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

WGLB, ELM GROVE, WISCONSIN
DIRECTIONAL ANTENNA
PROOF OF PERFORMANCE
March 2018

Exhibit EE
ENGINEERING EXHIBIT
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State of Illinois)
)ss
County of Cook)

Mark Alan Mueller, first being duly sworn, deposes and says that he is a Broadcast Technical Consultant and owner of Mueller Broadcast Design, which has been retained by J. Kinlow & A. Kinlow-Glosson, Co-Pers. Reps., J. Kinlow Estate ("J. Kinlow Estate"), permittee of WGLB (AM), Elm Grove, Wisconsin to prepare the following engineering exhibit. He is a licensed first-class radiotelephone operator, license number P1-18-44514 (renewed: PG-18-21512) and has been engaged in radio broadcast engineering work for a period of over 40 years. During this time he has been responsible for the preparation of many engineering exhibits and reports for submission to the Federal Communications Commission. He was awarded the Bachelor of Science degree from the University of Illinois at Urbana-Champaign.

The following exhibits were prepared by him and they are true and correct to the best of his knowledge and belief.

March 6, 2018

Mark A. Mueller, Affiant

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Engineering Report For
J. Kinlow Estate
W G L B (A M)
Elm Grove, Wisconsin
March 2018

This engineering report documents the Directional Antenna Performance Verification measurements for WGLB (AM), FCC facility ID number 73050, Elm Grove, Minnesota. WGLB currently operates on 1560 KHz with 185 watts and a four tower directional antenna daytime, and 250 watts with a different four tower directional antenna pattern using two of the same towers at night. This Verification is for the new 2,500 watt 4 tower daytime antenna pattern authorized by BP-20141110AAS and documents the required "model proof" in order to grant the covering license. All measurements were made personally by the writer in accordance with the FCC rules at 47 CFR 73.151(c). No changes were made to the licensed nighttime operation except to convert it to Method of Moments licensing.

Eligibility for 73.151(c) Processing

The WGLB antenna system consists of six conventional insulated uniform cross-section triangular 14" face steel guyed towers, series-fed with no top loading. They are 90° tall at the WGLB frequency (1560 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 48 meters long (90°) except for those which intersect where four-inch copper straps terminate the radial intersections. A 4" strap interconnects the towers to each other and to the phasor and transmitter. No physical changes were made to the previously licensed towers, ground system or diplexing filters to implement the daytime power increase. The other station using these towers (WJTI) was not affected since no changed were made to the towers or filters, and the licensed WGLB nighttime operation remains unchanged.

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Measurements

The WGLB antenna 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 six WGLB towers are identical in height and are base sampled using toroidal current transformers which are located at the output of the diplexing filters on the lead to the tower. Each tower was disconnected from its tuning network at the sample transformer and was measured at that point. The other towers were individually 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

Prior to tuning the array, the Gorman-Redlich antenna monitor was calibrated by the writer according to the manufacturer's instructions, with both zero degree and 180 degree phase indications verified as showing 0° and 180° as appropriate using the built-in calibration circuit. Feeding two channels at once from the same source verified that each channel indicated properly (equal ratio and phase) and a 90° delay inserted in each sample line in turn with the same source connected to the reference was used to verify proper mid-scale readings at both +90° and -90°. Finally, the ratio indications were verified using a field intensity meter to read the RF voltage on the sample lines while connected to the monitor, and manual calculations of the ratio confirmed proper operation of the monitor.

United States of America

FEDERAL COMMUNICATIONS COMMISSION

AM BROADCAST STATION CONSTRUCTION PERMIT

Authorizing Official:

Official Mailing Address:

JOEL J. KINLOW
PO BOX 091036
MILWAUKEE WI 53209

Son Nguyen
Supervisory Engineer
Audio Division
Media Bureau

Grant Date: April 20, 2015

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

Facility Id: 73050

Call Sign: WGLB

Permit File Number: BP-20141110AAS

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

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

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

Hours of Operation: Unlimited

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

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

Name of Permittee: JOEL J. KINLOW

Station Location: ELM GROVE, WI

Frequency (kHz): 1560

Station Class: B

Antenna Coordinates:

		Day				
Latitude:	N	43	Deg	00	Min	32 Sec
Longitude:	W	88	Deg	02	Min	06 Sec

		Night				
Latitude:	N	43	Deg	00	Min	32 Sec
Longitude:	W	88	Deg	02	Min	06 Sec

		Critical				
Latitude:	N	43	Deg	00	Min	32 Sec
Longitude:	W	88	Deg	02	Min	06 Sec

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

Nominal Power (kW): Day: 2.5 Night: 0.25 Critical: 0.70

Antenna Mode: Day: DA Night: DA Critical: ND

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

Antenna Registration Number(s):

Day:

Tower No.	ASRN	
3	None	49
4	None	49
5	None	49
6	None	49

Night:

Tower No.	ASRN	
1	None	49
2	None	49
5	None	49
6	None	49

Critical:

Tower No.	ASRN	
3	None	49

DESCRIPTION OF DIRECTIONAL ANTENNA SYSTEM

Theoretical RMS (mV/m/km): Day: 479.05 Night: 152.34

Standard RMS (mV/m/km): Day: 503.47 Night: 160.3

Augmented RMS (mV/m/km):

Q Factor: Day: Night:

Theoretical Parameters:

Day Directional Antenna:

Tower No.	Field Ratio	Phasing (Deg.)	Spacing (Deg.)	Orientation (Deg.)	Tower Ref Switch *	Height (Deg.)
3	1.0000	0.000	0.0000	0.000	0	90.0
4	0.6400	-168.000	70.0000	25.000	0	90.0
5	0.8500	-33.000	126.9000	179.600	0	90.0
6	0.5500	170.000	70.4000	154.400	0	90.0

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

Theoretical Parameters:

Night Directional Antenna:

Tower No.	Field Ratio	Phasing (Deg.)	Spacing (Deg.)	Orientation (Deg.)	Tower Ref Switch *	Height (Deg.)
1	1.0000	0.000	0.0000	0.000	0	90.0
2	0.7200	-125.000	70.0000	25.000	0	90.0
5	0.9000	125.000	60.0000	90.000	0	90.0
6	0.6500	0.000	109.8000	54.700	0	90.0

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

Non-Directional Antenna: Critical

Radiator Height: 48.1 meters; 90 deg

Theoretical Efficiency: 305.84 mV/m/kw at 1km

Inverse Distance Field Strength:

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

Day:

Azimuth:	Radiation:	
131.5	363.9	mV/m
288	279.6	mV/m
355	220.8	mV/m

Special operating conditions or restrictions:

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

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

3 A license application (FCC Form 302) to cover this construction permit must be filed with the Commission pursuant to Section 73.3536 of the Rules before the permit expires.

4 Licensee shall be responsible for satisfying all reasonable complaints of blanketing interference within the 1 V/m contour as required by Section 73.88 of the Commission's rules.

5 Ground system consists of 120 equally spaced, buried, copper radials about the base of each tower, each 48.1 meters in length except where terminated by property boundaries or where intersecting radials are shortened and bonded to a transverse copper strap midway between adjacent towers.

Special operating conditions or restrictions:

6 Upon the surrender of the license of WZRK(AM), Lake Geneva, Wisconsin to the Commission for cancellation prior to the commencement of program test authority by the WGLB(AM) facility authorized by the subject construction permit, pursuant to the discontinuance of operation provisions of 47 C.F.R. Section 73.1750.

*** END OF AUTHORIZATION ***

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MODEL DATA:

Theoretical Data:

STATION INFORMATION		
Call Letters	**No. Towers**	**Frequency**
WGLB	6	1.5600

TOWER INFORMATION						
	Tower Height (°)	**Spacing (°)**	**Orientation**	**Face Width (in.)**	**Radius (in.)**	**Velocity Factor**
Tower 1	90.0000	0.0000	0.0000	18.0000 / 18.0000	8.3138 / 8.3138	0.830000
Tower 2	90.0000	70.0000	25.0000	18.0000 / 18.0000	8.3138 / 8.3138	0.940000
Tower 3	90.0000	140.0000	25.0000	18.0000 / 18.0000	8.3138 / 8.3138	0.930000
Tower 4	90.0000	210.0000	25.0000	18.0000 / 18.0000	8.3138 / 8.3138	0.910000
Tower 5	90.0000	60.0000	90.0000	18.0000 / 18.0000	8.3138 / 8.3138	0.880000
Tower 6	90.0000	109.8000	54.7000	18.0000 / 18.0000	8.3138 / 8.3138	0.840000

Measured Impedance Matrix [47 CFR 73.151(c)(1)]

MATRIX INFORMATION		
	Calculated Impedance (other towers open)	**Measured Impedance (other towers open)**
Tower 1	77.97 +j121.49	77.67 +j120.92
Tower 2	42.70 +j43.72	43.00 +j46.64
Tower 3	47.72 +j54.51	46.03 +j58.09
Tower 4	58.34 +j67.42	58.98 +j70.93
Tower 5	58.58 +j79.88	58.55 +j78.35
Tower 6	68.55 +j113.90	68.93 +j113.77

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, as well as increasing the effective radius by 28.6% (14" to 18" face). The corrected measured impedances agree with the model within +/- 2 ohms and +/- 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 - 90.00° above ground
0.110719 > -103.661902 - 80.00° above ground
0.168885 > -104.932196 - 70.00° above ground
0.189443 > -106.459781 - 60.00° above ground
0.171299 > -108.390709 - 50.00° above ground
0.113256 > -111.629791 - 40.00° above ground
0.016954 > -146.465909 - 30.00° above ground
0.130175 > 76.139585 - 20.00° above ground
0.319826 > 72.417475 - 10.00° above ground
0.632938 > 70.532195 - 0.00° above ground

Tower 2
0.000000 > 0.000000 - 90.00° above ground
0.091276 > -111.423635 - 80.00° above ground
0.138133 > -112.235001 - 70.00° above ground
0.154419 > -113.023760 - 60.00° above ground
0.139487 > -113.865479 - 50.00° above ground
0.092347 > -115.117950 - 40.00° above ground
0.012082 > -129.330544 - 30.00° above ground
0.104727 > 67.943256 - 20.00° above ground
0.260307 > 66.606535 - 10.00° above ground
0.524315 > 66.002852 - 0.00° above ground

Tower 3
0.000000 > 0.000000 - 90.00° above ground
0.065836 > -178.615370 - 80.00° above ground
0.099463 > -178.126992 - 70.00° above ground
0.110855 > -177.601616 - 60.00° above ground
0.099655 > -176.945409 - 50.00° above ground
0.065342 > -175.790100 - 40.00° above ground
0.007545 > -159.797641 - 30.00° above ground
0.075945 > 1.352736 - 20.00° above ground
0.186332 > 2.755413 - 10.00° above ground
0.372112 > 3.526126 - 0.00° above ground

Tower 4
0.000000 > 0.000000 - 90.00° above ground
0.054229 > 115.613536 - 80.00° above ground
0.081357 > 116.398498 - 70.00° above ground
0.089861 > 117.237257 - 60.00° above ground
0.079780 > 118.281504 - 50.00° above ground
0.051097 > 120.150304 - 40.00° above ground
0.004597 > 155.728071 - 30.00° above ground
0.062990 > -64.300328 - 20.00° above ground
0.149983 > -62.212527 - 10.00° above ground
0.293872 > -61.033387 - 0.00° above ground

Tower 5
0.000000 > 0.000000 - 90.00° above ground
0.109447 > -101.078532 - 80.00° above ground
0.165729 > -102.428730 - 70.00° above ground
0.184945 > -103.734174 - 60.00° above ground
0.166460 > -105.083321 - 50.00° above ground
0.109331 > -106.997865 - 40.00° above ground
0.013428 > -129.904675 - 30.00° above ground
0.126886 > 77.506713 - 20.00° above ground
0.311360 > 75.699172 - 10.00° above ground
0.618909 > 74.990400 - 0.00° above ground

Tower 6
0.000000 > 0.000000 - 90.00° above ground
0.087037 > -150.709361 - 80.00° above ground
0.132731 > -150.570275 - 70.00° above ground
0.148817 > -150.393521 - 60.00° above ground
0.134398 > -150.111487 - 50.00° above ground
0.088519 > -149.505183 - 40.00° above ground
0.010343 > -140.655700 - 30.00° above ground
0.102051 > 28.916979 - 20.00° above ground
0.251063 > 29.801854 - 10.00° above ground
0.497197 > 30.359238 - 0.00° above ground

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MATRIX CALCULATIONS from Westberg Phasor Professional

ZMatrix					
77.97 + j121.49	35.69 - j25.81	-10.26 - j33.87	-32.46 - j3.30	49.54 - j22.49	12.13 - j49.27
35.69 - j25.81	42.70 + j43.72	26.33 - j17.73	-4.04 - j25.74	31.55 - j25.50	38.64 - j19.35
-10.26 - j33.87	26.33 - j17.73	47.72 + j54.51	36.18 - j17.20	-2.02 - j32.86	34.70 - j21.77
-32.46 - j3.30	-4.04 - j25.74	36.18 - j17.20	58.34 + j67.42	-26.73 - j11.85	3.85 - j34.69
49.55 - j22.49	31.55 - j25.50	-2.02 - j32.85	-26.73 - j11.85	58.58 + j79.88	38.60 - j27.82
12.13 - j49.27	38.64 - j19.35	34.70 - j21.77	3.85 - j34.69	38.60 - j27.82	68.55 + j113.90

YMatrix					
0.001995 - j0.004902	0.001474 + j0.002787	0.000330 - j0.000066	-0.000092 - j0.000118	0.001264 + j0.002369	0.000133 + j0.000202
0.001474 + j0.002787	0.002425 - j0.010279	0.001745 + j0.004884	0.000815 + j0.000194	0.000837 + j0.003100	0.000482 + j0.003322
0.000330 - j0.000066	0.001745 + j0.004884	0.002602 - j0.008630	0.002756 + j0.004572	0.000346 + j0.000246	0.000923 + j0.002789
-0.000092 - j0.000118	0.000815 + j0.000194	0.002756 + j0.004572	0.005253 - j0.007374	0.000033 - j0.000173	0.000864 + j0.000383
0.001264 + j0.002369	0.000837 + j0.003100	0.000346 + j0.000246	0.000033 - j0.000173	0.002414 - j0.006719	0.001107 + j0.001914
0.000133 + j0.000202	0.000482 + j0.003322	0.000923 + j0.002789	0.000864 + j0.000383	0.001107 + j0.001914	0.001387 - j0.005312

HMatrix - [I] = [H] X [F]					
0.020368 + j0.003199	0.000569 + j0.002316	0.001628 + j0.000351	0.000775 - j0.001008	0.000229 + j0.002521	0.001457 + j0.001190
0.000505 + j0.001874	0.026894 + j0.002668	0.000513 + j0.001911	0.001344 + j0.000302	0.000518 + j0.001879	0.000235 + j0.002061
0.001345 + j0.000297	0.000520 + j0.001950	0.026323 + j0.002721	0.000529 + j0.001939	0.001343 + j0.000609	0.000528 + j0.001909
0.000668 - j0.000858	0.001425 + j0.000319	0.000543 + j0.002015	0.025167 + j0.002810	0.000950 - j0.000679	0.001389 + j0.000623
0.000243 + j0.002278	0.000552 + j0.002099	0.001469 + j0.000663	0.001000 - j0.000718	0.023378 + j0.002935	0.000547 + j0.002080
0.001424 + j0.001165	0.000202 + j0.002494	0.000577 + j0.002265	0.001582 + j0.000711	0.000572 + j0.002252	0.020972 + j0.003143

HMatrix-inverse - $[F] = [H]^{-1}$ X [I]					
47.677807 - j6.774818	-2.085898 - j3.079484	-2.904734 + j0.926435	-0.241218 + j2.840483	-1.810728 - j4.279125	-4.246083 - j1.006656
-1.749091 - j2.464799	36.330205 - j2.960416	-1.136802 - j1.823450	-1.770859 + j0.293303	-1.707879 - j2.166937	-1.296906 - j2.663247
-2.389491 + j0.757026	-1.164561 - j1.861296	37.466384 - j3.394131	-1.140486 - j2.569815	-2.316329 + j0.170918	-1.504155 - j2.452036
-0.210957 + j2.422549	-1.886286 + j0.319545	-1.180075 - j2.672466	39.214689 - j4.324879	-0.850478 + j2.000995	-2.552728 - j0.262908
-1.701817 - j3.843170	-1.873629 - j2.438431	-2.532056 + j0.186303	-0.893206 + j2.108665	41.537937 - j4.569335	-2.102662 - j2.998324
-4.158774 - j0.984457	-1.448244 - j3.265454	-1.706524 - j2.937836	-2.918641 - j0.304516	-2.252969 - j3.258648	46.432198 - j5.830966

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TOWER CURRENTS- DAYTIME

Tower 1
0.000000 > 0.000000 - 90.00° above ground
0.134706 > -120.406543 - 80.00° above ground
0.203968 > -121.704285 - 70.00° above ground
0.226891 > -123.164072 - 60.00° above ground
0.202982 > -124.888641 - 50.00° above ground
0.131657 > -127.649991 - 40.00° above ground
0.015441 > -165.656602 - 30.00° above ground
0.158185 > 58.725857 - 20.00° above ground
0.380736 > 55.938852 - 10.00° above ground
0.744725 > 54.617266 - 0.00° above ground

Tower 2
0.000000 > 0.000000 - 90.00° above ground
0.086837 > -104.976489 - 80.00° above ground
0.130640 > -106.665666 - 70.00° above ground
0.145428 > -108.616574 - 60.00° above ground
0.131083 > -111.069316 - 50.00° above ground
0.086978 > -115.232903 - 40.00° above ground
0.015209 > -154.712753 - 30.00° above ground
0.098916 > 75.043601 - 20.00° above ground
0.245094 > 70.029561 - 10.00° above ground
0.494837 > 67.408072 - 0.00° above ground

Tower 3
0.000000 > 0.000000 - 90.00° above ground
1.947274 > -0.978407 - 80.00° above ground
3.498642 > -0.909647 - 70.00° above ground
4.875706 > -0.838105 - 60.00° above ground
6.056457 > -0.760605 - 50.00° above ground
7.013503 > -0.673840 - 40.00° above ground
7.719117 > -0.572881 - 30.00° above ground
8.148504 > -0.449657 - 20.00° above ground
8.280289 > -0.290718 - 10.00° above ground
7.999478 > 0.000000 - 0.00° above ground

Tower 4
0.000000 > 0.000000 - 90.00° above ground
1.263653 > -170.834451 - 80.00° above ground
2.263697 > -170.484206 - 70.00° above ground
3.140565 > -170.108431 - 60.00° above ground
3.877549 > -169.687346 - 50.00° above ground
4.454579 > -169.201214 - 40.00° above ground
4.851717 > -168.621305 - 30.00° above ground
5.050988 > -167.898609 - 20.00° above ground
5.036359 > -166.944392 - 10.00° above ground
4.694634 > -165.127356 - 0.00° above ground

Tower 5
0.000000 > 0.000000 - 90.00° above ground
1.636697 > -38.343338 - 80.00° above ground
2.930167 > -37.584730 - 70.00° above ground
4.058999 > -36.783303 - 60.00° above ground
5.001968 > -35.897363 - 50.00° above ground
5.734151 > -34.883078 - 40.00° above ground
6.231567 > -33.675490 - 30.00° above ground
6.473630 > -32.165418 - 20.00° above ground
6.443574 > -30.158927 - 10.00° above ground
6.008050 > -26.339494 - 0.00° above ground

Tower 6
0.000000 > 0.000000 - 90.00° above ground
1.059738 > 173.427975 - 80.00° above ground
1.896966 > 172.798723 - 70.00° above ground
2.618615 > 172.135988 - 60.00° above ground
3.204546 > 171.403950 - 50.00° above ground
3.632426 > 170.558877 - 40.00° above ground
3.881520 > 169.530060 - 30.00° above ground
3.934083 > 168.191114 - 20.00° above ground
3.774811 > 166.296655 - 10.00° above ground
3.262069 > 162.278806 - 0.00° above ground

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TOWER CURRENTS- NIGHTTIME

Tower 1
0.000000 > 0.000000 - 90.00° above ground
0.688612 > -6.764601 - 80.00° above ground
1.233959 > -6.420447 - 70.00° above ground
1.705500 > -6.036142 - 60.00° above ground
2.091181 > -5.589031 - 50.00° above ground
2.377690 > -5.054721 - 40.00° above ground
2.552652 > -4.395911 - 30.00° above ground
2.605388 > -3.545706 - 20.00° above ground
2.526347 > -2.373040 - 10.00° above ground
2.231257 > -0.000000 - 0.00° above ground

Tower 2
0.000000 > 0.000000 - 90.00° above ground
0.557160 > -128.507205 - 80.00° above ground
0.990124 > -128.652697 - 70.00° above ground
1.364123 > -128.793777 - 60.00° above ground
1.673152 > -128.940359 - 50.00° above ground
1.909703 > -129.103294 - 40.00° above ground
2.066109 > -129.298147 - 30.00° above ground
2.135179 > -129.549620 - 20.00° above ground
2.110040 > -129.899391 - 10.00° above ground
1.933602 > -130.612328 - 0.00° above ground

Tower 3
0.000000 > 0.000000 - 90.00° above ground
0.037486 > -146.742761 - 80.00° above ground
0.056024 > -147.060017 - 70.00° above ground
0.061624 > -147.383985 - 60.00° above ground
0.054437 > -147.731097 - 50.00° above ground
0.034572 > -148.242414 - 40.00° above ground
0.002126 > -160.510794 - 30.00° above ground
0.043330 > 32.897873 - 20.00° above ground
0.102545 > 32.471610 - 10.00° above ground
0.200667 > 32.302529 - 0.00° above ground

Tower 4
0.000000 > 0.000000 - 90.00° above ground
0.024418 > 155.988980 - 80.00° above ground
0.036787 > 156.465546 - 70.00° above ground
0.040812 > 156.970305 - 60.00° above ground
0.036427 > 157.600178 - 50.00° above ground
0.023539 > 158.729605 - 40.00° above ground
0.002176 > 178.727028 - 30.00° above ground
0.028375 > -24.010520 - 20.00° above ground
0.068313 > -22.692805 - 10.00° above ground
0.134631 > -21.947538 - 0.00° above ground

Tower 5
0.000000 > 0.000000 - 90.00° above ground
0.616185 > 120.653196 - 80.00° above ground
1.110445 > 120.711185 - 70.00° above ground
1.547996 > 120.742639 - 60.00° above ground
1.919611 > 120.750717 - 50.00° above ground
2.214706 > 120.738236 - 40.00° above ground
2.423129 > 120.707931 - 30.00° above ground
2.536070 > 120.661532 - 20.00° above ground
2.545922 > 120.598296 - 10.00° above ground
2.403743 > 120.484119 - 0.00° above ground

Tower 6
0.000000 > 0.000000 - 90.00° above ground
0.433283 > -7.856157 - 80.00° above ground
0.781435 > -7.274322 - 70.00° above ground
1.087973 > -6.661630 - 60.00° above ground
1.345182 > -5.994666 - 50.00° above ground
1.544443 > -5.246074 - 40.00° above ground
1.677702 > -4.370836 - 30.00° above ground
1.738133 > -3.289929 - 20.00° above ground
1.720033 > -1.858832 - 10.00° above ground
1.581398 > 0.874684 - 0.00° above ground

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TOWER DRIVE INFORMATION

TOWER DRIVE INFORMATION - DAY						
	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Antenna Monitor*	Power (W)
Tower 1	0.0000	0.0000	-11.80 - j432.79	0.74 ∡ 54.62	Detuned	-6.5432
Tower 2	0.0000	0.0000	-25.87 - j488.39	0.49 ∡ 67.40	Detuned	-6.3344
Tower 3	1.0000	0.0000	5.18 + j48.62	8.00 ∡ 0.00	**1.000 ∡ 0.0**	331.5991
Tower 4	0.6400	-168.0000	33.00 + j84.36	4.69 ∡ -165.13	**0.586 ∡ -165.1**	727.4089
Tower 5	0.8500	-33.0000	67.86 + j80.37	6.01 ∡ -26.34	**0.751∡ -26.3**	2449.6667
Tower 6	0.5500	170.0000	-74.79 + j156.28	3.26 ∡ 162.28	**0.408 ∡ +162.3**	-795.7972

TOWER DRIVE INFORMATION – NIGHT						
	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Antenna Monitor*	Power (W)
Tower 1	1.0000	0.0000	42.75 + j133.55	2.23 ∡ 0.00	**1.00 ∡ 0.0**	212.8091
Tower 2	0.7200	-125.0000	-13.57 + j104.56	1.93 ∡ -130.61	**0.865 ∡ -130.6**	-50.7506
Tower 3	0.0000	0.0000	-1.50 - j466.21	0.20 ∡ 32.31	Detuned	-0.0604
Tower 4	0.0000	0.0000	7.47 - j463.73	0.13 ∡ -21.95	Detuned	0.1354
Tower 5	0.9000	125.0000	-1.98 + j69.99	2.40 ∡ 120.48	**1.076 ∡ +120.5**	-11.4340
Tower 6	0.6500	0.0000	47.70 + j93.40	1.58 ∡ 0.87	**0.709 ∡ +0.9**	119.3005

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

Critical Hours nondirectional operation uses tower 3.

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

Sample Lines: Andrew 1/2" LDF4-50 Foam Dielectric Heliax

88% velocity factor, 50 ohms +/- 1 ohm

Lines were cut to equal electrical length and terminated with proper connectors. An additional short flexible cable connects the 1/2" Heliax to the antenna monitor. These jumpers are accounted for in the data which follows.

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

Location: At output of antenna tuning network and filters on tower feedline

Operating Potential: Grounded

Antenna Monitor: Gorman-Redlich CMR s/n 821

TCT-3 Serial Numbers & measured impedance at 1560 KHz:

Tower	TCT s/n	TCT Impedance	Line + TCT from Monitor	Line + TCT Z
1 (SW):	17160	50.92 +j0.546 ohms	49.03 -j0.13 ohms	49.03 ohms
2 (SC):	17162	50.50 +j0.269 ohms	49.27 -j0.14 ohms	49.27 ohms
3 (NC):	17161	50.59 +j0.386 ohms	49.01 +j0.17 ohms	49.01 ohms
4 (N):	17154	50.07 +j0.473 ohms	48.96 -j0.13 ohms	48.96 ohms
5 (SE):	17164	50.66 +j0.092 ohms	48.75 +j0.19 ohms	48.75 ohms
6 (NE):	17155	50.55 +j0.578 ohms	49.02 -j1.58 ohms	49.04 ohms

Maximum Variation in Sample Resistance: 0.52 ohms
Maximum Variation in Sample Reactance: j1.72 ohms
Maximum Variation in Sample Impedance: 0.52 ohms

Sample lines and elements were measured with the PowerAIM-120 Network Analyzer

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

Tower 1:	1.000/ +0.2°
Tower 2:	0.999/ +0.0°
Tower 4:	0.999/ -0.1°
Tower 5:	1.000/ +0.0°
Tower 6:	1.000/ +0.1°

The sample element phase and ratio calibration test was done with all transformers removed from the ATUs and configured adjacent to each other reading RF current tower 3 at 250 watts in pairs with #3 as the reference. The Times Microwave LMR-198 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.

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Sample Line Length and Impedance Test

Tower 1							
Marker	**Freq (MHz)**	**Rs**	**Xs**	**Zmag**	**Z (ohms)**	**Length°**	**Error°**
-45°	0.439239	0.766	-51.673	51.679			
Fc	1.560000	9.513	130.202	130.549		**159.822**	**0.005**
F@90°	0.878478	0.834	0.000	0.834		90	
+45°	1.317717	2.250	50.299	50.349	**51.010**		
Tower 2							
Marker	**Freq (MHz)**	**Rs**	**Xs**	**Zmag**	**Z (ohms)**	**Length°**	**Error°**
-45°	0.440599	0.556	-51.564	51.567			
Fc	1.560000	9.278	130.493	130.822		**159.329**	**-0.488**
F@90°	0.881198	0.741	0.000	0.741		90	
+45°	1.321797	2.300	50.320	50.373	**50.966**		
Tower 3							
Marker	**Freq (MHz)**	**Rs**	**Xs**	**Zmag**	**Z (ohms)**	**Length°**	**Error°**
-45°	0.439253	0.522	-51.416	51.419			
Fc	1.560000	9.734	133.683	134.037		**159.817**	**0**
F@90°	0.878505	0.677	0.000	0.677		90	
+45°	1.317758	2.163	50.308	50.354	**50.884**		
Tower 4							
Marker	**Freq (MHz)**	**Rs**	**Xs**	**Zmag**	**Z (ohms)**	**Length°**	**Error°**
-45°	0.440738	0.498	-51.491	51.493			
Fc	1.560000	9.110	129.844	130.163		**159.278**	**-0.538**
F@90°	0.881475	0.699	0.000	0.699		90	
+45°	1.322213	2.233	50.305	50.355	**50.921**		
Tower 5							
Marker	**Freq (MHz)**	**Rs**	**Xs**	**Zmag**	**Z (ohms)**	**Length°**	**Error°**
-45°	0.438565	0.492	-51.560	51.562			
Fc	1.560000	9.959	134.798	135.165		**160.067**	**0.251**
F@90°	0.877130	0.719	0.000	0.719		90	
+45°	1.315695	2.104	50.168	50.212	**50.883**		
Tower 6							
Marker	**Freq (MHz)**	**Rs**	**Xs**	**Zmag**	**Z (ohms)**	**Length°**	**Error°**
-45°	0.438377	0.466	-51.295	51.297			
Fc	1.560000	9.091	131.663	131.976		**160.136**	**0.319**
F@90°	0.876753	0.751	0.000	0.751		90	
+45°	1.315130	2.178	50.199	50.246	**50.769**		

Maximum deviation of sample line impedance: **0.241 ohms**
Maximum deviation of sample line length: **0.857° at 1560 KHz**

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WGLB Daytime Reference Field Strength Measurements

[47 CFR 73.151(c)(3)]

Point	Distance	mV/m	Coordinates (NAD 84)		Description
75° True (Maxima, main lobe)					
1	0.98	450.0	43.0111013	-88.0235902	1726 S. 89th St.
2	1.08	380.0	43.0113356	-88.0224073	1718 S. 88th St.
3	1.28	375.0	43.0118080	-88.0200148	8619 W. Mitchell
131.5° True (Minima, monitor point radial)					
1	0.87	256.0	43.0036516	-88.0271615	2187 S. 92nd St.
2	1.00	232.0	43.0028760	-88.0259652	2237 S. 91st St.
3	1.78	129.0	42.9981905	-88.0187528	W. Eckle Lane @ South 85th St.
230° True (Maxima, minor lobe)					
1	0.86	610.0	43.0038682	-88.0432038	2209 S. 105th St.
2	0.99	455.0	43.0031280	-88.0443947	2254 S. 106th St.
3	1.12	382.0	43.0023681	-88.0456178	2304 S. 107th St.
288° True (Minima, monitor point radial)					
1	0.78	120.0	43.0109980	-88.0442123	South 106th St. at cul-de-sac ("Allied Pools")
2	1.86	70.0	43.0139918	-88.0567865	South 116th. St at Orchard Court
3	2.45	50.0	43.0156540	-88.0637643	in park ("Greenfield Golf")
355° True (Minima, monitor point radial)					
1	2.94	29.0	43.0352355	-88.0382873	St. Camillus entrance, 15 MPH sign
2	3.21	36.5	43.0376516	-88.0385823	St. Camillus near loading dock
3	3.68	30.5	43.0418108	-88.0390759	1010 Innovation Drive

Distances in kilometers. Readings taken by the writer on November 15, 2017 using his Potomac Instruments FIM-41 s/n 1655, last calibrated 07/16/2017.

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WGLB Nighttime Reference Field Strength Measurements

[47 CFR 73.151(c)(3)]

Point	Distance	mV/m	Coordinates (NAD 84)		Description
67.5° True (Minima, monitor point radial)					
1	1.26	73.0	43.0131898	-88.0208322	87th and Lapham, NW corner
2	1.43	74.0	43.0137586	-88.0189345	1518 S. 85th St.
3	1.85	74.5	43.0152151	-88.0141387	1458 S. 82nd St.
116.5° True (Minima, monitor point radial)					
1	1.73	10.0	43.0018947	-88.0161879	2333 S. 83rd St.
2	1.92	8.4	43.0011348	-88.0140958	2374 S. 81st St.
3	2.14	10.0	43.0002213	-88.0116121	2435 S. 79th St.
220° True (Minor lobe)					
1	1.98	26.5	42.9952186	-88.0507106	111th at Cleveland, SW corner
2	2.47	27.3	42.9917927	-88.0546106	2900 S. 114th St.
3	2.72	22.7	42.9901111	-88.0565525	2994 Root River Parkway
241° True (Minima, monitor point radial)					
1	2.14	5.1	42.9995145	-88.0580492	2580 Root River Parkway
2	2.28	6.7	42.9988845	-88.0595995	2561 S. 118th St.
3	2.55	6.0	42.9976914	-88.0624963	2509 S. 117th St.
283.5° True (Side of major lobe, monitor point radial)					
1	1.68	50.0	43.0123690	-88.0551953	1651 S. 115th Ct.
2	2.43	33.0	43.0139318	-88.0641056	Greenfield Golf parking lot entrance
3	2.70	27.0	43.0144868	-88.0672974	1523 S. 124th St.
330° True (Major lobe)					
1	3.08	27.5	43.0328321	-88.0540151	216 N. 113rd St.
2	3.23	35.0	43.0339891	-88.0549271	11323 Mt. Vernon Ave.
3	3.41	36.0	43.0354411	-88.0560804	352 N 115th St.

Distances in kilometers. Readings taken by the writer on November 15, 2017 using his Potomac Instruments FIM-41 s/n 1655, last calibrated 07/16/2017.

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

This application covers the new WGLB daytime pattern and coverts the WGLB licensed nighttime pattern from a standard measured radial proof to Method of Moments. The currently licensed towers are used with no changes. Therefore, per §73.151(c)(1)(ix) no tower survey is required.

Construction Permit Condition Responses:

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

The towers are series-fed and the sample system meets the requirements of 47 CFR 73.151(c)(2)(1). This is the required report and filing.

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

WGLB has installed a Broadcast Electronics AM-2.5E transmitter, which the manufacturer states is type accepted for the power levels and intended service.

3 A license application (FCC Form 302) to cover this construction permit must be filed with the Commission pursuant to Section 73.3536 of the Rules before the permit expires.

This is the required FCC form 302-AM filing.

4 Licensee shall be responsible for satisfying all reasonable complaints of blanketing interference within the 1 V/m contour as required by Section 73.88 of the Commission's rules.

The licensee recognizes its responsibility to satisfy all reasonable complaints of blanketing interference.

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5 Ground system consists of 120 equally spaced, buried, copper radials about the base of each tower, each 48.1 meters in length except where terminated by property boundaries or where intersecting radials are shortened and bonded to a transverse copper strap midway between adjacent towers.

The ground system is as described, and no changes were made.

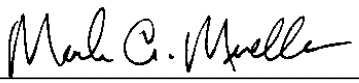
6 Upon the surrender of the license of WZRK(AM), Lake Geneva, Wisconsin to the Commission for cancellation prior to the commencement of program test authority by the WGLB(AM) facility authorized by the subject construction permit, pursuant to the discontinuance of operation provisions of 47 C.F.R. Section 73.1750.

The WZRK license has been surrendered and cancelled.

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. The WGLB antenna system is properly constructed and adjusted and program test authority is hereby requested.

March 6, 2018



Mark A. Mueller