June 29, 2018

2018 JUL -5 PM 1:52

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Accepted / Filed

JUN 29 2018

Federal Communications Commission
Office of the Secretary

Attention: Audio Division, Direct Measurement of Power

RE: WOLB (AM) Baltimore, MD (Facility ID 54711)

Dear Ms. Dortch,

We are submitting herewith an original and two copies of an application on Form 302-AM for the purpose of Direct Measurement of Power. Also enclosed is an Engineering Report containing pertinent information.

Greg Strickland
Corporate Engineer
Urban One, Inc. (Parent company of WOLB licensee Radio One Licenses, LLC.)
301 329-3254
gstrickland@radio-one.com

0007164544

Accepted / Filed

Federal Communications Commission
Washington, D. C. 20554

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

FOR FCC USE ONLY

JUN 29 2018

Federal Communications Commission
Office of the Secretary

FCC 302-AM
APPLICATION FOR AM BROADCAST STATION LICENSE

(Please read instructions before filling out form.

FOR COMMISSION USE ONLY
FILE NO. BZ-20180629ABX

SECTION I - APPLICANT FEE INFORMATION

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

Radio One Licenses, LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)
1010 Wayne Avenue, 14th Floor

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Silver Spring	MD	20910

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
301-429-3200	WOLB	Facility ID 54711

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): Application for Direct Measurement of Power

C. If Yes, provide the following information:

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

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

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

(A)	(B)	(C)	FOR FCC USE ONLY
	0001	$	

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	FOR FCC USE ONLY
	$	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT Radio One Licenses, LLC		
MAILING ADDRESS 1010 Wayne Avenue, 14th Floor		
CITY Silver Spring	STATE MD	ZIP CODE 20190

2. This application is for:

☑ Commercial ☐ Noncommercial

☐ AM Directional ☑ AM Non-Directional

Call letters	Community of License	Construction Permit File No.	Modification of Construction Permit File No(s).	Expiration Date of Last Construction Permit
WOLB	Baltimore, Maryland	N/A	N/A	N/A

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

☐ Yes ☑ No

If No, explain in an Exhibit.

Exhibit No. N/A

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

☐ Yes ☑ No

If No, state exceptions in an Exhibit.

Exhibit No. N/A

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

☐ Yes ☑ No

If Yes, explain in an Exhibit.

Exhibit No. N/A

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

☐ Yes ☐ No

☑ Does not apply

If No, explain in an Exhibit.

Exhibit No.

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

☐ Yes ☑ No

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

Exhibit No.

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

☐ Yes ☑ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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

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

CERTIFICATION

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

☑ Yes ☐ No

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

Name	Signature	
Karen Wishart		
Title	Date	Telephone Number
Vice President, Secretary	06/26/2018	301-429-3200

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
Radio One Licenses, LLC

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

☐ Station License ☑ Direct Measurement of Power

1. Facilities authorized in construction permit

Call Sign	File No. of Construction Permit (if applicable)	Frequency (kHz)	Hours of Operation	Power in kilowatts	
				Night	Day
	N/A	1010	Unlimited	0.03	0.25

2. Station location

State	City or Town
Maryland	Baltimore

3. Transmitter location

State	County	City or Town	Street address (or other identification)
Maryland	Baltimore	Baltimore	3500 East Monument Road

4. Main studio location

State	County	City or Town	Street address (or other identification)
Maryland	Baltimore	Baltimore	1705 Whitehead Road

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

State	County	City or Town	Street address (or other identification)
Maryland	Baltimore	Baltimore	1705 Whitehead Road

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

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

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

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system	RF common point or antenna current (in amperes) without modulation for day system
0.62	1.79

Measured antenna or common point resistance (in ohms) at operating frequency		Measured antenna or common point reactance (in ohms) at operating frequency	
Night	Day	Night	Day
77.7	77.7	+201.6	+201.6

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

Manufacturer and type of antenna monitor:

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.
Uniform guyed tower	86.9	86.9	88.1	Exhibit No. N/A

Excitation ☐ Series ☑ Shunt Folded unipole feed system

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

North Latitude	39	°	18	'	06	"	West Longitude	76	°	34	'	09	"

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?

No underlying construction permit.

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

Another AM station was added to the shared tower. Existing diplexing apparatus superseded by new triplexing apparatus.

Please see Engineering Report included with this application for measurement results.

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)
Greg Strickland	
Address (include ZIP Code)	Date
Urban One, Inc 1010 Wayne Avenue, 14th Floor Silver Spring, Maryland	06/26/2018
	Telephone No. (Include Area Code) 301-429-3254

☐ Technical Director ☐ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☑ Other (specify) Corporate Engineer

Engineering Report

WOLB – 1010 kHz, 250 W NDA
WRBS – 1230 kHz, 400 W NDA
WWIN – 1400 kHz, 500 W NDA

Baltimore, MD

Field Tuning of New Triplexing Equipment

Robert A. Elder
Sr. Field Engineer
Kintronic Labs, Inc.

11 May 2018

Executive Summary

WRBS - AM (1230 kHz) has been added to an existing diplex tower site in Baltimore, MD, where WOLB - AM (1010 kHz) and WWIN - AM (1400 kHz) have already been operating on a 6-wire skirted tower. The existing diplexing equipment has been superseded by a new triplexing antenna system designed and fabricated by Kintronic Labs. The site visit documented in the present report was for the purpose of providing final on-site tuning of the filtering and matching networks for simultaneous operation of these three stations, and for documenting all pertinent impedance and other data to characterize the system as tuned.

Adjustments to and measurements on the system were made during the week of April 14 – 20, 2018 during the night-time hours of 10 pm until 5 am; signal strength measurements were made during the day of 20 April and a repeat set of measurements made on 27 April 2018.

Measurements

All impedance measurements were made with an HP 8753C Network Analyzer in conjunction with a Tunwall Radio directional coupler and an ENI 350L RF amplifier in a calibrated measurement set up, and are presented below. For the filter characteristics and isolation measurements, the network analyzer was used in conjunction with the HP Model 850462 S-parameter Test Set in a calibrated set up. Signal strength measurements were made with a Potomac Instruments Field Strength Meter model PI-4100. A few signal strength measurements were also repeated using the Potomac Instruments model FIM-41, as noted in the data.

General Outline of material:

1. Filter Characteristics
2. Port-to-Port Isolation Between Stations
3. Tower Impedance Measurement Sweep
4. WOLB (1010 kHz) Characterization After Tuning
5. WRBS (1230 kHz) Characterization After Tuning
6. WWIN (1400 kHz) Characterization After Tuning
7. Signal Strength Measurements at Intermodulation Frequencies

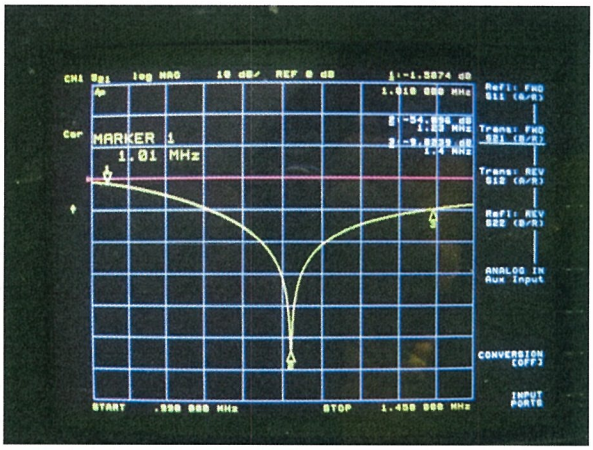
Filter Characteristics

There are eight filters in the new triplexing system: the networks for each station include series (notch) filters to provide rejection for the other two stations, and there are two shunt filters at the input point of the 1230 kHz system to provide further isolation from the other two stations.

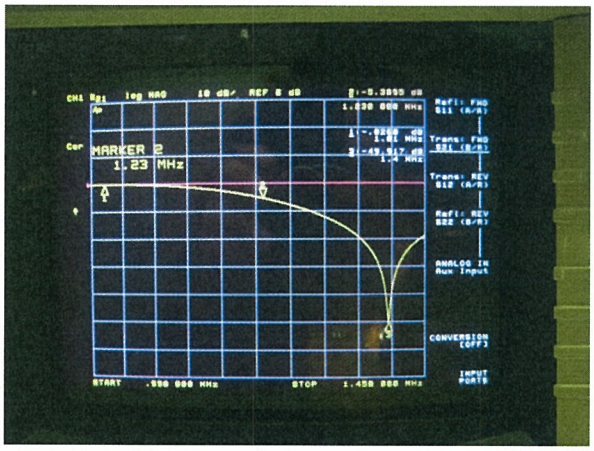
For each of the series filters in the triplexing system, the isolation provided for each filter separately was measured using the network analyzer connected to the S-parameter test set for a full two-port measurement. The measured isolation (in dB) was after making final adjustments to the filters. For the shunt filters, the shunt branch was set to a short circuit at the reject frequency and the parallel branch to resonance at 1230 kHz. The resulting isolation was then measured using the two-port measurement. The results are presented below.

WOLB (1010 kHz) System

Pass 1010 / Reject 1230: -54.2 dB

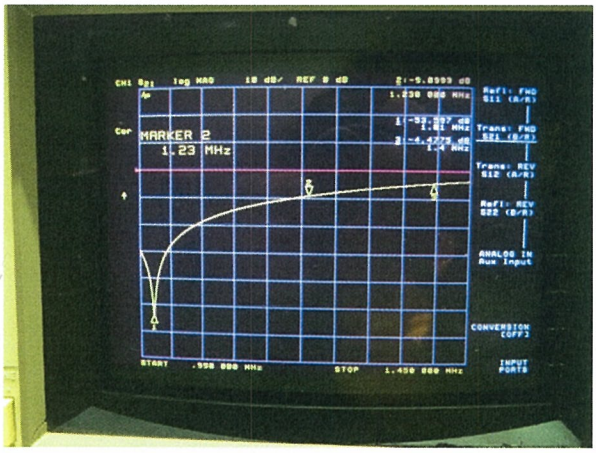


Pass 1010 / Reject 1400: - 50.0 dB

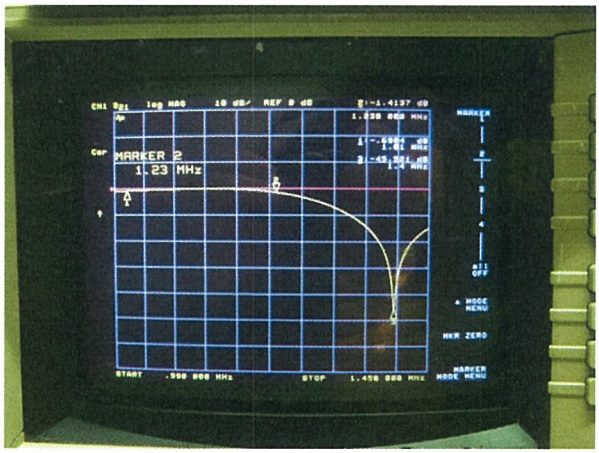


WRBS (1230 kHz) System

Pass 1230 / Reject 1010: -53.2 dB



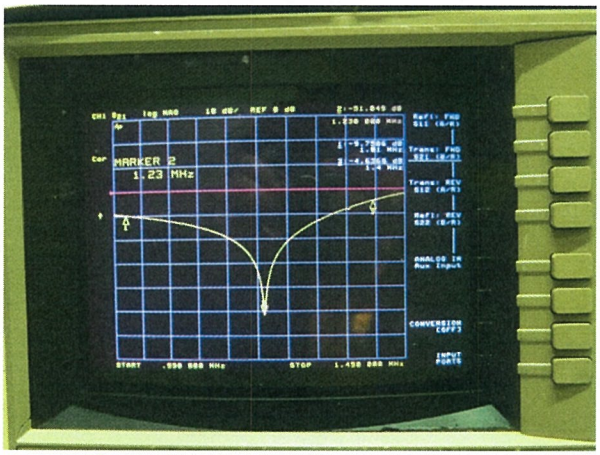
Pass 1230 / Reject 1400: -45.6 dB



WWIN (1400 kHz) System

Pass 1400 / Reject 1010: -50.8 dB

Pass 1400 / Reject 1230: -50.6 dB



Port-to-Port Isolation

After all the filters were measured individually, and after all adjustments were made to the filters as needed, an attempt was made to measure the total isolation between transmitters using the two-port analyzer setup, with measurements being made at the TX output end of the respective transmission lines. Since all measurements were being made through the night hours, there was considerable skywave interference present (particularly at the lower two frequencies), which provided misleading results. The table below presents the measurements taken:

Measurement taken between:	1010 kHz	1230 kHz	1400 kHz
1010 kHz and 1400 kHz	-24 dB	-68 dB	-81 dB
1010 kHz and 1230 kHz	-20 dB	-64 dB	-84 dB
1230 kHz and 1400 kHz	-80 dB	-52 dB	-20 dB

It is believed that the actual isolation between transmitters are all in the -70 to -80 dB range; the measurements of possible spurious emissions at intermodulation frequencies would seem to corroborate this belief.

Tower Impedance Sweep

Measurements of tower impedance were made at all three carrier frequencies and their respective +/- 15 kHz sideband frequencies in 5 kHz intervals. These measurements were made at the final output J-plug for the overall system (J2 J-plug), and are presented below.

Station	Freq. (kHz)	Impedance (Ω)	Modeled tower impedance (on carrier)
WOLB	995	114.0 + j202.4	
	1000	118.8 + j208.1	
	1005	122.0 + j212.8	
	1010	**126.2 + j217.3**	**133 + j232**
	1015	131.5 + j223.7	
	1020	136.5 + j229.4	
	1025	141.2 + j236.1	
WRBS	1215	748 – j39.5	
	1220	743 – j85.2	
	1225	741 – j128	
	1230	**729 – j170**	**729 – j186**
	1235	709 – j220	
	1240	685 – j259	
	1245	654 – j293	
WWIN	1385	123.1 – j284	
	1390	118.0 – j278	
	1395	113.0 – j272	
	1400	**108.5 – j266**	**99.7 – j252**
	1405	104 – j261	
	1410	98.2 – j256	
	1415	93.8 – j251	

WOLB Station (1010 kHz) Characterization After Tuning

After the filtering and matching networks were adjusted, measurements of matching impedance and SWR were made. The matching network was adjusted while monitoring the match at the input J-plug (J101), and then a sweep of impedance and SWR measurements was made at this point. Impedance measurements were also made at the point in the system at which the base current is monitored (at J-plug J102). Impedances have been measured at carrier frequency and the +/- 15 kHz sidebands in 5 kHz intervals. The latter measurement at J102 (on carrier) is the value to be reported on the 302-AM form as the (effective) tower base impedance, corresponding to the current measurement point for calculating outgoing power, and is designated in the data table below as "Output Z." For comparison, the value of this impedance predicted in the design (on carrier) is provided. The current corresponding to full broadcast power (as well as the +5% and -10% tolerance values) have been calculated and are reported below.

Freq. (kHz)	Input Z	SWR	"Output" Z	Output Z per design
995	30.6 – j8.8	1.719	70.7 + j158.4	
1000	37.2 – j2.7	1.354	72.1 + j172.5	
1005	44.4 + j0.5	1.126	74.8 + j186.3	
1010	**50.0 – j0.5**	**1.018**	**77.7 + j201.6**	**78 + j212**
1015	50.6 – j4.7	1.100	83.0 + j217.8	
1020	43.6 – j7.7	1.237	94.8 + j236.8	
1025	31.2 – j2.6	1.631	123.5 + j256.7	

Calculated Current Values:

Using the resistance measured at J-plug J102 (shown in bold above), the base current should be as follows:

	Day Power (W)	Current (A)	Night Power (W)	Current (A)
Full Power – 10%:	225	1.70	27	0.59
Nominal:	250	1.79	30	0.62
Full Power + 5%:	262.5	1.84	31.5	0.64

WRBS Station (1230 kHz) Characterization After Tuning

After the filtering and matching networks were adjusted for the 1230 kHz system, impedance and SWR measurements were made at the input point of the matching network (at J-plug J201), and impedance measurements were made at the point in the system at which the base current is monitored (at J-plug J202). Impedances have been measured at carrier frequency (1230 kHz) as well as the +/- 15 kHz sidebands in 5 kHz intervals. The latter measurement at J202 (on carrier) is the value to be reported on the 302-AM form as the (effective) tower base impedance, since it corresponds to the current measurement point for calculating outgoing power, and is designated in the data table below as "Output Z." For comparison, the value of this impedance predicted in the design (on carrier) is provided. The current corresponding to full broadcast power (as well as the +5% and -10% tolerance values) have been calculated and are reported below.

Freq. (kHz)	Input Z	SWR	"Output" Z	Output Z per design
1215	19.4 + j8.2	3.225	285.2 – j216.3	
1220	68.2 + j29.6	1.809	121.3 + j54.8	
1225	67.1 + j0.2	1.346	169.7 + j136.4	
1230	**49.8 + j0.0**	**1.072**	**214.0 + j181.8**	**265 + j223**
1235	36.1 + j12.3	1.546	285.6 + j212.2	
1240	36.3 + j41.6	2.777	309.6 + j52.5	
1245	49.0 + j31.1	1.872	200.0 + j174.9	

Calculated Current Values:

Using the resistance measured at J-plug J102 (shown in bold above), the base current should be as follows:

	Day/Night Power (W)	Current (A)
Full Power – 10%:	360	1.30
Nominal:	400	1.37
Full Power + 5%:	420	1.40

Note: for 1000W, for which the system is capable, the nominal current would be 2.16 A.

Additional Tuning Note for the 1230 kHz System:

The data reported above represent the "final" tuned status of the 1230 kHz system, as it was left at the conclusion of the site visit. This tuned status was the result of having implemented a roughly – 50° phase shift in the matching network at the ATU, as an attempt to improve the sideband performance of the system. The data appearing below presents the impedance sweep from the initial tuning, prior to the additional phase shift. During the site visit, both sets of data were presented to the customer to allow discussion of expected performance for each; the customer then opted for the "final" status previously reported.

Freq. (kHz)	Input Z	SWR	"Output" Z	Output Z per design
1215	17.0 – j50.3	6.591	285.2 – j216.3	
1220	22.2 – j11.5	2.423	121.3 + j54.8	
1225	39.4 – j0.4	1.271	169.7 + j136.4	
1230	50.0 + j0.05	1.031	214.0 + j181.8	265 + j223
1235	49.8 – j6.0	1.130	285.6 + j212.2	
1240	30.5 + j6.5	1.841	309.6 + j52.5	
1245	52.3 + j29.6	1.785	200.0 + j174.9	

Subsequent discussion of these results amongst the Kintronic engineering staff, however, has led us to conclude that the initial tuning was a better approximation to the performance predicted in the design, with a bandwidth more conducive to a desirable transmitter performance, particularly within the +/- 5 kHz bandwidth. It is recommended, when there is opportunity, to have the system re-tuned so as to bring it back to the earlier performance. Some additional improvement may also be realized by making the impedance measurements at the transmitter end of the coaxial line while making the final system adjustments.

WWIN Station (1400 kHz) Characterization After Tuning

After the filtering and matching networks were adjusted for the 1400 kHz system, impedance and SWR measurements were made at the input point of the matching network (at J-plug J301), and impedance measurements were made at the point in the system at which the base current is monitored (at J-plug J303). Impedances have been measured at carrier frequency (1400 kHz) as well as the +/- 15 kHz sidebands in 5 kHz intervals. The latter measurement at J303 (on carrier) is the value to be reported on the 302-AM form as the (effective) tower base impedance, since it corresponds to the current measurement point for calculating outgoing power, and is designated in the data table below as "Output Z." For comparison, the value of this impedance predicted in the design (on carrier) is provided. The current corresponding to full broadcast power (as well as the +5% and -10% tolerance values) have been calculated and are reported below.

Freq. (kHz)	Input Z	SWR	"Output" Z	Output Z per design
1385	49.7 – j12.1	1.277	194.2 – j152.6	
1390	48.6 – j5.9	1.130	179.6 – j143.6	
1395	49.1 – j1.8	1.042	167.8 – j128.8	
1400	**50.0 + j0.1**	**1.005**	**158.6 – j111.5**	**122 – j122**
1405	50.8 – j0.2	1.017	151.3 – j93.8	
1410	49.9 – j2.4	1.051	145.0 – j74.6	
1415	46.7 – j5.2	1.137	140.1 – j55.0	

Calculated Current Values:

Using the resistance measured at J-plug J303 (shown in bold above), the base current should be as follows:

	Day/Night Power (W)	Current (A)
Full Power – 10%:	450	1.68
Nominal:	500	1.78
Full Power + 5%:	525	1.82

Field Strength Measurements at Intermodulation Product Frequencies

Field strength measurements of the unmodulated signal at full licensed power were made at the carrier frequencies of each of the three stations to be used as reference values, and then at each of the various intermodulation frequencies falling between 500 kHz and 5 MHz (as shown in the data table following).

Each station was operating at its full authorized daytime power level, with normal audio modulation. With the exception of a few repeated measurements, the signal strength measurements were made using a Potomac Instruments PI-4100 field strength meter (S/N 350), last calibrated at the factory on 11 January 2018. A few measurements were also taken using a Potomac Instruments model FIM-41 meter, as noted. The measurement location was inside the Baltimore Cemetery, at a distance of 1.1 km and bearing of 149° (true) away from the station. The GPS coordinates of the measurement location (NAD 83), as indicated on the PI-4100, are: 39 18 36.7N, 76 34 31.5W. There were no overhead wires or possible reradiating objects observed in the immediate vicinity of the measurement location.

At each of the intermodulation frequencies noted, observations were made of the signal strength and the nature of any audio modulation detected, and were analyzed relative to the field strengths of the unmodulated carrier frequency signals of the three stations. There were no frequencies at which the measured signal strength exceeded the FCC limits, other than those for which (as noted in the data) the signal was clearly attributable to another source. The field observations therefore indicate that no spurious emissions exist stemming from intermodulation products generated by the three stations.

The table presented on the following pages is the output of an Excel spreadsheet used to record the data and calculate the emission levels relative to that of each of the constituent carrier frequencies (in dB).

Field Strength Measurements at Intermodulation Product Frequencies and Calculated Strengths Relative to Carriers in dB

Stations:

	Call letters	Freq	Power (W)	Unmod. Carrier reading (mV/m)
A	WOLB	1010	250	109
B	WRBS	1230	400	155
C	WWIN	1400	500	181

Date and Time of measurements: 27 April 2018, 1230 - 1500 hrs

IM Frequency	Δ F1	Δ F2	Δ F3	Origin	Reading (mV/m)	Note	relative to 1010 (dB)	limit	relative to 1230 (dB)	limit	relative to 1400 (dB)	limit
610	400	620	790	1230 + 1400 - 2 x 1010	0.7740	1	-43.0	-67.0	-46.1	-69.0	-47.4	-70.0
620	390	610	780	2 x 1010 - 1400	0.0292		-71.4	-67.0	-74.6	-69.0	-75.8	-70.0
670	340	560	730	1010 + 2 x 1230 - 2 x 1400	0.1170	2	-59.4	-67.0	-62.5	-69.0	-63.8	-70.0
780	230	450	620	2 x 1400 - 2 x 1010	0.1710	3	-56.1	-67.0	-59.2	-69.0	-60.5	-70.0
790	220	440	610	2 x 1010 - 1230	0.0206		-74.5	-67.0	-77.6	-69.0	-78.9	-70.0
840	170	390	560	1010 + 1230 - 1400	0.2290	4	-53.6	-67.0	-56.7	-69.0	-58.0	-70.0
960	50	270	440	2 x 1010 - 2 x 1230 + 1400	0.0976	5	-61.0	-55.0	-64.1	-69.0	-65.4	-70.0
1060	50	170	340	2 x 1230 - 1400	0.0425		-68.2	-55.0	-71.3	-69.0	-72.6	-70.0
1180	170	50	220	1010 - 1230 + 1400	0.0355		-69.7	-67.0	-72.9	-55.0	-74.1	-70.0
1350	340	120	50	1010 - 2 x 1230 + 2 x 1400	0.1240	6	-58.9	-67.0	-62.0	-69.0	-63.3	-55.0
1450	440	220	50	2 x 1230 - 1010	0.0638	7	-64.7	-67.0	-67.8	-69.0	-69.1	-55.0
1570	560	340	170	2 x 1400 - 1230	1.6300	8	-36.5	-67.0	-39.6	-69.0	-40.9	-70.0
1620	610	390	220	1230 + 1400 - 1010	0.6880	9	-44.0	-67.0	-47.1	-69.0	-48.4	-70.0
1670	660	440	270	3 x 1230 - 2 x 1010	0.0154		-77.0	-67.0	-80.1	-69.0	-81.4	-70.0
1680	670	450	280	2 x 1010 + 2 x 1230 + 2 x 14	0.0165		-76.4	-67.0	-79.5	-69.0	-80.8	-70.0
1790	780	560	390	2 x 1400 - 1010	0.0175		-75.9	-67.0	-79.0	-69.0	-80.3	-70.0
1840	830	610	440	2 x 1230 - 1010 + 1400	0.0129		-78.5	-67.0	-81.7	-69.0	-82.9	-70.0
1850	840	620	450	2 x 1010 + 1230 - 1400	0.0135		-78.1	-67.0	-81.3	-69.0	-82.5	-70.0
2010	1000	780	610	1230 + 2 x 1400 - 2 x 1010	0.0131		-78.4	-67.0	-81.5	-69.0	-82.8	-70.0
2020	1010	790	620	2 x 1010	0.0142		-77.7	-67.0	-80.8	-69.0	-82.1	-70.0
2070	1060	840	670	1010 + 2 x 1230 - 1400	0.0127		-78.7	-67.0	-81.8	-69.0	-83.1	-70.0
2190	1180	960	790	2 x 1010 - 1230 + 1400	0.0131		-78.4	-67.0	-81.5	-69.0	-82.8	-70.0
2240	1230	1010	840	1010 + 1230	0.0138		-78.0	-67.0	-81.1	-69.0	-82.4	-70.0
2360	1350	1130	960	2 x 1010 + 2 x 1230 - 2 x 14	0.0127		-78.7	-67.0	-81.8	-69.0	-83.1	-70.0
2410	1400	1180	1010	1010 + 1400	0.0140		-77.8	-67.0	-80.9	-69.0	-82.2	-70.0
2460	1450	1230	1060	2 x 1230	0.0135		-78.1	-67.0	-81.3	-69.0	-82.5	-70.0
2580	1570	1350	1180	1010 + 1230 + 2 x 1400	0.0125		-78.8	-67.0	-81.9	-69.0	-83.2	-70.0
2630	1620	1400	1230	1230 + 1400	0.0172		-76.0	-67.0	-79.2	-69.0	-80.4	-70.0
2800	1790	1570	1400	2 x 1400	0.0125		-78.8	-67.0	-81.9	-69.0	-83.2	-70.0
2850	1840	1620	1450	2 x 1230 + 1400 - 1010	0.0122		-79.0	-67.0	-82.1	-69.0	-83.4	-70.0
3020	2010	1790	1620	1230 + 2 x 1400 - 1010	0.0121		-79.1	-67.0	-82.2	-69.0	-83.5	-70.0
3080	2070	1850	1680	2 x 1010 + 2 x 1230 - 1400	0.0121		-79.1	-67.0	-82.2	-69.0	-83.5	-70.0
3240	2230	2010	1840	2 x 1230 + 2 x 1400 - 2 x 10	0.0123		-79.0	-67.0	-82.1	-69.0	-83.4	-70.0
3250	2240	2020	1850	2 x 1010 + 1230	0.1470	10	-57.4	-67.0	-60.5	-69.0	-61.8	-70.0
3420	2410	2190	2020	2 x 1010 + 1400	0.0125		-78.8	-67.0	-81.9	-69.0	-83.2	-70.0
3470	2460	2240	2070	2 x 1230 + 1010	0.0136		-78.1	-67.0	-81.2	-69.0	-82.5	-70.0
3590	2580	2360	2190	2 x 1010 - 1230 + 2 x 1400	0.0128		-78.6	-67.0	-81.7	-69.0	-83.0	-70.0
3640	2630	2410	2240	1010 + 1230 + 1400	0.0283		-71.7	-67.0	-74.8	-69.0	-76.1	-70.0
3810	2800	2580	2410	2 x 1400 + 1010	0.0134		-78.2	-67.0	-81.3	-69.0	-82.6	-70.0
3860	2850	2630	2460	2 x 1230 + 1400	0.0241		-73.1	-67.0	-76.2	-69.0	-77.5	-70.0

4030	3020	2800	2630	2 x 1400 + 1230	0.0133	-78.3	-67.0	-81.4	-69.0	-82.7	-70.0
4480	3470	3250	3080	2 x 1010 + 2 x 1230	0.0130	-78.5	-67.0	-81.6	-69.0	-82.9	-70.0
4650	3640	3420	3250	2 x 1010 + 1230 + 1400	0.0134	-78.2	-67.0	-81.3	-69.0	-82.6	-70.0
4820	3810	3590	3420	2 x 1010 + 2 x 1400	0.0136	-78.1	-67.0	-81.2	-69.0	-82.5	-70.0
4870	3860	3640	3470	1010 + 2 x 1230 + 1400	0.0137	-78.0	-67.0	-81.1	-69.0	-82.4	-70.0

NOTES:

1 audio from 600 WCAO
2 audio from 680 WCBN
3 audio from 780 WABA
4 audio from some other station (not identified)
5 weak audio from some other station (not identified)
6 weak audio from some other station (not identified)
7 audio from some other station (not identified)
8 audio from 1570 WNST
9 audio from 1620 WLOY
10 no audio detected. Same frequency as 100 kW shortwave station operating from Pyongyang, South Korea. Operation at this frequency is between 1330 - 2100 hrs, UTC. [Ref: shortwaveschedule.com] Repeated measurement with FIM-41, no signal detected at all.
11 Isolation limits are calculated using formulae cited in FCC Rules 73.44