)	1	166.20	131.63	132.0	276.0	276.0
4 (S)	4	150.67	119.33	119.66	227.9	228.0
5 (SE)	5	49.30	39.06	n/a	200.5	n/a
6 (SW)	6	148.10	117.30	n/a	290.6	n/a
7 (N)	7	116.59	92.34	n/a	327.9	n/a

This corresponds to a maximum relative spacing error for towers 1, 2, 3 and 4 of less than 0.4° and bearing error of less than 0.1° with either #1 or #2 as reference, well within the allowed tolerances of +/- 1.5°.

3717 23rd Street S
St. Cloud, MN 56301
Tel 320-251-4553
Fax 320-251-6252

Bonestroo

GEODETIC COORDINATE CERTIFICATION

West

TOWER 1
Ground Elevation = 1080.7

	DEGREES	MINUTES	SECONDS	DATUM
LATITUDE	45	36	17.45 N	NAD 83
LONGITUDE	94	08	25.31 W	NAD 83

Center

TOWER 2
Ground Elevation = 1080.2

	DEGREES	MINUTES	SECONDS	DATUM
LATITUDE	45	36	17.17 N	NAD 83
LONGITUDE	94	08	21.49 W	NAD 83

East

TOWER 3
Ground Elevation = 1081.5

	DEGREES	MINUTES	SECONDS	DATUM
LATITUDE	45	36	16.89 N	NAD 83
LONGITUDE	94	08	17.68 W	NAD 83

South

TOWER 4
Ground Elevation = 1080.0

	DEGREES	MINUTES	SECONDS	DATUM
LATITUDE	45	36	13.62 N	NAD 83
LONGITUDE	94	08	22.84 W	NAD 83

Southeast

TOWER 5
Ground Elevation = 1081.4

	DEGREES	MINUTES	SECONDS	DATUM
LATITUDE	45	36	15.39 N	NAD 83
LONGITUDE	94	08	18.48 W	NAD 83

Northwest

TOWER 6
Ground Elevation = 1080.7

	DEGREES	MINUTES	SECONDS	DATUM
LATITUDE	45	36	18.58 N	NAD 83
LONGITUDE	94	08	24.09 W	NAD 83

North

TOWER 7
Ground Elevation = 1080.0

	DEGREES	MINUTES	SECONDS	DATUM
LATITUDE	45	36	20.09 N	NAD 83
LONGITUDE	94	08	20.54 W	NAD 83

Calculated Geodetic Bearings between towers:

Tower 2 to Tower 1 - North 83° 54' 31" West - Distance = 272.9'
Tower 2 to Tower 3 - South 83° 57' 24" East - Distance = 272.5'
Tower 2 to Tower 4 - South 15° 03' 10" West - Distance = 372.1'
Tower 2 to Tower 5 - South 49° 51' 31" East - Distance = 279.8'
Tower 2 to Tower 6 - North 52° 10' 55" West - Distance = 233.7'
Tower 2 to Tower 7 - North 12° 54' 27" East - Distance = 303.8'

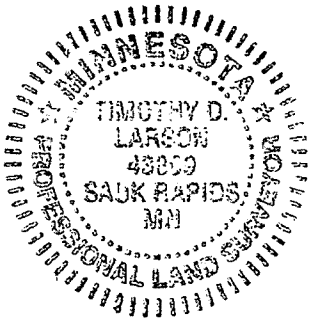
Date: June 15, 2010
Project #: 000929-10005-0
Location: SE1/4 Sec. 13, T36N, R31W, Benton County, Minnesota.

I certify that the Latitude and the Longitude are accurate to within plus or minus 5 feet horizontally; and that the site elevation is accurate to within 10 feet vertically. Relative tolerance between points is +\- 0.5 feet. The horizontal datum (coordinates) are in terms of the North American Datum of 1983 (NAD83) and are expressed as degrees, minutes, and seconds to the nearest hundredth of a second. The vertical datum (height) is in terms of the North American Vertical Datum of 1988 and is determined to the nearest foot.

Timothy D. Larson

Timothy D. Larson, Professional Land Surveyor
State of Minnesota, License# 43809

15 June, 2010
Date



Mueller Broadcast Design
613 S. La Grange Road
La Grange, Illinois 60525
(708) 352-2166

Preparer's Certification

This engineering report was prepared by me from data personally collected on site using equipment owned and maintained by me for this purpose. It is true and correct to the best of my knowledge and belief.

September 19, 2012

Mark A. Mueller

Mueller Broadcast Design
613 S. La Grange Road
La Grange, Illinois 60525
(708) 352-2166

WBHR TOWER DRIVE INFORMATION - DAY						
	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Power (W)	Antenna Monitor
Tower 2 C	0.7800	0.0000	37.98 - j52.26	12.37 ∠ -88.43	5815.3140	75.2% ∠ -88.4°
Tower 4 S	1.0000	90.0000	15.59 - j78.46	16.46 ∠ 0.00	4226.1239	100.0% ∠ 0.0°

WBHR TOWER DRIVE INFORMATION - NIGHT						
	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Power (W)	Antenna Monitor
Tower 1 E	1.0000	0.0000	18.92 - j77.55	3.52 ∠ 0.00	234.3421	100.0% ∠ 0.0°
Tower 3 W	0.6800	-49.0000	42.78 - j78.18	2.39 ∠ -47.11	244.8501	67.9% ∠ -47.1°
Tower 4 S	0.1000	-30.0000	121.12 - j227.63	0.43 ∠ -19.41	22.8265	12.2% ∠ -19.4°

WVAL TOWER DRIVE INFORMATION - DAY						
	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Power (W)	Antenna Monitor
Tower 1 E	1.0000	0.0000	49.26 + j5.39	6.50 ∠ 0.00	2079.0716	100% ∠ 0.0°
Tower 4 S	0.7200	40.0000	25.26 + j7.22	4.56 ∠ 37.96	525.1168	70.2% ∠ +38.0°

WVAL TOWER DRIVE INFORMATION - NIGHT						
	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Power (W)	Antenna Monitor
Tower 1 E	0.5000	47.5000	51.61 - j27.87	1.99 ∠ 47.82	204.7391	56.7% ∠ +47.8°
Tower 2 C	1.0000	0.0000	53.76 + j38.91	3.51 ∠ 0.00	661.8195	100.0% ∠ +0.0°
Tower 4 S	0.2500	-160.0000	-30.38 + j204.64	0.71 ∠ -166.60	-15.1513	20.2% ∠ -166.6°

WMIN TOWER DRIVE INFORMATION - DAY						
	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Power (W)	Antenna Monitor
Tower 2 C	1.0000	-44.0000	164.29 + j119.13	2.02 ∠ -29.90	669.1162	0.493 ∠ -29.9°
Tower 5 SE	1.0000	0.0000	16.08 - j56.35	4.10 ∠ 0.00	270.8856	1.000 ∠ 0°
Tower 7 N	1.0000	-78.0000	184.49 + j116.35	2.03 ∠ -61.97	759.6516	0.495 ∠ -62.0°

WMIN TOWER DRIVE INFORMATION - NIGHT						
	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Power (W)	Antenna Monitor
Tower 1 E	1.0000	135.0000	20.94 + j146.57	1.40 ∠ 135.75	40.8871	0.528 ∠ +135.8°
Tower 3 W	0.8000	18.0000	41.39 + j204.51	1.04 ∠ 19.07	44.9149	0.393 ∠ +19.1°
Tower 5 SE	1.0000	0.0000	19.94 - j29.81	2.65 ∠ 0.00	140.3180	1.000 ∠ 0°
Tower 6 NW	0.8000	155.0000	2.82 - j54.04	2.20 ∠ 153.54	13.6512	0.830 ∠ +153.5°