

ORIGINAL



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April 9, 2018

By Hand

Accepted / Filed

APR - 9 2018

Federal Communications Commission
Office of the Secretary

Marlene H. Dortch, Esq.
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554
Attn: Audio Division

Re: **Application for Broadcast Station License
and Request for Program Test Authority**
Radio License Holdings LLC
Station WMAL(AM), Washington, DC
Facility ID 73250

2018 APR 11 PM 2:32

Dear Ms. Dortch:

Transmitted herewith in triplicate behalf of Radio License Holdings LLC ("RLH"), licensee of radio station WMAL(AM), Washington, DC, is an application on FCC Form 302-AM seeking a new broadcast station license. A method of moments computer analysis of the directional operation of station WMAL has been submitted herewith pursuant to Section 73.151(c) of the Commission's rules.

Please note that the associated filing fee for this application was paid via the FCC Fee Filer. Accordingly, proof of payment of that filing fee has been included with this submission.

Pursuant to Section 73.1620 of the Commission's rules, RLH respectfully requests that station WMAL be authorized to commence program tests as soon as possible.

Should any questions arise concerning this application, please contact the undersigned.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Andy', written over a horizontal line.

Andrew S. Kersting
Regulatory Counsel

Enclosure

Agency Tracking ID:PGC3080411
Authorization Number:260457
Successful Authorization -- Date Paid: 4/9/18
FILE COPY ONLY!!

READ INSTRUCTIONS CAREFULLY BEFORE PROCEEDING	FEDERAL COMMUNICATIONS COMMISSION REMITTANCE ADVICE FORM 159 PAGE NO 1 OF 1		APPROVED BY OMB 3060-059
(1) LOCKBOX #979089			SPECIAL USE FCC USE ONLY
SECTION A - Payer Information			
(2) PAYER NAME (if paying by credit card, enter name exactly as it appears on your card) Cumulus Media Inc.		(3) TOTAL AMOUNT PAID (dollars and cents) \$1505.00	
(4) STREET ADDRESS LINE NO. 1 3280 Peachtree Road, NW			
(5) STREET ADDRESS LINE NO. 2 Suite 2200			
(6) CITY Atlanta		(7) STATE GA	(8) ZIP CODE 30305
(9) DAYTIME TELEPHONE NUMBER (INCLUDING AREA CODE) 404-9490700		(10) COUNTRY CODE (IF NOT IN U.S.A.) US	
FCC REGISTRATION NUMBER (FRN) AND TAX IDENTIFICATION NUMBER (TIN) REQUIRED			
(11) PAYER (FRN) 0009621244		(12) FCC USE ONLY	
IF PAYER NAME AND THE APPLICANT NAME ARE DIFFERENT, COMPLETE SECTION B IF MORE THAN ONE APPLICANT, USE CONTINUATION SHEETS (FORM 159-C)			
(13) APPLICANT NAME Radio License Holdings LLC			
(14) STREET ADDRESS LINE NO. 1 3280 Peachtree Road, NW			
(15) STREET ADDRESS LINE NO. 2 Suite 2200			
(16) CITY Atlanta		(17) STATE GA	(18) ZIP CODE 30305
(19) DAYTIME TELEPHONE NUMBER (INCLUDING AREA CODE) 404-9490700		(20) COUNTRY CODE (IF NOT IN U.S.A.) US	
FCC REGISTRATION NUMBER (FRN) AND TAX IDENTIFICATION NUMBER (TIN) REQUIRED			
(21) APPLICANT (FRN) 0023190655		(22) FCC USE ONLY	
COMPLETE SECTION C FOR EACH SERVICE, IF MORE BOXES ARE NEEDED, USE CONTINUATION SHEET			
(23A) FCC Call Sign/Other ID WMAL		(24A) Payment Type Code(PTC) MMR	(25A) Quantity 1
(26A) Fee Due for (PTC) \$700.00		(27A) Total Fee \$700.00	FCC Use Only
(28A) FCC CODE 1 73250		(29A) FCC CODE 2 FCCForm302-AM	
(23B) FCC Call Sign/Other ID WMAL		(24B) Payment Type Code(PTC) MOR	(25B) Quantity 1
(26B) Fee Due for (PTC)		(27B) Total Fee	FCC Use Only

\$805.00		\$805.00	
(28B) FCC CODE 1	73250	(29B) FCC CODE 2	FCCForm302-AM

Accepted / Filed

APR 9 2018

FOR
FCC
USE
ONLY

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. *Bmmk-20180409 ABG*

SECTION I - APPLICANT FEE INFORMATION

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

Radio License Holdings LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)

3280 Peachtree Road, NW

MAILING ADDRESS (Line 2) (Maximum 35 characters)

Suite 2200

CITY

Atlanta

STATE OR COUNTRY (if foreign address)

GA

ZIP CODE

30305

TELEPHONE NUMBER (include area code)

(404) 949-0700

CALL LETTERS

WMAL

OTHER FCC IDENTIFIER (if applicable)

73250

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		
M	M	R

(B)

FEE MULTIPLE			
0	0	0	1

(C)

FEE DUE FOR FEE TYPE CODE IN COLUMN (A)
\$ 700.00

FOR FCC USE ONLY

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

(A)

M	O	R
---	---	---

(B)

0	0	0	1
---	---	---	---

(C)

\$ 805.00

FOR FCC USE ONLY

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

TOTAL AMOUNT REMITTED WITH THIS APPLICATION

\$ 1,505.00

FOR FCC USE ONLY

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SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT Radio License Holdings LLC		
MAILING ADDRESS 3280 Peachtree Road, NW, Suite 2200		
CITY Atlanta	STATE GA	ZIP CODE 30305

2. This application is for:

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

Call letters WMAL	Community of License Washington, DC	Construction Permit File No. BP-20151008AAI	Modification of Construction Permit File No(s).	Expiration Date of Last Construction Permit May 12, 2019
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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.

The station is operating pursuant to its existing license authorization (File No. BML-20100510BDZ).

Exhibit No.

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.
1

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.

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

☐ Yes ☐ No

If No, explain in an Exhibit.

☒ Does not apply

Exhibit No.

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

☐ Yes ☒ No

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

Exhibit No.

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

☐ Yes ☒ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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


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

CERTIFICATION

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

☒ Yes ☐ No

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

Name Richard S. Denning	Signature 	
Title Senior Vice President & General Counsel	Date April 9, 2018	Telephone Number (404) 949-0700

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.

EXHIBIT 1

Annexed hereto as Appendix A is a Tower Lease Agreement, dated October 17, 2016 between Red Zebra Broadcasting, LLC and DC Radio Assets, LLC in satisfaction of special operating condition 8 set forth in Construction Permit (File No. BP-20151008AAI) with respect to a written agreement between the parties. Confidential and proprietary information has been redacted from the lease agreement. Also attached is an Assignment and Assumption Agreement dated September 15, 2017 reflecting the assignment of the lease agreement from Red Zebra Broadcasting, LLC to Salem Radio Properties, Inc., an affiliate of Salem Communications Holding Corporation.

Please note that the call letters of radio station WSPZ(AM), Bethesda, MD (Facility ID 11846), were changed to WWRC effective November 20, 2017.

APPENDIX A

Tower Lease Agreement
and
Assignment and Assumption of Lease

(Copies attached)

TOWER LEASE AGREEMENT

This Agreement (this "Agreement"), made this 17th day of October, 2016 ("Effective Date"), between RED ZEBRA BROADCASTING, LLC, a Delaware limited liability company, with its principal offices located at 1801 Rockville Place, Suite 405, Rockville, Maryland 20852, hereinafter designated LESSOR, and DC RADIO ASSETS, LLC, a Delaware limited liability company, with its principal offices at 3280 Peachtree Road, NW, Suite 2300, Atlanta, Georgia 30305, hereinafter designated LESSEE. The LESSOR and LESSEE are at times collectively referred to hereinafter as the "Parties" or individually as the "Party".

WITNESSETH

In consideration of the mutual covenants contained herein and intending to be legally bound hereby, the Parties hereto agree as follows:

1. PREMISES. LESSOR hereby leases to the LESSEE a portion of that certain space (the "Tower Space") on the LESSOR's towers, hereinafter referred to as the "Towers", located on a 58-acre parcel of property owned by LESSOR at 16925 Black Rock Road, Germantown, Maryland 20876 Montgomery County, Maryland, shown as lot 4, in a subdivision known as "SENECA PARK ESTATES", recorded in Plat Book 167 at Plat 18848 among the land records of Montgomery County (the entirety of LESSOR's property is referred to hereinafter as the "Property"), together with land space (the "Land Space") comprised of the following: (i) the non-exclusive right ("Right of Way") for ingress and egress, upon reasonable advance notice, on foot or motor vehicle, including trucks, and for the installation and maintenance of utility wires, poles, cables, conduits, and pipes over, under, or along a right-of-way extending from the nearest public right-of-way, Black Rock Road, to the Land Space and the Tower Space; and (ii) together with any further rights of way (the "Further Rights of Way") over and through the Property. The Tower Space, Land Space, Right of Way and Further Rights of Way, if any, are substantially described in Exhibit "A" attached hereto and made a part hereof and are collectively referred to hereinafter as the "Premises".

In the event any public utility is unable to use the Right of Way or Further Rights of Way, the LESSOR hereby agrees to grant an alternative right(s)-of-way either to the LESSEE or to the public utility.

LESSOR hereby grants permission to LESSEE to install, maintain and operate within the Tower Space the radio communications equipment, antennas and appurtenances described in Exhibit "B" attached hereto and made a part hereof, and are collectively referred to hereinafter as the "Equipment".

LESSEE reserves the right to replace the aforementioned Equipment with similar and comparable equipment provided said replacement does not increase tower loading of said Tower or otherwise interfere with LESSOR's business operations or the business operations of any of LESSOR's then-existing tenants, subject to prior written notice to and approval of LESSOR (which approval shall not be unreasonably withheld, conditioned or delayed).

2. SURVEY. LESSOR also hereby grants to LESSEE the right to survey the Property and Premises, and said survey shall then become Exhibit "C" which shall be attached hereto and made a part

hereof, and shall control in the event of boundary and access discrepancies between it and Exhibit "A". The cost for such work shall be borne by the LESSEE.

3. TERM; RENTAL; ELECTRICAL.

The term (the "Term") shall be for ten (10) years and shall commence on the Commencement Date (as hereinafter defined) at which time rental payments shall commence and be due at a total annual rental amount of [REDACTED] to be paid in equal monthly installments on the first day of the month, in advance, to LESSOR or to such other person, firm or place as LESSOR may, from time to time, designate in writing at least thirty (30) days in advance of any rental payment date by notice given in accordance with Paragraph 23 below. The Agreement shall commence the date construction begins or April 1, 2017, whichever occurs first, hereinafter the "Commencement Date". LESSOR and LESSEE agree that they shall acknowledge in writing the Commencement Date. LESSOR and LESSEE acknowledge and agree that rent will not become due and payable until ninety (90) days after the construction begins (the "Construction Period"), during which time access and use of the Premises will be provided to LESSEE free of charge. However,

[REDACTED]

Upon agreement of the Parties, LESSEE may pay rent by electronic funds transfer and in such event, LESSOR agrees to provide to LESSEE bank routing information for such purpose upon request of LESSEE.

b. LESSOR hereby agrees to provide to LESSEE certain documentation (the "Rental Documentation") evidencing LESSOR's interest in, and right to receive payments under, this Agreement, including without limitation: (i) documentation, acceptable to LESSEE in LESSEE's reasonable discretion, evidencing LESSOR's good and sufficient title to and/or interest in the Property and right to receive rental payments and other benefits hereunder; and (ii) complete and fully executed Internal Revenue Service Form W-9. Delivery of Rental Documentation to LESSEE shall be a prerequisite for the payment of any rent by LESSEE and notwithstanding anything to the contrary herein, LESSEE shall have no obligation to make any rental payments until Rental Documentation has been supplied to LESSEE as

provided herein; provided; however, that LESSEE acknowledges that it has received, as of the Effective Date, acceptable Rental Documentation from the LESSOR under this Agreement, and (ii) rent shall continue to accrue and LESSEE shall pay all accrued and unpaid rent upon receipt of the Rental Documentation.

Any assignee(s), transferee(s) or other successor(s) in interest of LESSOR shall provide to LESSEE documentation in the manner set forth in the preceding paragraph within a commercially reasonable time following a written request from LESSEE, in a form reasonably acceptable to LESSEE.

c. LESSOR shall, at all times during the Term, provide access to electrical service, telephone service and other utility services within the Premises. If permitted by the local utility companies servicing the Property, LESSEE shall contract directly for utilities to be used by LESSEE's installation. LESSEE agrees and is responsible to contract directly for LESSEE's power consumption (provided the power company so agrees). LESSEE shall be permitted at any time during the Term, at LESSEE's sole expense, to install, maintain and/or provide access to and use additional equipment, as necessary during any power interruption at the Premises a temporary power source, and all related equipment and appurtenances within the Premises. LESSEE shall have the right to install conduits connecting the temporary power source and related appurtenances to its Equipment on the Premises.

4. EXTENSIONS. This Agreement shall automatically be extended for three (3) additional five (5) year Terms unless LESSEE terminates it at the end of the then current Term by giving LESSOR written notice of the intent to terminate at least six (6) months prior to the end of the then current Term.

5. ADDITIONAL EXTENSIONS. If at the end of the third (3rd) extension Term this Agreement has not been terminated by LESSEE pursuant to Section 4 above, this Agreement shall continue to be in force upon the same covenants, terms and conditions for a further Term of five (5) years and for five (5) year Terms thereafter until terminated by either Party by giving written notice of its intention to so terminate to the other Party at least eighteen (18) months prior to the end of the then current Term.

6. RENTAL ESCALATIONS. The annual rental shall increase on each one year anniversary of the Commencement Date by [REDACTED] during the initial and extended terms.

7. TAXES. LESSEE is responsible for paying all personal property taxes, real estate taxes or any other assessments or charges owed on the Property which LESSOR demonstrates is the result of LESSEE's use of the Premises and/or the installation, maintenance, and operation of the LESSEE's improvements, including without limitation any sales/use taxes imposed on the rent (except to the extent that LESSEE is or may become exempt from the payment of any such sales/use tax, in the jurisdiction in which the Property is located), and also including without limitation all increases in real estate taxes which LESSOR can reasonably demonstrate arose from the LESSEE's improvements and use of the Premises. Each party shall each be responsible for the payment of any taxes, levies, assessments and other charges, including franchise and/or similar taxes, imposed upon their respective businesses as conducted. Notwithstanding the foregoing, LESSEE shall not have the obligation to pay any tax, assessment, or charge that LESSEE can reasonably dispute in good faith in appropriate proceedings prior

to a final determination that such tax is properly assessed, provided that LESSEE initiates such proceeding within 30 days of receipt of notice of any such tax, assessment, or charge. Nothing in this Paragraph shall be construed as making LESSEE liable for any portion of LESSOR's income taxes in connection with any Property or otherwise. LESSOR shall have the responsibility of paying the real estate taxes, assessments, or charges owed on the Property and shall invoice LESSEE for LESSEE's pro-rata portion on an annual basis.

LESSEE shall have the right, at its sole option and at its sole cost and expense, to appeal, challenge or seek modification of any tax assessment or billing for which LESSEE is responsible for payment. LESSOR agrees to cooperate with LESSEE at LESSEE's expense in filing, prosecuting and perfecting any appeal or challenge to taxes as set forth in the preceding sentence, including but not limited to, executing any consent, appeal or other similar document. In the event that as a result of any appeal or challenge by LESSEE, there is a reduction, credit or repayment received by the LESSOR for any taxes previously paid by LESSEE, LESSOR agrees to promptly reimburse to LESSEE the amount of said reduction, credit or repayment.

8. USE; GOVERNMENTAL APPROVALS. LESSEE shall use the Premises for the purpose of constructing, maintaining, repairing and operating a communications facility and uses incidental thereto. All improvements related to the installation of LESSEE's Equipment shall be at LESSEE's expense and their installation shall be at the discretion and option of LESSEE. LESSEE shall have the right to replace, repair, add or otherwise modify its utilities, Equipment, or any portion thereof and the frequencies over which the Equipment operates during the Term, regardless of whether the Equipment or frequencies are specified on any exhibit attached hereto, subject to prior written notice to and approval of LESSOR (which approval shall not be unreasonably withheld, conditioned, or delayed); provided, however, the following alterations, improvements or modifications shall not require LESSOR's prior approval provided they do not interfere with the business operations of LESSOR or any of LESSOR's then existing tenants: (i) any change or addition of frequencies at which LESSEE's Equipment is operated so long as the same are licensed to LESSEE and operated in accordance with the terms and conditions of this Agreement, (ii) any alteration, improvement or modification performed completely within LESSEE's Equipment platform and/or cabinet(s), and (iii) any replacement of any Equipment located on the Tower provided the replacement does not increase the tower loading (provided, with respect to any such replacement, LESSEE provides LESSOR with prior written notice of the same). It is understood and agreed that (i) the commencement of the use of HD channels related to the radio station(s) broadcasting from the Tower Space shall not be deemed to be the addition of frequencies as referenced in the immediately preceding sentence, provided that the use of HD channels does not interfere with LESSOR's business operations or the business operations of any of LESSOR's then existing tenants, and (ii) LESSEE's ability to use the Premises is contingent upon its obtaining after the Effective Date of this Agreement all of the certificates, permits and other approvals (collectively the "Governmental Approvals") that may be required by any Federal, State or Local authorities as well as satisfactory soil boring tests and structural analysis, if required, which will permit LESSEE's use of the Premises as set forth above. LESSOR shall cooperate with LESSEE in its effort to obtain such approvals and shall take no action which would adversely affect the status of the Property with respect to the proposed use thereof by LESSEE. In the event that (i) any of such applications for such Governmental Approvals should be finally rejected; (ii)

any Governmental Approval issued to LESSEE (including the radio station license) is canceled, expires, lapses, or is otherwise withdrawn or terminated by a governmental authority of competent jurisdiction but only as a result of government action outside of the reasonable control of the LESSEE and not as a result of LESSEE's exercise of discretion or business judgment (iii) LESSEE determines that such Governmental Approvals may not be obtained in a timely manner; (iv) LESSEE determines that any soil boring tests or structural analysis is unsatisfactory or; (v) LESSEE determines that the Premises is no longer technically or structurally compatible for its use, LESSEE shall have the right to terminate this Agreement. Notice of LESSEE's exercise of its right to terminate shall be given to LESSOR in writing by certified mail, return receipt requested, and shall be effective upon the mailing of such notice by LESSEE, or upon such later date as designated and agreed upon by both Parties. All rentals paid through the date of termination shall be retained by LESSOR, with the balance returned to LESSEE, if any. Upon such termination, this Agreement shall be of no further force or effect except to the extent of the representations, warranties and indemnities made by each Party to the other hereunder and any obligations which the parties expressly agree shall survive termination. Otherwise, and except as expressly set forth herein, neither party shall have any further obligation to the other.

LESSOR and LESSEE acknowledge that the process of duplexing the signals of their respective stations will take a coordinated effort on the part of both Parties. To that end, LESSOR recognizes that the initial installation of LESSEE's Equipment will require a period of time during which LESSOR, and possibly other existing tenants of the Premises, will be required to temporarily reduce power, operate non-directionally, and/or potentially suspend broadcast operations altogether for brief periods of time. LESSEE will exercise commercially reasonable efforts to minimize the occurrence of such periods of operation, and will cooperate in good faith with LESSOR and, to the extent necessary, other tenants of the Premises, to schedule such periods of operation during times when they would have a minimal effect upon the broadcast operations of LESSOR and the other tenants of the Premises, including at night and on weekends. Notwithstanding the foregoing, LESSOR acknowledges that, in order for LESSEE to obtain a covering license authorization for its station, LESSEE is required to take certain measurements that will need to be taken during the daylight hours. To that end, LESSOR will cooperate with LESSEE to facilitate the initial installation, modification and/or testing of LESSEE's Equipment at mutually-agreeable times during the daytime hours. [REDACTED]

Further, LESSOR acknowledges that the initial installation of LESSEE's Equipment will require (i) approximately five (5) days in which station WSPZ(AM), Bethesda, Maryland (Facility ID 11846) ("WSPZ") will be required to operate non-directionally while filters are installed; (ii) WSPZ to suspend operations entirely during the overnight hours for one (1) night to permit the installation of a filter onto the WSPZ phasor, (iii) WSPZ to operate with reduced power for a period of up to one (1) week, and (iv) approximately one (1) month during which LESSEE will install its own equipment for WMAL, which will have no impact upon LESSOR or WSPZ's licensed operations. LESSEE will take commercially reasonable efforts to ensure that the period during which WSPZ operates either non-directionally or with reduced power is as short as possible, but in any event is no longer than ninety (90) days. During this period, LESSEE will complete the installation necessary to allow both LESSEE'S and LESSOR'S stations to operate in compliance with their respective license authorizations and LESSEE will cover all costs associated with

returning both stations to full licensed power at the Premises. LESSEE will provide LESSOR with a copy of an FCC Form 302-AM License Application filed for WMAL within five (5) business days after it is filed with the FCC containing a "Method of Moments Proof of Performance."

9. INDEMNIFICATION. Subject to Paragraph 11 below, each Party shall indemnify, defend and hold the other harmless against any injury or claim of liability or loss from personal injury or property damage resulting from or arising out of the negligence or willful misconduct of the indemnifying Party, its employees, contractors or agents, except to the extent such claims or damages may be due to or caused by the negligence or willful misconduct of the other Party, or its employees, contractors or agents.

10. INSURANCE.

a. LESSOR and LESSEE each agree that at its own cost and expense, each will maintain commercial general liability insurance with limits not less than [REDACTED] for injury to or death of one or more persons in any one occurrence and [REDACTED] in the aggregate (inclusive of excess coverages); and [REDACTED] for damage or destruction to property in any one occurrence and [REDACTED] in the aggregate (inclusive of excess coverages). LESSEE's insurance policy will include coverage for fire and flood in connection with LESSEE's Equipment whether installed or stored on the Premises. LESSOR and LESSEE each agree that it will include the other Party as an additional insured.

b. In addition, LESSOR shall obtain and keep in force during the Term a policy or policies insuring against loss or damage to the Tower at full replacement cost, as the same shall exist from time to time without a coinsurance feature. LESSOR's policy or policies shall insure against all risks of direct physical loss or damage (except the perils of flood and earthquake unless required by a lender or included in the base premium), including coverage for any additional costs resulting from debris removal and reasonable amounts of coverage for the enforcement of any ordinance or law regulating the reconstruction or replacement of any undamaged sections of the Tower required to be demolished or removed by reason of the enforcement of any building, zoning, safety or land use laws as the result of a covered loss, but not including plate glass insurance.

11. LIMITATION OF LIABILITY. Neither Party shall be liable to the other, or any of their respective agents, representatives, employees for any lost revenue, lost profits, loss of technology, rights or services, incidental, punitive, indirect, special or consequential damages, loss of data, or interruption or loss of use of service, even if advised of the possibility of such damages, whether under theory of contract, tort (including negligence), strict liability or otherwise.

12. ACCESS TO TOWER. LESSOR agrees the LESSEE shall have access to the Tower at all times for the purpose of installing and maintaining its own Equipment, subject to advance notice to and approval of LESSOR, which approval shall not be unreasonably withheld, conditioned, or delayed, except in cases of emergency where notice is not feasible or advisable. For purposes of this section, notice may be provided by email. LESSOR shall provide LESSEE with normal means of access for the purpose of ingress and egress to the Premises and Tower location. It is agreed, however, that only authorized engineers, employees or properly authorized contractors of LESSEE or persons under their direct supervision will be permitted to enter said premises. LESSEE agrees to provide LESSOR with a list of

authorized contractors and changes thereto from time to time upon the reasonable request of LESSOR. LESSEE is responsible for seeing that said contractors maintain substantially the same levels of liability insurance as LESSEE and LESSOR as denoted in paragraph 10(a) above.

13. TOWER COMPLIANCE. LESSOR covenants that it will keep the Towers in good repair as required by all Laws (as defined in Paragraph 33 below). The LESSOR shall also comply with all rules and regulations enforced by the FCC and Federal Aviation Administration with regard to the lighting and performing reasonable maintenance which would be required in the normal course of business.

No materials may be used in the installation of the antennas or transmission lines that will cause corrosion or rust or deterioration of the Tower structure or its appurtenances.

All antenna(s) on the Tower(s) must be identified by a marking fastened securely to its bracket on the Tower and all transmission lines are to be tagged at the conduit opening where it enters any user's equipment space.

Upon request of the LESSOR, and provided that such relocation does not have a material adverse effect on the broadcasting signals transmitted from the Towers, and subject to prior FCC approval, LESSEE agrees to relocate its Equipment on a temporary basis to another location on the Property, hereinafter referred to as the "Temporary Relocation," for the purpose of LESSOR performing maintenance, repair or similar work at the Property or on the Towers provided:

a. The Temporary Relocation is similar to LESSEE's existing location in size and is fully compatible for LESSEE's use, in LESSEE's reasonable determination;

b. LESSOR pays all costs incurred by LESSEE for relocating LESSEE's Equipment to the Temporary Relocation and improving the Temporary Relocation so that it is fully compatible for the LESSEE's use, in LESSEE's reasonable determination;

c. LESSOR gives LESSEE at least ninety (90) days written notice prior to requiring LESSEE to relocate;

d. LESSEE's use at the Premises is not interrupted or diminished during the relocation and LESSEE is allowed, if necessary, in LESSEE's reasonable determination and at LESSOR's cost and expense, to place a temporary installation on the Property during any such relocation; and

e. Upon the completion of any maintenance, repair or similar work by LESSOR, LESSEE is permitted to return to its original location from the temporary location with all costs for the same being paid by LESSOR.

14. INTERFERENCE. LESSEE agrees to install Equipment of the type and frequency which will not cause harmful interference which is measurable in accordance with then existing industry standards to any equipment, as currently operated and within the technical parameters within which such equipment is being operated, of LESSOR or other lessees of the Property which existed on the

Property prior to the date this Agreement is executed by the Parties or such time as LESSEE requests to modify its existing Equipment. In the event LESSEE modifies its Equipment and such modified operation causes interference to the operation of either LESSOR or other lessees of the Property which existed on the Property prior to the date of this Agreement, and LESSOR notifies LESSEE in writing of such interference, LESSEE will take all commercially reasonable steps necessary to correct and eliminate the interference, including but not limited to powering down such Equipment and later powering up such Equipment for intermittent testing. In no event will LESSOR be entitled to terminate this Agreement or relocate the Equipment as long as LESSEE is making a good faith effort to remedy the interference issue and LESSEE has powered down its Equipment and is only performing intermittent testing at times reasonably approved by LESSOR, provided however, that LESSOR shall be permitted to terminate this Agreement (without any additional opportunity to cure) if it is determined that LESSEE's Equipment is causing interference in violation of this Paragraph to LESSOR's radio broadcast transmission or signal and LESSEE has refused to take the steps (including powering down its Equipment) as required hereby. LESSOR agrees that LESSOR and/or any other tenants of the Property who currently have or in the future take possession of the Property will be permitted to install only such equipment that is of the type and frequency which will not cause harmful interference which is measurable in accordance with then existing industry standards to the then existing Equipment of LESSEE. The Parties acknowledge that there will not be an adequate remedy at law for noncompliance with the provisions of this Paragraph and therefore, either Party shall have the right to equitable remedies, such as, without limitation, injunctive relief and specific performance.

15. REMOVAL AT END OF TERM. LESSEE shall, within thirty (30) days after expiration of the Term, or within ninety (90) days after any earlier termination of the Agreement, at LESSEE's sole expense, remove its building(s), Equipment, fixtures and all personal property and restore the Premises to its original condition, reasonable wear and tear and immaterial and inconsequential casualty damage excepted. If such time for removal causes LESSEE to remain on the Premises after termination of this Agreement, LESSEE shall pay rent at the then existing monthly rate or on the existing monthly pro-rata basis if based upon a longer payment term, until such time as the removal of the building, Equipment, fixtures and all personal property are completed.

16. HOLDOVER. LESSEE has no right to retain possession of the Premises or any part thereof beyond the expiration of that removal period set forth in Paragraph 15 herein, unless the Parties are negotiating a new lease or lease extension in good faith. In the event that the Parties are not in the process of negotiating a new lease or lease extension in good faith, LESSEE holds over in violation of Paragraph 15 and this Paragraph 16, then the rent then in effect payable from and after the time of the expiration or earlier removal period set forth in Paragraph 15 shall be equal to the rent applicable during the month immediately preceding such expiration or earlier termination.

17. RIGHTS UPON SALE. Should LESSOR, at any time during the Term decide (i) to sell or transfer all or any part of the Property or the Tower thereon to a purchaser other than LESSEE, or (ii) to grant to a third party by easement or other legal instrument an interest in and to that portion of the Tower and or Property for the purpose of operating and maintaining communications facilities or the management thereof, such sale or grant of an easement or interest therein shall be under and subject to

this Agreement and any such purchaser or transferee shall recognize LESSEE's rights hereunder under the terms of this Agreement.

18. QUIET ENJOYMENT. LESSOR covenants that LESSEE, on paying the rent and performing the covenants herein, shall peaceably and quietly have, hold and enjoy the Premises.

19. TITLE. LESSOR represents and warrants to LESSEE as of the Effective Date of this Agreement, and covenants during the Term that LESSOR is seized of good and sufficient title and interest to the Property and has full authority to enter into and execute this Agreement. LESSOR further covenants during the Term that there are no liens, judgments or impediments of title on the Property, or affecting LESSOR's title to the same and that there are no covenants, easements or restrictions which prevent or adversely affect the use or occupancy of the Premises by LESSEE as set forth above.

20. INTEGRATION. It is agreed and understood that this Agreement contains all agreements, promises and understandings between LESSOR and LESSEE and that no verbal or oral agreements, promises or understandings shall be binding upon either LESSOR or LESSEE in any dispute, controversy or proceeding at law, and any addition, variation or modification to this Agreement shall be void and ineffective unless made in writing signed by the Parties or in a written acknowledgment in the case provided in Paragraph 3. In the event any provision of the Agreement is found to be invalid or unenforceable, such finding shall not affect the validity and enforceability of the remaining provisions of this Agreement. The failure of either Party to insist upon strict performance of any of the terms or conditions of this Agreement or to exercise any of its rights under the Agreement shall not waive such rights and such Party shall have the right to enforce such rights at any time and take such action as may be lawful and authorized under this Agreement, in law or in equity.

21. GOVERNING LAW. This Agreement and the performance thereof shall be governed, interpreted, construed and regulated by the Laws (as defined herein) of the State of Maryland without regard to principles of conflicts of Laws thereof.

22. ASSIGNMENT. This Agreement may be sold, assigned or transferred by either Party with the written approval and consent of the Other Party; provided, however, that the other party hereby grants approval for a sale, assignment, or transfer from LESSEE or LESSOR to an entity affiliated with LESSEE or LESSOR, or to any purchaser which acquires all or substantially all of the assets of the radio station(s) utilizing the Premises by reason of a merger, acquisition or other business reorganization. As to other parties, this Agreement may not be sold, assigned or transferred without the written consent of the Other Party which such consent will not be unreasonably withheld, delayed or conditioned. No change of stock ownership, partnership interest or control of LESSEE or transfer upon partnership or corporate dissolution of LESSEE shall constitute an assignment hereunder.

23. Other Tenants. LESSOR retains to right to enter into other lease transactions with additional third parties whereby LESSOR may lease a portion of its land space providing said lease does not cause harmful interference to LESSEE's transmission or operation of LESSEE's equipment in any way.

24. NOTICES. Subject to Paragraph 12, all notices hereunder must be in writing and shall be deemed validly given if sent by certified mail, return receipt requested or by commercial courier,

provided the courier's regular business is delivery service and provided further that it guarantees delivery to the addressee by the end of the next business day following the courier's receipt from the sender, addressed as follows (or any other address that the Party to be notified may have designated to the sender by like notice):

LESSOR: Red Zebra Broadcasting, LLC
1801 Rockville Pike
Suite 405
Rockville, Maryland 20852

LESSEE: DC Radio Assets, LLC
3280 Peachtree Road
Suite 2300
Atlanta, Georgia 30305
Attention: Lease Administration

Notice shall be effective upon actual receipt or refusal as shown on the receipt obtained pursuant to the foregoing.

25. SUCCESSORS. This Agreement shall extend to and bind the heirs, personal representative, successors and assigns of the Parties hereto.

26. RECORDING. LESSOR agrees to execute a Memorandum of this Agreement which LESSEE may record at its sole expense in the appropriate land records. The date set forth in the Memorandum of this Agreement is for recording purposes only and bears no reference to commencement of either the Term or rent payments.

27. DEFAULT.

In the event there is a breach by LESSEE with respect to any of the provisions of this Agreement or its obligations under it, including the payment of rent, LESSOR shall give LESSEE written notice of such breach. After receipt of such written notice, LESSEE shall have fifteen (15) days in which to cure any monetary breach and thirty (30) days in which to cure any non-monetary breach, provided LESSEE shall have such extended period as may be required beyond the thirty (30) days if the nature of the cure is such that it reasonably requires more than thirty (30) days and LESSEE commences the cure within the thirty (30) day period and thereafter continuously and diligently pursues the cure to completion. LESSOR may not maintain any action or effect any remedies for default against LESSEE unless and until LESSEE has failed to cure the breach within the time periods provided in this Paragraph.

In the event there is a breach by LESSOR with respect to any of the provisions of this Agreement or its obligations under it, LESSEE shall give LESSOR written notice of such breach. After receipt of such written notice, LESSOR shall have thirty (30) days in which to cure any such breach, provided LESSOR shall have such extended period as may be required beyond the thirty (30) days if the nature of the cure is such that it reasonably requires more than thirty (30) days and LESSOR commences the cure within the thirty (30) day period and thereafter continuously and diligently pursues the cure to completion.

LESSEE may not maintain any action or effect any remedies for default against LESSOR unless and until LESSOR has failed to cure the breach within the time periods provided in this Paragraph.

28. REMEDIES. Upon default or breach with respect to a material term of this Agreement, and the expiration of the applicable cure period, the non-defaulting Party may at its option perform the defaulting Party's duties or obligations on the defaulting Party's behalf, including but not limited to obtaining the required insurance policies. The reasonably incurred costs and expenses of any such performance by the non-defaulting Party shall be repaid by the defaulting Party upon receipt of invoice from the non-defaulting party. The non-defaulting party seeking reimbursement shall use reasonable efforts to mitigate its damages in connection with a default by the defaulting party. Without limiting anything herein, in the event of a default by either Party with respect to a material provision of this Agreement, without limiting the non-defaulting Party in the exercise of any right or remedy which the non-defaulting Party may have by reason of such default, the non-defaulting Party may terminate the Agreement and/or pursue any remedy now or hereafter available to the non-defaulting Party under the Laws or judicial decisions of the state in which the Premises are located.

29. ENVIRONMENTAL. Each party will be responsible for all obligations of compliance with any and all environmental and industrial hygiene laws, including any regulations, guidelines, standards, or policies of any governmental authorities regulating or imposing standards of liability or standards of conduct with regard to any environmental or industrial hygiene conditions or concerns as may now or at any time hereafter be in effect, that are in any way related to its specific activities conducted in, on, or in any way related to the Tower or Property. LESSOR represents to LESSEE, to the best of LESSOR's knowledge, that there are not any existing conditions at, on or under the Property that would be in violation of any such environmental or industrial hygiene laws or regulations.

30. CASUALTY. In the event of damage by fire or other casualty to the Tower or Premises that cannot reasonably be expected to be repaired within ninety (90) days following same or, if the Property is damaged by fire or other casualty so that such damage may reasonably be expected to disrupt LESSEE's operations at the Premises for more than ninety (90) days, LESSEE may, at the time following the determination that the Premises cannot be restored within 90 days, terminate this Agreement upon fifteen (15) days prior written notice to LESSOR. Any such notice of termination shall cause this Agreement to terminate on the date set forth in such notice and the Parties shall make an appropriate adjustment, as of such termination date, with respect to payments due to the other under this Agreement. Notwithstanding the foregoing, the rent shall abate during the period of repair following such fire or other casualty in proportion to the degree to which LESSEE's use of the Premises is impaired.

31. CONDEMNATION. In the event of any condemnation of all or any portion of the Property, this Agreement shall terminate as to the part so taken as of the date the condemning authority takes title or possession, whichever occurs first. If as a result of a partial condemnation of the Premises or Tower, LESSEE, is unable to use the Premises for the purposes intended hereunder, or if such condemnation may reasonably be expected to disrupt LESSEE's operations at the Premises

for more than ninety (90) days, LESSEE may, at LESSEE's option, terminate this Agreement. LESSEE may on its own behalf make a claim in any condemnation proceeding involving the Premises for losses related to the Equipment or fixtures, its relocation costs and its damages and losses (but not for the loss of its leasehold interest). Any such notice of termination shall cause this Agreement to terminate on the date set forth in such notice and the Parties shall make an appropriate adjustment as of such termination date with respect to payments due to the other under this Agreement. In the event that this Agreement is not terminated by reason of such condemnation, LESSOR shall promptly repair any damage to the Premises caused by such condemning authority.

32. SUBMISSION OF AGREEMENT/PARTIAL INVALIDITY/AUTHORITY. The submission of this Agreement for examination does not constitute an offer to lease the Premises and this Agreement becomes effective only upon the full execution of this Agreement by the Parties. If any provision herein is invalid, it shall be considered deleted from this Agreement and shall not invalidate the remaining provisions of this Agreement. This Agreement shall not be changed or modified in whole or in part except by an instrument duly signed by LESSOR and LESSEE. Each of the Parties hereto warrants to the other that the person or persons executing this Agreement on behalf of such Party has the full right, power and authority to enter into and execute this Agreement on such Party's behalf and that no consent from any other person or entity is necessary as a condition precedent to the legal effect of this Agreement.

33. APPLICABLE LAWS. During the Term, LESSOR shall maintain the Property and all structural elements of the Premises in compliance, in all material respects, with all applicable laws, rules, regulations, ordinances, directives, covenants, easements, zoning and land use regulations, and restrictions of record, permits, building codes, and the requirements of any applicable fire insurance underwriter or rating bureau, now in effect or which may hereafter come into effect (including, without limitation, the Americans with Disabilities Act and laws regulating hazardous substances) (collectively "Laws"). LESSEE shall, in respect to the condition of the Premises and at LESSEE's sole cost and expense, comply, in all material respects, with (a) all Laws relating solely to LESSEE's specific and unique nature of use of the Premises; and (b) all building codes requiring modifications to the Premises due to the improvements being made by LESSEE in the Premises.

34. SURVIVAL. The provisions of the Agreement relating to indemnification from one Party to the other Party shall survive any termination or expiration of this Agreement. Additionally, any provisions of this Agreement which require performance subsequent to the termination or expiration of this Agreement shall also survive such termination or expiration.

35. CAPTIONS. The captions contained in this Agreement are inserted for convenience only and are not intended to be part of the Agreement. They shall not affect or be utilized in the construction or interpretation of the Agreement.

[Signature page follows]

IN WITNESS WHEREOF, the Parties hereto have set their hands and affixed their respective seals the day and year first above written.

WITNESS:

LESSOR:
RED ZEBRA BROADCASTING, LLC

Isyie

By: C.B. Ford
Name: C.B. Ford
Title: CFO

WITNESS:

LESSEE:
DC RADIO ASSETS, LLC

Andrew Kauting

By: Richard D. Denny
Name: Richard D. Denny
Title: SVP

EXHIBIT "A"

Premises

1. Fifty-Eight (58) acre transmitter site located at 16925 Black Rock Road, Germantown, Maryland 20876 in Montgomery County, Maryland, shown as lot 4, in a subdivision known as "SENECA PARK ESTATES," recorded in Plat Book 167 at Plat 18848 among the land records of Montgomery County.
2. Directional AM transmission antenna system comprised of four (4) guyed, steel towers, each 400 feet in height and underground copper radial ground system.
3. Each tower is enclosed by a twenty (20) foot square fence.
4. Tuning equipment mounted inside a small permanent structure at the base of each tower.
5. Electrical connections to the tower structure made by a loop of copper tubing from tuning equipment cabinets.
6. Towers fed by underground transmission lines, power and control lines from a centrally located 20x40 equipment building. This building is LESSOR's existing equipment building which contains transmitters, control equipment, phasing and power dividing equipment.
7. An adjacent diesel emergency generator and a fuel tank are located behind a ten (10) foot concealment wall.

EXHIBIT "B"

LESSEE's Equipment

1. Duplicate set of structures and additional underground cabling facilities to combine 630kHz signal with 570 kHz signal utilizing the existing four (4) towers and ground system
2. Precisely designed and manufactured tuning, matching, filtering, and combining equipment.
3. A new prefabricated equipment building (approximately 25' x 35') at the central equipment area, near LESSOR's existing equipment building. This will be LESSEE's equipment shelter.
4. Trenches to route new cabling to each tower from LESSEE's equipment shelter
5. Additional commercial power capacity replacing PEPCO pad mounted transformer and additional underground conduit into LESSEE's equipment shelter
6. Separate emergency generator (approximately 5' x 10') adjacent to LESSEE's equipment shelter. This approximate 5' x 10' area will also include a 250 gallon Diesel fuel tank, as part of the emergency generator.
7. New transmission lines, filters, and antenna tuning units (ATU's)
8. Wall or fence around LESSEE's emergency generator
9. Concrete pads, transmission conduit, concealing cabinets, telephone lines, power lines, ground radials or straps
10. Filter designs
11. If any of this Equipment requires additional subsurface grounding for electrical purposes, LESSEE will be responsible for the installation of such grounding.

ASSIGNMENT AND ASSUMPTION OF LEASE

THIS ASSIGNMENT AND ASSUMPTION OF LEASE (this "Assignment") is entered into as of September 15, 2017 among Red Zebra Broadcasting, LLC, a Delaware limited liability company ("Assignor"), and Salem Radio Properties, Inc., a Delaware corporation ("Assignee").

This Assignment is made pursuant to that certain Asset Purchase Agreement (the "Agreement") dated May 12, 2017, as amended, among Assignor, an affiliate of Assignor, AM 570, LLC, and Assignee, with respect to the following radio broadcast station:

WSPZ(AM), Bethesda, MD (FCC Facility ID. No. 11846)

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, and pursuant to the Agreement, Assignor hereby assigns those Station Agreements specified in *Exhibit A* hereto to Assignee and all of Assignor's rights, interests and benefits thereunder, and Assignee hereby assumes and agrees to perform the obligations of Assignor arising under the Station Agreements specified in *Exhibit A* hereto from and after Closing.

This Assignment may be signed in any number of counterparts with the same force and effect as if all signatures appeared on one and the same instrument. This Assignment is made pursuant to (and does not modify) the Agreement, which contains certain representations, warranties and covenants regarding the Station Agreements. Capitalized terms used herein and not otherwise defined shall have the respective meanings set forth in the Agreement.

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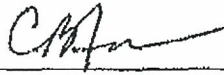
[SIGNATURE PAGE FOLLOWS]

SIGNATURE PAGE TO ASSIGNMENT AND ASSUMPTION OF CONTRACTS

IN WITNESS WHEREOF, the parties hereto have executed and delivered this Assignment as of the date first set forth above.

ASSIGNOR:

RED ZEBRA BROADCASTING, LLC

By: 
Name: Charles B. Ford Jr.
Title: Corporate Secretary

ASSIGNEE:

SALEM RADIO PROPERTIES, INC.

By: _____
Name: Christopher J. Henderson
Title: Sr. Vice President and Secretary

SIGNATURE PAGE TO ASSIGNMENT AND ASSUMPTION OF CONTRACTS

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RED ZEBRA BROADCASTING, LLC

By: _____

Name: Charles B. Ford Jr.

Title: Corporate Secretary

ASSIGNEE:

SALEM RADIO PROPERTIES, INC.

By: _____

Name: Christopher J. Henderson

Title: Sr. Vice President and Secretary

Exhibit A

Station Agreements

1. Tower Lease Agreement between Red Zebra Broadcasting, LLC (as Lessor) and DC Radio Assets, LLC (as Lessee) dated as of October 17, 2016

GRAHAM BROCK, INC.

BROADCAST TECHNICAL CONSULTANTS

APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DA1
WASHINGTON, DISTRICT OF COLUMBIA
February 2018

TECHNICAL EXHIBIT

Copyright 2018

SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant

Radio License Holdings, 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
WMAL	BP-20151008AAI	630	U	2.7	10.0

2. Station location

State	City or Town
District of Columbia	Washington

3. Transmitter location

State	County	City or Town	Street address (or other identification)
MD	Montgomery	Germantown	16925 Black Rock Road

4. Main studio location

State	County	City or Town	Street address (or other identification)
DC	District of Columbia	Washington	4400 Jenifer St.

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

State	County	City or Town	Street address (or other identification)
DC	District of Columbia	Washington	4400 Jenifer St.

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 7.64		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 50.0 Day 50.0		Measured antenna or common point reactance (in ohms) at operating frequency Night 0.1 Day 0.1	

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
Tower #1	0.0	0.0	1.000	1.000		
Tower #2	-2.5	-2.5	0.832	0.831		
Tower #3	104.7	104.7	0.660	0.661		
Tower #4	116.9	116.9	1.030	1.029		

Manufacturer and type of antenna monitor:

Potomac AM 1901-D IJ3PI1900

SECTION III - Page 2

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

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded.	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit.
Uniform cross section guyed steel tower	#1 122 #3 122 #2 122 #4 122	#1 122 #3 122 #2 122 #4 122	#1 123 #3 123 #2 122 #4 123	Exhibit No.

Excitation

☒ Series

☐ Shunt

ASRN's 1059002, 1059005, 1059004, 1059003

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

North Latitude	39 ° 08 ' 02 "	West Longitude	77 ° 18 ' 14 "
----------------	----------------	----------------	----------------

If not fully described above, attach as an Exhibit further details and dimensions including any other antenna mounted on tower and associated isolation circuits.

Exhibit No.

Also, if necessary for a complete description, attach as an Exhibit a sketch of the details and dimensions of ground system.

Exhibit No.

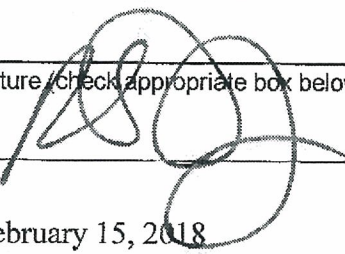
10. In what respect, if any, does the apparatus constructed differ from that described in the application for construction permit or in the permit?

None

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

New construction / Diplexing with WWRC

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) R. Stuart Graham	Signature (check appropriate box below) 
Address (include ZIP Code) GA 31522 Graham Brock, Inc. P. O. Box 24466 St. Simons Island	Date February 15, 2018
	Telephone No. (Include Area Code) 912-638-8028

☐ Technical Director

☐ Registered Professional Engineer

☐ Chief Operator

☒ Technical Consultant

☐ Other (specify)

APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DA1
WASHINGTON, DISTRICT OF COLUMBIA
February 2018

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ROBERT A. ELDER - ENGINEERING REPORT AND AFFIDAVIT - EXHIBIT #9

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R. STUART GRAHAM - AFFIDAVIT

APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DA1
WASHINGTON, DISTRICT OF COLUMBIA
February 2018

This Technical Statement was prepared on behalf of Radio License Holdings, LLC (“RLH”), licensee of radio station WMAL, 630 kHz, Washington, District of Columbia. RLH holds a Construction Permit (BP-20151008AAI) to relocate WMAL to the WWRC, 570 kHz, Bethesda, Maryland towers and tower site. WMAL will be diplexing with WWRC on all four towers of the WWRC directional array. This application seeks program test authority and a station license with computer analyzed directional operation under the provisions of §73.151(c) of the Commission’s rules. The calculations shown herein are for the directional (“DA”) daytime power of 10.0 kilowatts and the directional (“DA”) nighttime power of 2.7 kilowatts. The daytime and nighttime pattern is identical with the exception of the power.

The towers are identified using the following number sequence: Tower #1 (south), Tower #2 (east), Tower #3 (north) and Tower #4 (west). The towers and ground system were constructed in accordance with the WWRC construction permit and license. As such, the towers and ground system exist in accordance with the WMAL construction permit. As an existing directional array, RLH requests a waiver of the requirement to provide a survey of the tower configuration in agreement with MM Docket 13-249, September 2017 which changes §73.151(c)(1)(ix).¹

-
- 1) Revise paragraph (c) of Section 73.151 to read as follows:
§ 73.151 Field strength measurements to establish performance of directional antennas. * * * * *
(c) * * * (1) * * * (ix) The orientation and distances among the individual antenna towers in the array shall be confirmed by a post-construction certification by a land surveyor (or, where permitted by local regulation, by an engineer) licensed or registered in the state or territory where the antenna system is located. Stations submitting a moment method proof for a pattern using towers that are part of an authorized AM array are exempt from the requirement to submit a surveyor's certification, provided that the tower geometry of the array is not being modified and that no new towers are being added to the array.

Information is provided herein to demonstrate the directional antenna parameters for the authorized directional pattern is in accordance with the requirements of §73.151(c) of the Commission's rules. The system has been adjusted to produce antenna monitor parameters within +/- 5 percent in ratio and +/- 3 degrees in phase of the modeled values, as required by the rules.

We have tried to be as accurate as possible in the preparation of this application. All information contained in this application was extracted from the CDBS database. We assume no liability for omissions or errors in this source. Should there be any questions concerning the information contained herein, we welcome the opportunity to discuss the matter by phone at 912-638-8028 or by email at rsg@grahambrock.com.

APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DA1
WASHINGTON, DISTRICT OF COLUMBIA
February 2018

EXHIBIT #1

Analysis of Tower Impedance Measurements to Verify Method of Moments Model

Tower base impedance measurements were made at the final J-plugs within the Antenna Tuning Units (“ATU’s”) using a HP 8753C network analyzer in conjunction with an ENI model 350L RF amplifier and the Tunwall Radio directional coupler kit, in a calibrated setup. The other tower(s) were open circuited at the same points where impedance measurements were made (“reference points”), in compliance with §73.151(c)(1).

The reference point in each ATU is followed by the feed-line that exits the ATU enclosure and is connected to the tower above the base insulator. Circuit calculations were performed to relate the Method of Moments modeled impedances of the tower feed points to the ATU output measurement (reference) points, as shown on the following pages. The XL shown for each tower, which was calculated for the assumed stray inductance, was less than 10 uH, in compliance with §73.151(c)(1)(vii).

The modeled and measured base impedances at the ATU output jacks, with the other towers open circuited at their ATU output jacks agree within +/- 2 ohms and +/- 4 percent for resistance, as required by §73.151(c)(2) of the FCC’s rules.

WMAL Washington DC
630 2.7/10.0 kW

Tower	Physical Height (degrees)	Velocity Factor Adjustment	Modeled Height (degrees)	Modeled Percent of Height	Physical Equivalent Radius (inches)	Modeled Radius (inches)	Percent of Equivalent Radius
1 (south)	92.2	0.93140	98.99	107.4%	17.189	16.628	96.7%
2 (east)	92.2	0.92518	99.66	108.1%	17.189	16.628	96.7%
3 (north)	92.2	0.93708	98.39	106.7%	17.189	16.628	96.7%
4 (west)	92.2	0.95500	96.54	104.7%	17.189	16.628	96.7%

Tower Height Tolerance
>75% <125%

Tower	Height	Minimum	Maximum
1 (south)	92.2	69.2	115.3
2 (east)	92.2	69.2	115.3
3 (north)	92.2	69.2	115.3
4 (west)	92.2	69.2	115.3

Tower Radius Tolerance
>80% <150%

Actual	Minimum	Maximum
17.189	13.751	25.783
17.189	13.751	25.783
17.189	13.751	25.783
17.189	13.751	25.783

Tower	Face Size (inches)	Equivalent Radius (inches)
1 (south)	36	17.1887
2 (east)	36	17.1887
3 (north)	36	17.1887
4 (west)	36	17.1887

EXHIBIT #1A
APPLICATION FOR STATION LICENSE
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WMAL AM RADIO STATION
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EXHIBIT #2

Derivation of Operating Parameters for Directional Antenna

The Method of Moments model of the array, following verification with the measured individual open circuited base impedances, was utilized for directional antenna calculations. Calculations were made to determine the complex voltage values for sources located at ground level under each tower of the array to produce current moment sums for the towers that, when normalized, equated to the theoretical field parameters of the authorized directional antenna pattern. The tower currents were calculated using these voltage sources. Ten segments were used for each tower so that the modeled current pulse at the base of the tower would correspond to the toroid pick-up at the output of the ATU. As the tower structures, sampling pickups, and sampling lines are identical, the antenna monitor ratios and phases corresponding to the theoretical parameters were calculated directly from the modeled tower currents.

WMAL Washington DC
630 2.7 kW - Night 10 kW - Day

DAY - REFERENCE TOWER #1

Tower	Current Magnitude (amperes)	Current Phase (degrees)	Moment Method Calculations of Antenna Monitor Values		Antenna Monitor As Adjusted Antenna Monitor Values	
			Ratio	Phase	Ratio	Phase
1 (south)	10.32	0.0	1.000	0.0	1.000	0.00
2 (east)	8.58	-2.5	0.831	-2.5	0.832	-2.30
3 (north)	6.82	104.7	0.661	104.7	0.657	103.80
4 (west)	10.62	116.9	1.029	116.9	1.073	116.0

Day Common Point Impedance Common Point Current Transmitter Power Output
Resistance 50.00 Ohms 14.51 10530
Reactance 0.10 +J Ohms

Day - Antenna Monitor Tolerances

Tower	Ratio (5%)		Phase (3°)	
	(+)	(-)	(+)	(-)
1 (south)	1.050	0.950	3.0	-3.0
2 (east)	0.873	0.790	0.5	-5.5
3 (north)	0.694	0.628	107.7	101.7
4 (west)	1.081	0.978	119.9	113.9

NIGHT - REFERENCE TOWER #1

Tower	Current Magnitude (amperes)	Current Phase (degrees)	Moment Method Calculations of Antenna Monitor Values		Antenna Monitor As Adjusted Antenna Monitor Values	
			Ratio	Phase	Ratio	Phase
1 (south)	5.36	0.0	1.000	0.0	1.000	0.00
2 (east)	4.46	-2.5	0.832	-2.5	0.832	-2.30
3 (north)	3.54	104.7	0.660	104.7	0.657	103.80
4 (west)	5.52	116.9	1.030	116.9	1.073	116.0

Night Common Point Impedance Common Point Current Transmitter Power Output
Resistance 50.00 Ohms 7.64 2916
Reactance 0.10 +J Ohms

Night - Antenna Monitor Tolerances

Tower	Ratio (5%)		Phase (3°)	
	(+)	(-)	(+)	(-)
1 (south)	1.050	0.950	3.0	-3.0
2 (east)	0.874	0.790	0.5	-5.5
3 (north)	0.693	0.627	107.7	101.7
4 (west)	1.081	0.978	119.9	113.9

EXHIBIT #2A
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EXHIBIT #3

Method of Moments Model Details for Towers Driven Individually

The array of towers was modeled using Westberg Engineering PhasorPro 2.1.1.21. One wire was used to represent each tower. The electrical height of each tower was specified using degrees at the operating frequency of 630 kHz (0.63 MHz), as taken from the theoretical directional antenna specifications. Each tower was modeled using ten segments. As the towers are 92.2° in electrical height, the segment length is 9.22 electrical degrees, in compliance with §73.151(c)(1)(iii) of the Commission's rules.

The individual tower characteristics were adjusted to provide a match of its modeled impedances, when presented to a circuit model, that included branches representing the stray feed-line hookup inductances at the tower bases, with the base impedances that were measured at the output jacks of the ATU's, while the other tower(s) in the array were open circuited. The Method of Moments model assumed loads at ground level having the reactance that was calculated for them using the base circuit models for the open circuited towers of the array.

Each tower's modeled height, relative to its physical height, falls within the required range of 75% to 125%, in compliance with §73.151(c)(1)(v) of the Commission's rules. Each tower's modeled radius falls within the range of 80% to 150% of the radius of a circle having a

circumference equal to the sum of the widths of the tower sides, which is in compliance with §73.151(c)(1)(i) of the Commission's rules. The array consists of identical, uniform cross section towers having a face of 36 inches.

WMAL	Washington	DC
630	2.7/10.0	kW

TOWER	L(μ H) - series	X(L)	Z(tower-modeled)	Z(ATU-measured)	Z(tower-measured) *
1 (south)	0.70	+j 2.8	56.50 +j 67.62	56.50 +j 70.40	56.50 +j 67.62
2 (east)	1.01	+j 4.0	58.80 +j 71.92	58.80 +j 75.90	58.80 +j 71.92
3 (north)	3.06	+j 12.1	55.10 +j 64.59	55.10 +j 76.70	55.10 +j 64.59
4 (west)	3.05	+j 12.1	52.50 +j 54.01	52.50 +j 66.10	52.50 +j 54.01

From Moment Method Calculated Values

Tower Impedance Tolerance

Resistance & Reactance

+/- 2 Ohms and +/- 4%

Tower	Resistance	(+/- ohms)	High	Low
1 (south)	56.50	4.26	60.8	52.2
2 (east)	58.80	4.35	63.2	54.4
3 (north)	55.10	4.20	59.3	50.9
4 (west)	52.50	4.10	56.6	48.4

	Reactance	(+/- ohms)	High	Low
1 (south)	67.62	4.70	72.3	62.9
2 (east)	71.92	4.88	76.8	67.0
3 (north)	64.59	4.58	69.2	60.0
4 (west)	54.01	4.16	58.2	49.8

* - Z(tower-measured):

$$\text{Resistance} = Z(\text{ATU-measured})$$
$$\text{Reactance} = Z(\text{ATU-measured}) - X(L)$$

EXHIBIT #3A

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EXHIBIT #4

Method of Moments Model Details for Directional Antenna Pattern(s)

The array of towers was modeled using Westberg Engineering PhasorPro 2.1.1.21 with the individual tower characteristics that were verified by the individual tower impedance measurements. Calculations were made to determine the complex voltage values for sources located at ground level under each tower of the array to produce current moment sums for the tower that, when normalized, equated to the theoretical field parameters of the authorized directional antenna pattern(s). The following pages contain details of the Method of Moments model of the directional antenna patterns.

STATION INFORMATION		
Call Letters	No. Towers	Frequency
WMAL	4	0.6300

TOWER INFORMATION						
	Tower Height (')	Spacing (')	Orientation	Face Width (in.)	Radius (in.)	Velocity Factor
Tower 1	92.2000	0.0000	0.0000	36.0000 / 36.0000	16.6277 / 16.6277	0.931400
Tower 2	92.2000	224.4000	48.7000	36.0000 / 36.0000	16.6277 / 16.6277	0.925180
Tower 3	92.2000	251.4000	31.7000	36.0000 / 36.0000	16.6277 / 16.6277	0.937080
Tower 4	92.2000	71.7000	342.6000	36.0000 / 36.0000	16.6277 / 16.6277	0.955000

MATRIX INFORMATION	
	Impedance (other towers open)
Tower 1	56.50 + j67.62
Tower 2	58.80 + j71.92
Tower 3	55.10 + j64.59
Tower 4	52.50 + j54.01

EXHIBIT #4A
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DETUNED TOWER CURRENTS
Tower 1
0.000000 > 0.000000 - 92.20° above ground
0.087604 > 105.471956 - 82.98° above ground
0.135283 > 106.177315 - 73.76° above ground
0.156181 > 106.885344 - 64.54° above ground
0.150544 > 107.671691 - 55.32° above ground
0.118345 > 108.733859 - 46.10° above ground
0.059551 > 111.331415 - 36.88° above ground
0.026635 > -81.521794 - 27.66° above ground
0.139811 > -73.578699 - 18.44° above ground
0.283744 > -72.273543 - 9.22° above ground
0.514916 > -71.438949 - 0.00° above ground
Tower 2
0.000000 > 0.000000 - 92.20° above ground
0.088768 > 105.828323 - 82.98° above ground
0.137149 > 106.534349 - 73.76° above ground
0.158364 > 107.229123 - 64.54° above ground
0.152631 > 107.982720 - 55.32° above ground
0.119915 > 108.976966 - 46.10° above ground
0.060202 > 111.376711 - 36.88° above ground
0.027163 > -80.391600 - 27.66° above ground
0.141905 > -73.166835 - 18.44° above ground
0.287577 > -71.993770 - 9.22° above ground
0.520962 > -71.259865 - 0.00° above ground
Tower 3
0.000000 > 0.000000 - 92.20° above ground
0.080045 > 80.244482 - 82.98° above ground
0.123331 > 80.958695 - 73.76° above ground
0.142084 > 81.678327 - 64.54° above ground
0.136648 > 82.481370 - 55.32° above ground
0.107106 > 83.572684 - 46.10° above ground
0.053523 > 86.270146 - 36.88° above ground
0.024776 > -106.719549 - 27.66° above ground
0.127321 > -98.797377 - 18.44° above ground
0.257510 > -97.461968 - 9.22° above ground
0.466508 > -96.601839 - 0.00° above ground
Tower 4
0.000000 > 0.000000 - 92.20° above ground
0.156473 > -108.769834 - 82.98° above ground
0.243573 > -109.728001 - 73.76° above ground
0.283826 > -110.731342 - 64.54° above ground
0.276667 > -111.839171 - 55.32° above ground
0.220996 > -113.269672 - 46.10° above ground
0.115734 > -116.484891 - 36.88° above ground
0.042594 > 82.093110 - 27.66° above ground
0.251959 > 69.796872 - 18.44° above ground
0.522130 > 68.099279 - 9.22° above ground
0.962264 > 67.096090 - 0.00° above ground

ZMatrix			
56.50 + j67.62	-20.67 - j2.49	-18.92 + j7.01	36.92 - j21.75
-20.67 - j2.49	58.80 + j71.92	36.56 - j24.30	-18.90 - j8.61
-18.92 + j7.01	36.56 - j24.30	55.10 + j64.59	-18.47 - j6.88
36.92 - j21.75	-18.90 - j8.61	-18.47 - j6.88	52.50 + j54.01

YMatrix			
0.005245 - j0.007785	0.001113 - j0.001520	0.000522 - j0.000922	0.003751 + j0.003169
0.001113 - j0.001520	0.005783 - j0.007700	0.003688 + j0.002466	0.002552 - j0.001568
0.000522 - j0.000922	0.003688 + j0.002466	0.006217 - j0.008050	0.002201 - j0.001924
0.003751 + j0.003169	0.002552 - j0.001568	0.002201 - j0.001924	0.007801 - j0.009234

HMatrix - [I] = [H] X [F]			
0.010184 + j0.001077	0.000169 - j0.000367	-0.000004 - j0.000371	0.000225 + j0.000756
0.000172 - j0.000372	0.010041 + j0.001088	0.000263 + j0.000733	0.000293 - j0.000325
-0.000004 - j0.000367	0.000259 + j0.000717	0.010315 + j0.001067	0.000253 - j0.000336
0.000220 + j0.000724	0.000277 - j0.000308	0.000245 - j0.000325	0.010726 + j0.001037

HMatrix-inverse - [F] = [H] ⁻¹ X [I]			
96.529103 - j9.839547	-0.377104 + j3.629462	1.286619 + j3.305339	-3.574768 - j6.400984
-0.383308 + j3.674050	97.927961 - j10.363606	-4.098208 - j6.411312	-1.467400 + j3.367822
1.271650 + j3.269997	-4.024804 - j6.267896	95.428480 - j9.494563	-1.137337 + j3.214550
-3.456413 - j6.124059	-1.391760 + j3.182489	-1.105208 + j3.108801	91.895086 - j8.749706

TOWER CURRENTS
Mode 1
Tower 1
0.000000 > 0.000000 - 92.20° above ground
2.615470 > -6.132840 - 82.98° above ground
4.694958 > -5.872804 - 73.76° above ground
6.534263 > -5.579731 - 64.54° above ground
8.114725 > -5.238239 - 55.32° above ground
9.407490 > -4.833154 - 46.10° above ground
10.381312 > -4.344229 - 36.88° above ground
11.007479 > -3.741161 - 27.66° above ground
11.259370 > -2.972107 - 18.44° above ground
11.109998 > -1.942015 - 9.22° above ground
10.324466 > 0.000000 - 0.00° above ground
Tower 2
0.000000 > 0.000000 - 92.20° above ground
2.128680 > -12.942821 - 82.98° above ground
3.825750 > -12.423384 - 73.76° above ground
5.330207 > -11.858679 - 64.54° above ground
6.626599 > -11.223449 - 55.32° above ground
7.691381 > -10.493832 - 46.10° above ground
8.499332 > -9.637573 - 36.88° above ground
9.027678 > -8.606190 - 27.66° above ground
9.256065 > -7.317071 - 18.44° above ground
9.165273 > -5.620326 - 9.22° above ground
8.584692 > -2.486493 - 0.00° above ground
Tower 3
0.000000 > 0.000000 - 92.20° above ground
1.439186 > 103.339085 - 82.98° above ground
2.609069 > 103.519801 - 73.76° above ground
3.670404 > 103.686411 - 64.54° above ground
4.612976 > 103.841549 - 55.32° above ground
5.420725 > 103.986152 - 46.10° above ground
6.076013 > 104.122084 - 36.88° above ground
6.562553 > 104.252519 - 27.66° above ground
6.865991 > 104.382700 - 18.44° above ground
6.973587 > 104.521200 - 9.22° above ground
6.820416 > 104.728426 - 0.00° above ground
Tower 4
0.000000 > 0.000000 - 92.20° above ground
2.315948 > 115.263098 - 82.98° above ground
4.183376 > 115.443292 - 73.76° above ground
5.866911 > 115.612676 - 64.54° above ground
7.351976 > 115.775050 - 55.32° above ground
8.614524 > 115.932558 - 46.10° above ground
9.627721 > 116.088437 - 36.88° above ground
10.366593 > 116.247665 - 27.66° above ground
10.808721 > 116.418341 - 18.44° above ground
10.933471 > 116.613941 - 9.22° above ground
10.620117 > 116.930393 - 0.00° above ground

Mode 2
Tower 1
0.000000 > 0.000000 - 92.20° above ground
1.359038 > -6.132840 - 82.98° above ground
2.439571 > -5.872804 - 73.76° above ground
3.395303 > -5.579731 - 64.54° above ground
4.216535 > -5.238239 - 55.32° above ground
4.888275 > -4.833154 - 46.10° above ground
5.394288 > -4.344229 - 36.88° above ground
5.719654 > -3.741161 - 27.66° above ground
5.850540 > -2.972107 - 18.44° above ground
5.772924 > -1.942015 - 9.22° above ground
5.364750 > 0.000000 - 0.00° above ground
Tower 2
0.000000 > 0.000000 - 92.20° above ground
1.106094 > -12.942821 - 82.98° above ground
1.987918 > -12.423384 - 73.76° above ground
2.769657 > -11.858679 - 64.54° above ground
3.443282 > -11.223449 - 55.32° above ground
3.996559 > -10.493832 - 46.10° above ground
4.416382 > -9.637573 - 36.88° above ground
4.690919 > -8.606190 - 27.66° above ground
4.809593 > -7.317071 - 18.44° above ground
4.762416 > -5.620326 - 9.22° above ground
4.460737 > -2.486493 - 0.00° above ground
Tower 3
0.000000 > 0.000000 - 92.20° above ground
0.747823 > 103.339085 - 82.98° above ground
1.355712 > 103.519801 - 73.76° above ground
1.907198 > 103.686411 - 64.54° above ground
2.396972 > 103.841549 - 55.32° above ground
2.816691 > 103.986152 - 46.10° above ground
3.157189 > 104.122084 - 36.88° above ground
3.410002 > 104.252519 - 27.66° above ground
3.567674 > 104.382700 - 18.44° above ground
3.623582 > 104.521200 - 9.22° above ground
3.543992 > 104.728426 - 0.00° above ground
Tower 4
0.000000 > 0.000000 - 92.20° above ground
1.203402 > 115.263098 - 82.98° above ground
2.173746 > 115.443292 - 73.76° above ground
3.048536 > 115.612676 - 64.54° above ground
3.820199 > 115.775050 - 55.32° above ground
4.476238 > 115.932558 - 46.10° above ground
5.002711 > 116.088437 - 36.88° above ground
5.386640 > 116.247665 - 27.66° above ground
5.616376 > 116.418341 - 18.44° above ground
5.681198 > 116.613941 - 9.22° above ground
5.518375 > 116.930393 - 0.00° above ground

FIELD INFORMATION - DAY		
	Field Ratio	Field Phase
Tower 1	1.0000	0.0000
Tower 2	0.8250	-5.0000
Tower 3	0.5900	108.0000
Tower 4	0.9160	120.0000

FIELD INFORMATION - NIGHT		
	Field Ratio	Field Phase
Tower 1	1.0000	0.0000
Tower 2	0.8250	-5.0000
Tower 3	0.5900	108.0000
Tower 4	0.9160	120.0000

TOWER DRIVE INFORMATION - DAY					
	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Power (W)
Tower 1	1.0000	0.0000	$40.68 + j97.02$	$10.32 \angle 0.00$	4335.9088
Tower 2	0.8250	-5.0000	$64.69 + j86.17$	$8.58 \angle -2.49$	4767.5416
Tower 3	0.5900	108.0000	$3.98 + j38.13$	$6.82 \angle 104.73$	185.0503
Tower 4	0.9160	120.0000	$6.31 + j46.49$	$10.62 \angle 116.93$	711.4993

TOWER DRIVE INFORMATION - NIGHT					
	Field Ratios	Field Phase	Drive Imped. (Ω)	Current	Power (W)
Tower 1	1.0000	0.0000	$40.68 + j97.02$	$5.36 \angle 0.00$	1170.6954
Tower 2	0.8250	-5.0000	$64.69 + j86.17$	$4.46 \angle -2.49$	1287.2362
Tower 3	0.5900	108.0000	$3.98 + j38.13$	$3.54 \angle 104.73$	49.9636
Tower 4	0.9160	120.0000	$6.31 + j46.49$	$5.52 \angle 116.93$	192.1048

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EXHIBIT #5

Direct Measurement of Power

WMAL will operate with a daytime directional power of 10.0 kilowatts and a common point impedance of 50.0 +J 0.1 ohms and operating with an Antenna Input Power of 10.53 kilowatts of power to achieve a nominal power of 10.0 kilowatts, in accordance with §73.51(b)(2).¹

Adjusting the daytime input power by 1.053 results in the following:

10,000 Watts * 1.053 = 10530 Watts

Common Point Resistance = 50 Ohms

Manipulating $I^2 * R = P$

Where I = Common Point Current, R = Common Point Resistance, P = Power in Watts

$I = (10,0530/50)^{.5} = 14.51$ Amps at Common Point

The daytime directional power will be monitored at the common point.

WMAL will operate with a nighttime directional power of 2.70 kilowatts and a common point impedance of 50.0 +J 0.1 ohms and operating with an Antenna Input Power of 2.916 kilowatts of power to achieve a nominal power of 2.7 kilowatts, in accordance with §73.51(b)(1).²

1) ***§73.51 Determining operating power.***

(b) The authorized antenna input power for each station shall be equal to the nominal power for such station, with the following exceptions:

(2) For stations with nominal powers in excess of 5 kW, the authorized antenna input power to directional antennas shall exceed the nominal power by 5.3 percent.

2) ***§73.51 Determining operating power.***

(b) The authorized antenna input power for each station shall be equal to the nominal power for such station, with the following exceptions:

(1) For stations with nominal powers of 5 kW, or less, the authorized antenna input power to directional antennas shall exceed the nominal power by 8 percent.

Adjusting the daytime input power by 1.053 results in the following:

$10,000 \text{ Watts} * 1.053 = 10530 \text{ Watts}$

Common Point Resistance = 50 Ohms

Manipulating $I^2 * R = P$

Where I = Common Point Current, R = Common Point Resistance, P = Power in Watts

$I = (10,0530/50)^{.5} = 14.51 \text{ Amps at Common Point}$

The daytime directional power will be monitored at the common point.

Common point impedance was measured utilizing a HP 8753C network analyzer in conjunction with an ENI model 350L RF amplifier and the Tunwall Radio directional coupler kit, in a calibrated setup.

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EXHIBIT #6

Sampling System and Measurements

The sample system for WMAL consists of equal electrical lengths of RFS LCT-12-50JTC ½ inch foam, phase stabilized coaxial transmission lines terminated into Delta Electronics TCT-1, 0.5 V/A toroid sample transformers. A tabulation of the sample line lengths and characteristic impedances are included as Exhibit #6A.

Impedance measurements of the antenna monitor sample lines with toroid sample transformers attached were made using a HP 8753C network analyzer in conjunction with an ENI model 350L RF amplifier and the Tunwall Radio directional coupler kit, in a calibrated setup. The impedance at the input to the sample lines, terminated by the toroid sample transformers was measured and tabulated in Exhibit #6A.

Impedance measurements of the antenna monitor sampling lines were made using a HP 8753C network analyzer in conjunction with an ENI model 350L RF amplifier and the Tunwall Radio directional coupler kit, in a calibrated setup. The measurements were made looking into the antenna monitor ends of the sampling lines, without the sampling lines connected to the toroid samples under open-circuited conditions. The sampling line length was found to be between 249.9 and 250.3 electrical degrees at the operating frequency of 630 kHz, within the 1.0 degree variance as specified by §73.151(c)(2)(i) of the Commission's rules.

The characteristic impedance values of the sampling lines, was found to be between 49.3 and 49.4 Ohms, within the 2.0 Ohm variance as specified by §73.151(c)(2)(i).

Toroid current transformer calibration was checked by connection at the antenna monitor with short, equal length jumpers and fed a 630 kHz RF signal into a known load and found to exhibit identical phase and ration indications (within the manufacturer's specifications) on the monitor.

The antenna monitor is a Potomac Instruments 1901-D with RF filtering from the factory. The monitor is recently calibrated at the factory and was checked and calibrated in the field according to the manufacturer's recommended proceedure.

WMAL Washington DC
630 2.7 kW - Night 10.0 kW - Day

RFS LCF-12-50JTC

Sample Line and Sample Transformer Combined Impedance at 630 kHz

Tower Sample System	Sample Transformer Make / Type	Resistance (ohms)	Reactance (ohms)
1 (south)	Delta TCT-1, sn 18355	51.70	-2.50
2 (east)	Delta TCT-1, sn 18356	51.70	-2.30
3 (north)	Delta TCT-1, sn 18353	51.70	-2.30
4 (west)	Delta TCT-1, sn 18354	51.60	-2.20

Sample Line Length and Impedance Calculations

Tower Sample Line	Calculated Electrical Length at 630 kHz (degrees)	Measured Characteristic Impedance
1 (south)	250.3	49.4
2 (east)	249.9	49.4
3 (north)	250.2	49.3
4 (west)	250.2	49.4

Sample Line Lengths : +/-

0.17 Degrees : Limit +/- 0.5°

Characteristic Impedance : +/-

0.1 Ohms : Limit +/- 1.0 Ohms

EXHIBIT #6A
APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DA1
WASHINGTON, DISTRICT OF COLUMBIA
February 2018

APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
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EXHIBIT #7

Reference Field Strength Measurements

Daytime reference field strength measurements were made at a minimum of three locations along radials specified in the Construction Permit (BP-20151008AAI) corresponding to the null radials of the directional pattern, 36°, 74°, 188°, 285°, and 354° and along the major lobe radial 136.5°. The tabulated measured field strength measurements, measurement point descriptions and GPS coordinates for the reference measurement points during directional operation are attached as Exhibit #7A.

Since the daytime and nighttime directional array are identical, with the exception of operating power, additional field measurements at the same locations were not made during nighttime directional mode operation.

WMAL 630 Washington DC 10.0 kW - Day
 2.7 kW - Night

Array Field Measurements
 The day and night pattern are identical with the exception of power
 therefore no night field measurements are included.

Major Lobe

Radial (°T)	Point #	N. Latitude	W. Longitude	Dist (mi)	Dist (km)	mv/m	Time (24 hr)	Date
136.5°	1	39.11028	77.27333		0.00	314.00	1414	2/13/2018
		13101 Chestnut Oak Drive, Gaithersburg MD						
136.5°	2	39.07747	77.23428		0.00	120.00	1436	2/13/2018
		13604 Pine View Dri, Rockville MD at beginning of circle						
136.5°	3	39.06556	77.21939		0.00	86.90	1450	2/13/2018
		10520 White Clover Terrace, Potomac, MD						
136.5°	4	39.03350	77.18050		0.00	38.10	1516	2/13/2018
		88009 Harness Trail, Potomac MD						

Geographic Coordinates Datum: WGS 84 (Digital)
 Latitude and Longitude Format: DD.ddddd

Field Measurements: David Supplee

EXHIBIT #7A
APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DA1
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February 2018

WMAL Washington DC Array Field Measurements
 630 2.7 kW - Night 10.0 kW - Day The day and night pattern are identical with the exception of power
 therefore no night field measurements are included.

Monitor Point Pattern Null Radial (Specified on Station Construction Permit)

Radial (°T)	Point #	N. Latitude	W. Longitude	Dist (mi)	Dist (km)	mv/m	Time (24 hr)	Date
36°	1	39.15930	77.28015	2.12	3.41	27.00	1104	11/9/2017
		Kingsview Village & Lehman Farm Road, Parking lot, last space, closest to intersection						
36°	2	39.19363	77.24808	5.03	8.10	2.00	1046	11/9/2017
		20601 Bolland Farm Road, Germantown, Maryland						
36°	3	39.25035	77.19497	9.88	15.90	2.40	1027	11/9/2017
		Rolling Fork Drive, Woodfield Road. Intersection in Median						

Geographic Coordinates Datum: WGS 84 (Digital)
 Latitude and Longitude Format: DD.ddddd

Field Measurements: David Supplee

EXHIBIT #7B
APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DA1
WASHINGTON, DISTRICT OF COLUMBIA
February 2018

WMAL Washington DC Array Field Measurements
630 2.7 kW - Night 10.0 kW - Day

The day and night pattern are identical with the exception of power therefore no night field measurements are included.

Monitor Point Pattern Null Radial (Specified on Station Construction Permit)

Radial (°T)	Point #	N. Latitude	W. Longitude	Dist (mi)	Dist (km)	mv/m	Time (24 hr)	Date
74°	1	39.14470	77.25837	2.52	4.06	18.00	927	11/9/2017
		Seneca Park Drive, north end of dam by guard rail						
74°	2	39.15927	77.18923	6.34	10.20	2.50	959	11/9/2017
		154 Sapling Hill Way, Germantown, Maryland						
74°	3	39.17173	77.14142	9.07	14.60	3.20	1008	11/9/2017
		7118 cypress Hill Drive, at mailbox						

Geographic Coordinates Datum: WGS 84 (Digital)
Latitude and Longitude Format: DD.ddddd

Field Measurements: David Supplee

EXHIBIT #7C
APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DA1
WASHINGTON, DISTRICT OF COLUMBIA
February 2018

WMAL 630 Washington DC 10.0 kW - Day
 2.7 kW - Night

Array Field Measurements
 The day and night pattern are identical with the exception of power
 therefore no night field measurements are included.

Monitor Point Pattern Null Radial (Specified on Station Construction Permit)

Radial (°T)	Point #	N. Latitude	W. Longitude	Dist (mi)	Dist (km)	mv/m	Time (24 hr)	Date
188°	1	39.10828	77.30838	1.83	2.95	74.00	1451	11/9/2017
		14800 Kelley Farm Drive, Germantown, Maryland at mailbox						
188°	2	39.08963	77.31225	3.13	5.04	23.00	1439	11/9/2017
		15000 Springfield Road, Germantown, Maryland in driveway						
188°	3	39.07217	77.31455	4.36	7.02	18.00	1424	11/9/2017
		15126 River Road, Potomac, Maryland						
188°	4	39.03172	77.32168	7.15	11.51	6.60	1111	11/10/2017
		10875 Patowmack Drive, Great Falls, Virginia at mailbox						
188°	5	38.99025	77.32942	10.07	16.21	3.20	1100	11/10/2017
		15126 River Road, Potomac, Maryland						

Geographic Coordinates Datum: WGS 84 (Digital)
 Latitude and Longitude Format: DD.ddddd

Field Measurements: David Supplee

EXHIBIT #7D
 APPLICATION FOR STATION LICENSE
 RADIO LICENSE HOLDINGS LLC
 WMAL AM RADIO STATION
 630 kHz - 2.7/10.0 kW - DAI
 WASHINGTON, DISTRICT OF COLUMBIA
 February 2018

WMAL 630 Washington DC
 2.7 kW - Night 10.0 kW - Day
 Array Field Measurements
 The day and night pattern are identical with the exception of power
 therefore no night field measurements are included.

Monitor Point Pattern Null Radial (Specified on Station Construction Permit)

Radial (°T)	Point #	N. Latitude	W. Longitude	Dist (mi)	Dist (km)	mv/m	Time (24 hr)	Date
285°	1	39.14290	77.34328	2.21	3.56	4.20	1317	11/9/2017
		17511 White Ground Road, Boyds, Maryland at steel gate						
285°	2	39.15173	77.39118	4.84	7.79	2.80	1331	11/9/2017
		18126 Cattail Road, opposite side of road from white gate						
285°	3	39.16917	77.47300	9.44	15.19	0.85	1348	11/9/2017
		19200 Martinsbug Road, Dickerson, Maryland						

Geographic Coordinates Datum: WGS 84 (Digital)
 Latitude and Longitude Format: DD.ddddd

Field Measurements: David Supplee

EXHIBIT #7E
APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DAI
WASHINGTON, DISTRICT OF COLUMBIA
February 2018

WMAL Washington DC Array Field Measurements
 630 2.7 kW - Night 10.0 kW - Day
 The day and night pattern are identical with the exception of power
 therefore no night field measurements are included.

Monitor Point Pattern Null Radial (Specified on Station Construction Permit)

Radial (°T)	Point #	N. Latitude	W. Longitude	Dist (mi)	Dist (km)	mv/m	Time (24 hr)	Date
354°	1	39.16528	77.30830	2.14	3.44	23.00	1117	11/9/2017
		18620 Thundercloud Road, Boyds, Maryland across from mailbox						
354°	2	39.22743	77.31585	6.46	10.40	4.00	1139	11/9/2017
		22640 Shiloh Church Road, across from mailbox						
354°	3	39.27412	77.32033	9.44	15.19	1.80	1200	11/9/2017
		25215 Peach Tree Road, boyds, Maryland, next to 25215 marker						

Geographic Coordinates Datum: WGS 84 (Digital)
 Latitude and Longitude Format: DD.ddddd

Field Measurements: David Supplee

EXHIBIT #7F
 APPLICATION FOR STATION LICENSE
 RADIO LICENSE HOLDINGS LLC
 WMAL AM RADIO STATION
 630 kHz - 2.7/10.0 kW - DA1
 WASHINGTON, DISTRICT OF COLUMBIA
 February 2018

Commonwealth of Pennsylvania

County of Dauphin

David N. Supplee, having been duly sworn, states the following:

That he is employed full-time as Regional Director of Engineering of radio station WMAL.

That he is familiar with the operation of field intensity meters and the methods and procedures used to conduct field strength measurements on AM broadcast stations.

That he personally conducted field intensity measurements between October 24, 2017 and November 30, 2017 on radio stations WMAL and WWRC (Formerly WSPZ).

That the field intensity meters used in conducting these measurements were:

Potomac Instruments FIM41, Serial #133 last calibrated 02/20/2012

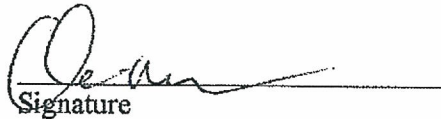
Potomac Instruments FIM41, Serial #162 last calibrated 03/14/2001

Potomac Instruments PI 4100, Serial #337 last calibrated 05/19/2017

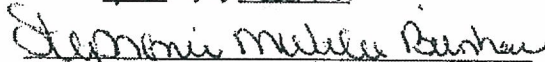
That the readings of the FIM 41 meters was essentially in agreement with the PI 4100.

That all data relating to these measurements is true and correct to the best of his knowledge.

This the 14th day of December, 2017.


Signature

Sworn to and subscribed before me
this the 14 day of December, 2017.


Notary Public

My commission expires: 10/7/2018

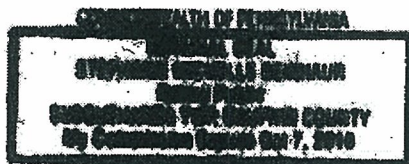


EXHIBIT #8
APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DA1
WASHINGTON, DISTRICT OF COLUMBIA
February 2018

Engineering Report

WMAL – 630 kHz, DA1 (10.0 kW Day / 2.7 kW Night)
WSPZ – 570 kHz, 5.0 kW DA-D / 1.0 kW DA-N

Gaithersburg, MD

Final Commissioning Report

Robert A. Elder

Sr. Field Engineer,
Compliance Matters, Inc.

5 December 2017

EXHIBIT #9
APPLICATION FOR STATION LICENSE
RADIO LICENSE HOLDINGS LLC
WMAL AM RADIO STATION
630 kHz - 2.7/10.0 kW - DA1
WASHINGTON, DISTRICT OF COLUMBIA
February 2018

Executive Summary

The WMAL-AM station has moved its operations from its former site in Bethesda, MD to be diplexed onto the previously existing 4-tower WSPZ-AM station's transmitter site located in Germantown, MD. A combination of existing equipment from the original phasing and matching system for WSPZ (manufactured by Phasetek) and new equipment consisting of phasing and matching networks for WMAL, two replacement ATUs for WSPZ, filters to protect each stations' operations from the other, and prematching networks (manufactured by Kintronic Labs) were installed on the existing WSPZ site.

WMAL will be submitting a Method of Moments (MoM) Technical Exhibit to support its filing of a Full Proof of Performance to support its application for license on a Form 302-AM. The adjustments and measurements made during the commissioning process, and documented in this engineering report, are intended to provide the requisite technical data needed for the MoM proof filing.

WSPZ will be submitting a Partial Proof using field signal strength measurements taken on radial lines, per the FCC requirements as recently updated.

Data are also presented to characterize the final system state after completion of adjustments, for each operational mode for each station.

The material described above has been organized in the present report as follows:

Outline of material:

1. Filter Characteristics
2. Spur Measurements at Intermodulation Product Frequencies
3. Updated Tower Impedance Matrix Measurements ("Opens" and "Shorts")
4. WSPZ Characterization
 - a. Transmission Lines and Sampling System characteristics
 - b. Operational Field Parameters (Day, Night)
 - c. Final phasor counter dial settings (Day, Night)
 - d. Input Impedance Sweep for each pattern, and design predictions
 - e. Operating Impedances at Strategic Points (Day, Night Patterns)
5. WMAL Characterization
 - a. Transmission Lines and Sampling System characteristics
 - b. Operational Field Parameters (DA)
 - c. Final phasor counter dial settings
 - d. Input Impedance Sweep for each pattern, and design predictions
 - e. Operating Impedances for Directional Mode at Strategic Points

Filter Characteristics

The two stations having only a 60 kHz separation (WSPZ on 570 kHz, and WMAL on 630 kHz) presented a significant design challenge, viz., to provide sufficient isolation between stations so as to not cause mutual interference or spurious emissions due to intermodulation products, while still maintaining a functional bandwidth for both stations; and a subsequent field challenge, to ensure that the filters have been precisely tuned and operate correctly according to the design, both for isolation and bandwidth performance.

Final field tuning adjustments were made to each of the 10 filters in the system while measuring the S_{12} parameter with the network analyzer connected to the external S-parameter test set, so as to measure the filter notch with a full two-port measurement. The measured isolation (in dB) as recorded below was after making final adjustments to the respective filters.

WSPZ (570 kHz) System

1. Shunt Filter (located near phasor input):	-27.4 dB
2. Tower 1 series filter:	-40.9 dB
3. Tower 2 series filter:	-39.9 dB
4. Tower 3 series filter:	-40.2 dB
5. Tower 4 series filter:	-36.6 dB

WMAL (630 kHz) System

1. Shunt Filter (located at phasor input):	-26.8 dB
2. Tower 1 series filter:	-45.4 dB
3. Tower 2 series filter:	-39.5 dB
4. Tower 3 series filter:	-47.6 dB
5. Tower 4 series filter:	-46.6 dB

Intermodulation Product Spur Measurements

Measurements of signal strength were taken at a location within the main lobe of both WSPZ – Day pattern and the WMAL directional pattern, at a distance 3.0 km from the transmitter site. These measurements were made by Mr. Dave Supplee on 10 November 2017, using an FIM-4100 field strength meter. The first two measurements shown are the unmodulated carrier measurements used for the isolation calculation. Spur measurements were taken at the following intermodulation product frequencies as shown below:

<u>Freq. (kHz)</u>	<u>Origin</u>	<u>Meas. (mV/m)</u>	<u>Isolation (dB)</u>	
			<u>(Rel. to 570)</u>	<u>(Rel. to 630)</u>
570	WSPZ carrier	339		
630	WMAL carrier	451		
510	2 x 570 – 630	.0162	-86.4	-88.9
690	2 x 630 – 570	.0334	-80.1	-82.6
1080	3 x 570 – 630	.0159	-86.6	-89.1
1140	2 x 570	.0387	-78.8	-81.3
1200	570 + 630	.0198	-84.7	-87.2
1260	2 x 630	.0160	-86.5	-89.0
1320	3 x 630 – 570	.0460	-77.3	-79.8
1770	2 x 570 + 630	.0108	-89.9	-92.4
1830	570 + 2 x 630	.0120	-89.0	-91.5
2340	3 x 570 + 630	.0091	-91.4	-93.9
2400	2 x 570 + 2 x 630	.0092	-91.3	-93.8
2460	570 + 3 x 630	.0092	-91.3	-93.8
3030	2 x 570 + 3 * 630	.0082	-92.3	-94.8

All measured spurs were below the required limits, with the exception of those at 1140 kHz and 1220 kHz. At these frequencies, the observed audio signals received were demonstrably from other stations, with no audio from either the WMAL or WSPZ broadcasts.

Updated Tower Impedance Measurements

Tower impedance measurements had been made during the earlier site visit (June 2017), to support the final design and pre-tuning efforts for the new equipment. Since this was prior to the installation of the new equipment, the tower impedance matrix measurements were repeated (10/9/17), this time at the final output J-plug just before the feed connections to the respective towers. These updated measurements were used in the final tower modeling to determine the target operational field parameters and drive point impedances for the WMAL directional pattern.

For each tower, a measurement was made of the impedance at each station's carrier frequency, once with the three other towers in an open condition, and again with the other three towers connected to ground (shorted) at or near the measurement point. An additional measurement (called the "Feed Impedance") was made for each, from the output point with the tower grounded. These measurements are presented below.

For the measurements taken with the other towers "shorted," the towers were shorted using a very low reactance grounding strap connected to the bottom of the tower on one end, and to the ground strap below the base insulator on the other end. Both surfaces were prepared for the connection point. For the "Z(feed)" measurements, the tower being measured was grounded across its base insulator using a jumper cable. For each, the measurement point was the final output J-plug before the actual tower feed pipe.

The measurements were all taken with an HP 8753C network analyzer in conjunction with an ENI model 350L RF amplifier and the Tunwall Radio directional coupler kit, in a calibrated setup. Measurements were taken using the respective sample lines to the towers from the WMAL transmitter building.

WSPZ (570 kHz)

<u>Tower #</u>	<u>Z (Others Open)</u>	<u>Z (Others Shorted)</u>	<u>Z (Feed)</u>
1	40.2 + j17.3	27.4 + j35.9	0.7 + j15.3
2	39.6 + j22.6	35.9 + j43.2	1.2 + j17.0
3	39.9 + j23.1	38.5 + j43.5	2.2 + j25.8
4	38.4 + j15.4	36.1 + j33.9	1.2 + j20.1

WMAL (630 kHz)

<u>Tower #</u>	<u>Z (Others Open)</u>	<u>Z (Others Shorted)</u>	<u>Z (Feed)</u>
1	56.5 + j70.4	62.1 + j88.2	0.7 + j16.9
2	58.8 + j75.9	65.7 + j85.7	1.2 + j18.6
3	55.1 + j76.7	61.9 + j88.4	2.4 + j28.6
4	52.5 + j66.1	54.0 + j75.4	0.9 + j22.0

WSPZ Characterization: Transmission and Sample Lines

Measurements of the line lengths and characteristic impedances of both the existing transmission lines and existing sample lines for the WSPZ system had been made during the previous site visit (July 2017). These data are included in the present report for the sake of completeness.

WSPZ Transmission Lines

Measurements of lengths and characteristic impedance were made for each of the transmission lines, using the same technique as that for the sample lines, and assuming the same velocity factor as above.

<u>Tower #</u>	<u>Elec. Length (degrees)</u>	<u>Length (m)</u>	<u>Length (feet)</u>	<u>Z₀ (Ω)</u>
1	174.09	226.4	742.7	50.8
2	131.97	171.6	563.0	50.6
3	132.64	172.5	565.9	50.6
4	128.61	167.2	548.7	50.4

WSPZ Sample Lines

Measurements of the lengths and characteristic impedance of each sample line were made, making use of the standard procedure in the FCC. The results of these measurements are summarized below. A velocity factor of 0.89 is assumed.

<u>Tower #</u>	<u>Elec. Length (degrees)</u>	<u>Length (m)</u>	<u>Length (feet)</u>	<u>Z₀ (Ω)</u>
1	190.56	247.8	813.0	51.4
2	190.25	247.4	811.6	51.2
3	190.31	247.5	811.9	51.3
4	190.38	247.6	812.2	51.1

In addition, during the more recent site visit, a “benchtop” verification measurement was made on the existing WSPZ current sampling toroids, to ensure that measurements taken with the WSPZ toroids are consistent with measurements taken using the WMAL toroids. Using a common signal through all four toroids together and measuring on the WMAL antenna monitor, the following data were collected:

Toroid #1: 1.000 < - 00.1°
Toroid #2: 0.999 < - 00.4°
Toroid #3: 1.001 < - 00.2°
Toroid #4: 0.999 < - 00.2°

WSPZ Characterization: Operational Field Parameters

Prior to the addition of equipment needed to diplex WMAL onto the WSPZ tower array, the current sampling for the WSPZ system had been taken near their final output J-plugs in their ATUs. With the additional networks added to the overall system, these toroids, remaining in their installed location, are now on the "protected" side of the filters and pre-match networks, resulting in current ratios and phases which differ from their original operating field parameters.

For both the WSPZ and WMAL tuning/commissioning process, a set of toroids was mounted at the final output J-plug of the new equipment, and referred to as the "commissioning point." As measured at this point in the system, the parameters for establishing the WSPZ patterns should be reasonably close to the operational parameters previously in use, and thus, those parameters were used as the tuning target values. After the measured parameters were brought to these target values (within a fairly tight tolerance), the sample lines for WSPZ were then reconnected to their toroids on the "protected" side.

In order to approximate the expected values of current ratio and phase as measured at this point in the WSPZ system, a series of comparative measurements were taken at different times during the tuning process, with one set of parameter measurements taken at the commissioning toroids, and another set at the protected toroids. These data were plotted against each other in order to obtain a rough equivalent value of each target parameter for the new toroid location, through linear extrapolation. This was done primarily as a "sanity" check for the values observed at the protected toroid location after final adjustments were made. It should be noted that new operational parameters will be in effect as a result of a successful partial proof for WSPZ.

The table below presents the "target" operational parameters, the final set of parameters as measured at the "commissioning point" ("CP"), the corresponding parameters as measured at the WSPZ toroids ("PP" for "protected point") and the "extrapolated values" (EV).

Day Pattern Operational Parameters:

<u>Tower #</u>	<u>"Target" parameters</u>	<u>Actual ("CP")</u>	<u>Actual ("PP")</u>	<u>Rough "EV"</u>
1 (ref)	1.000 < 0.0°	1.000 < 0.0°	1.000 < 0.0°	1.000 < 0.0°
2	0.804 < 9.3°	0.805 < 9.0°	0.816 < 8.8°	0.817 < 8.8°
3	0.759 < 126.1°	0.749 < 126.9°	0.167 < 118.5°	0.171 < 116.4°
4	1.049 < 119.9°	1.047 < 119.4°	0.299 < 113.0°	0.300 < 114.0°

Night Pattern Operational Parameters:

<u>Tower #</u>	<u>"Target" parameters</u>	<u>Actual ("CP")</u>	<u>Actual ("PP")</u>	<u>Rough "EV"</u>
1 (ref)	1.000 < 0.0°	1.000 < 0.0°	1.000 < 0.0°	1.000 < 0.0°
2	0.951 < 21.3°	0.932 < 20.5°	0.953 < 20.0°	0.944 < 20.7°
3	0.869 < 146.7°	0.861 < 147.4°	0.210 < 139.9°	0.220 < 137.8°
4	1.040 < 122.9°	1.050 < 123.7°	0.298 < 118.7°	0.292 < 117.5°

WSPZ Characterization: Final Phasor Counter Dial Settings

<u>DAY Pattern</u>			<u>NIGHT Pattern</u>		
<u>Comp. ID</u>	<u>Dial Setting</u>	<u>Function</u>	<u>Comp. ID</u>	<u>Dial Setting</u>	
D C1C	31.70	CP Resistance	N C1B	20.80	
D L2	06.10	CP "Output"	N L2	10.78	
D L1	10.00	CP Reactance	N L1	11.00	
1D C1B	29.22	Tower 1 Power	1N C1B	31.00	
1D L3&4	03.29	Tower 1 Phase	1N L3&4	08.50	
2D C1B	13.25	Tower 2 Power	2N C1B	14.30	
2D L3&4	06.70	Tower 2 Phase	2N L3&4	06.42	
3D C1B	21.70	Tower 3 Power	3N C1B	19.90	
3D L1	20.00	Tower 3 Phase (a)	3N L1	20.10	
3D L3&4	03.80	Tower 3 Phase (b)	3N L3&4	06.50	
4D C1B	20.00	Tower 4 Power	4N C1B	26.60	
4D L1	12.60	Tower 4 Phase (a)	4N L1	38.80	
4D L3&4	12.90	Tower 4 Phase (b)	4N L3&4	15.90	

WSPZ Characterization: Antenna Input Impedance Sweeps

After all tuning adjustments were made, an impedance measurement sweep was made (at the carrier frequency of 570 kHz +/- 15 kHz sideband frequencies in 5 kHz intervals), measuring at the J1 J-plug corresponding to the Common Point Bridge in the WSPZ Phasor cabinet, for each operational mode. For the two directional modes, the bandwidth performance predicted in the system design by Kintronic Labs (KTL) is also presented for comparison.

The results of these measurements are presented below:

Day Directional Pattern Input Impedance Sweep

<u>Freq. (kHz)</u>	<u>Input Z</u>	<u>SWR</u>	<u>SWR (predicted in KTL design)</u>
555	60.2 - j55.2	2.674	5.259
560	40.6 - j26.4	1.843	1.906
565	43.6 - j0.4	1.148	1.351
570	50.0 + j0.1	1.001	1.000
575	38.8 + j5.4	1.325	1.221
580	37.5 + j17.3	1.632	1.631
585	34.6 + j21.0	1.852	3.352

Night Directional Pattern Input Impedance Sweep

<u>Freq. (kHz)</u>	<u>Input Z</u>	<u>SWR</u>	<u>SWR (predicted in KTL design)</u>
555	26.7 + j0.8	1.871	1.510
560	48.3 + j29.0	1.791	2.126
565	74.0 + j7.6	1.509	1.525
570	50.0 + j0.1	1.004	1.000
575	38.6 + j15.8	1.551	1.474
580	36.7 + j27.1	1.995	1.340
585	30.4 + j42.4	3.119	3.645

Non-Directional Modes

The overall design of the upgraded duplexing system made use of previously existing networks at towers 1 and 2, including both non-directional matching networks. Also, the overall new design incorporates the previously existing phasor cabinet networks, which includes a single T-network used by both non-directional operational modes in common, with no change to the original design for these networks. For these reasons, no comparison to bandwidth performance predicted in the KTL design is made for these operational modes.

In the tuning of the networks for non-directional operation, the ND-2 mode was slightly favored, since it started out with better operational characteristics as compared to that of ND-1.

ND-1 Non-Directional Input Impedance Sweep

<u>Freq. (kHz)</u>	<u>Input Z</u>	<u>SWR</u>
555	66.3 + j32.2	1.854
560	83.3 + j20.2	1.813
565	73.8 - j0.5	1.477
570	50.1 - j0.8	1.015
575	33.8 + j14.7	1.693
580	26.5 + j36.7	3.110
585	27.9 + j66.8	5.361

ND-2 Non-Directional Input Impedance Sweep

<u>Freq. (kHz)</u>	<u>Input Z</u>	<u>SWR</u>
555	49.2 - j38.3	2.126
560	45.6 - j17.4	1.456
565	47.2 - j3.4	1.104
570	50.2 + j0.5	1.013
575	45.3 - j2.1	1.114
580	29.6 + j3.1	1.699
585	17.2 + j21.3	3.494

WSPZ Characterization: Operating Impedance Measurements at Strategic Points

Measurements were made with a Delta Electronics OIB-3 to determine the operating impedance at various points in the system for each directional pattern. Reported measurements below are in order of "power flow," with the first being the input match at the input point of the respective ATU, and the final being the drive point impedance. Intermediate operating impedance measurements are generally at the intervening J-plugs, except for one measurement in towers 3 and 4 which was taken at the "break point" between a series coil on the WSPZ side and the pre-matching T-network which is in common with both sides. For each impedance measurement reported below, the measurement is identified by the J-plug at which measurement was made; for the exception noted above, the measurement point is identified simply by "BP."

All measurements below were made with a Delta Electronics OIB-3, and all reported reactances have been corrected for frequency. For measurement points which correspond to a location at which a "predicted" impedance appears on the Kintronic Labs RF schematic, that impedance has been presented for comparison. The appropriate comparison for drive points, however, are those as predicted by the latest tower modeling based on the updated impedance matrix data, as shown.

Day Pattern Measurements:

<u>Tower 1:</u>	<u>KTL RF schematic:</u>	<u>Drive point per model:</u>
IJ1: 50 + j0		
IJ2: 37 + j45	35 + j55.7	
J106: 35 - j31	35 - j14.3	
J105: 35 + j32	35.7 + j55.4	35.5 + j33.0
<u>Tower 2:</u>		
2J1: 50 + j0		
2J2: 41 + j49	41.8 + j54.4	
J206: 40 - j29	41.8 - j10.6	
J205: 39 + j34	41.8 + j59.2	39.3 + j22.0
<u>Tower 3:</u>		
J304: 34 + j8		
J305: 90 - j23	38.9 + j49.9	
J306: 85 - j6		
"BP": 90 - j438	88.9 - j344	
J307: 5 + j6	4.7 + j18.9	0.1 - j3.3
<u>Tower 4:</u>		
J404: 29 - j29		
J405: 45 - j74	27.5 + j15.8	
J406: 45 - j75		
"BP": 61 - j414	27.5 - j254	
J407: 3.3 - j3	3.0 + j9.2	2.2 - j9.0

Night Pattern Measurements:

Tower 1:

1J1: $50 + j0$
1J2: $48 + j44$
J106: $36 - j34$
J105: $36 + j30$

KTL RF schematic:

$37.6 + j54.8$
 $37.6 - j15.2$
 $37.6 + j54.6$

Drive point per model:

$36.0 + j33.2$

Tower 2:

2J1: $50 + j0$
2J2: $35.5 + j52$
J206: $36 - j26$
J205: $36 + j35$

$34.6 + j57.2$
 $34.6 - j7.8$
 $34.6 + j62$

$33.7 + j33.5$

Tower 3:

J304: $45 - j24.2$
J305: $90 + j47$
J306: $84 + j58$
"BP": $90 - j371$
J307: $6 + j12$

$71.7 + j135$
 $71.7 - j259$
 $5.4 + j24.4$

$7.8 + j4.0$

Tower 4:

J404: $45 - j73$
J405: $25 - j81$
J406: $25 - j81$
"BP": $34 - j416$
J407: $1 - j3$

$14.6 + j2.5$
 $14.6 - j268$
 $1.5 + j17.9$

$1.7 - j6.7$

WMAL Characterization: Transmission and Sample Lines

Measurements of phase delay, line length, characteristic impedance were made to both sample lines and transmission lines, using the measurement protocol required in the FCC Rules for the verification of sampling systems for MoM proofs of performance. In addition, the impedance (at 630 kHz) with the sample lines terminated into their respective current sampling toroids was measured for each of the sample lines, and the toroids were verified using the “benchtop” measurement as required in the FCC Rules. The sampling system is shown to meet all the requirements for sampling systems used in a MoM proof. For the calculation of physical lengths, a velocity of 89% is assumed. The following data are presented:

WMAL Transmission Lines

<u>Twr #</u>	<u>Phase (°)</u>	<u>Length (m)</u>	<u>Length (ft)</u>	<u>Z_0 (Ω)</u>
1	223.55	263.0	862.9	49.6
2	250.19	294.3	965.7	49.8
3	183.31	215.7	707.5	49.5
4	129.09	151.9	498.3	49.9

WMAL Sample Lines

The sample lines were originally laid out to terminate into current sampling toroids located at the “protected” side of the filter networks, based on the original design intent of locating the toroids at the final output point for each tower during commissioning, and then moving the toroids following the commissioning process. For this reason, the original sample lines were augmented by short (~ 12 ft) extension cables, in order to reach the “commissioning point.” During the commissioning process, it was determined that the current sampling toroids would need to remain at the “commissioning point” after commissioning, and as a result the total sample lines will always incorporate the extension cables. The data presented below characterize the sample lines as augmented by the extensions.

<u>Twr #</u>	<u>Phase (°)</u>	<u>Length (m)</u>	<u>Length (ft)</u>	<u>Z_0 (Ω)</u>	<u>Z (term)</u>
1	250.29	294.45	966.1	49.4	51.7 – j2.5
2	249.94	294.05	964.7	49.4	51.7 – j2.3
3	250.15	294.29	965.5	49.3	51.7 – j2.3
4	250.22	294.38	965.8	49.4	51.6 – j2.2

Toroid verification

The results of the "benchtop" verification of the current sampling toroids are as follows:

<u>Toroid #</u>	<u>Serial Number</u>	<u>Ratio</u>	<u>Phase</u>
1	18355	1.000	0.0 ° (reference)
2	18356	0.997	0.0 °
3	18353	0.998	0.1 °
4	18354	0.999	0.0 °

As a "cross check," toroids 1 and 2 were reversed, with the following results:

2	18356	1.000	0.0 ° (reference)
1	18355	0.998	0.0 °

The toroids are manufactured by Delta Electronics, and have the following manufacturer's performance specifications:

Absolute magnitude accuracy:	+/- 2%
Absolute phase accuracy:	+/- 2 °
Tracking magnitude accuracy:	+/- 1%
Tracking phase accuracy:	+/- 0.5 °

The sample lines are within 0.35° of each other; their characteristic impedances are within 0.1 Ω of each other, and the impedances when terminated into their respective toroids are within 0.1 + j0.3 Ω of each other. The sampling toroids are well within the manufacturer's performance specifications. It is therefore seen that the WMAL sampling system meets all the requirements of the FCC Rules pertaining to sampling systems in use for a Method of Moments proof of performance.

WMAL Characterization: Operational Field Parameters

The final "target" operational field parameters for the WMAL directional pattern were derived from Moment Method modeling, making use of the updated impedance measurement matrix, as indicated earlier in the present report. These target values are presented below, along with the actual operating parameters indicated on the antenna monitor after final pattern-related adjustments to the system.

Directional Pattern Operational Parameters:

<u>Tower</u>	<u>"Target" parameters (from model)</u>	<u>Actual (Final) measured parameters</u>
1	1.000 < 0.0 °	1.000 < 0.0 °
2	0.829 < -2.0 °	0.832 < -2.3 °
3	0.659 < 104.5 °	0.657 < 103.8 °
4	1.072 < 116.7 °	1.073 < 116.0 °

Calculated FCC tolerances for the above operating parameters (+/- 5%; +/- 3 °):

<u>Tower:</u>	<u>Ratio (- 5%)</u>	<u>Ratio (+ 5%)</u>	<u>Phase (- 3 °)</u>	<u>Phase (+ 3 °)</u>
2	0.788	0.870	- 5.0	+ 1.0
3	0.626	0.692	101.5	107.5
4	1.018	1.126	113.7	119.7

WMAL Characterization: Final Phasor Counter Dial Settings

<u>Comp. ID</u>	<u>Function</u>	<u>Dial Setting</u>
L1A	CP Reactance	15.28
L3	CP Resistance	04.70
L12	Tower 1 Power	03.90
L10	Tower 1 Phase	11.80
L22	Tower 2 Power	02.30
L20	Tower 2 Phase	06.00
L30	Tower 3 Power	13.00
L31	Tower 3 Phase	11.51
L43	Tower 4 Power	27.40
L40	Tower 4 Phase	20.00

WMAL Characterization: Antenna Input Impedance Sweeps

After all tuning adjustments were made, an impedance measurement sweep was made (at the carrier frequency of 630 kHz +/- 15 kHz sideband frequencies in 5 kHz intervals), measuring at the transmitter port of the Main/Aux/DL switch, for each operational mode. Bandwidth performance predicted in the system design by Kintronic Labs is presented for comparison.

Directional Pattern Input Impedance Sweep

<u>Freq. (kHz)</u>	<u>Input Z</u>	<u>SWR</u>	<u>Kintronic design prediction</u>
615	53.3 - j79.9	4.159	5.259
620	29.3 - j28.0	2.416	1.906
625	37.1 - j3.6	1.366	1.351
630	50.0 + j0.1	1.004	1.0
635	52.6 - j2.9	1.078	1.221
640	52.5 - j0.0	1.050	1.631
645	65.4 - j16.8	1.486	3.352

ND-1 Non-Directional Pattern Input Impedance Sweep

<u>Freq. (kHz)</u>	<u>Input Z</u>	<u>SWR</u>	<u>Kintronic design prediction</u>
615	23.5 + j22.9	2.670	2.364
620	37.4 + j23.8	1.846	1.614
625	49.2 + j13.9	1.323	1.195
630	50.0 - j0.1	1.003	1.0
635	43.8 - j10.0	1.286	1.125
640	28.0 - j13.6	1.970	1.962
645	22.6 - j3.8	2.229	1.468

ND-2 Non-Directional Pattern Input Impedance Sweep

<u>Freq. (kHz)</u>	<u>Input Z</u>	<u>SWR</u>	<u>Kintronic design prediction</u>
615	70.1 + j41.7	2.145	2.364
620	72.7 + j13.6	1.546	1.614
625	59.3 + j1.1	1.192	1.195
630	49.4 - j0.8	1.018	1.0
635	41.4 + j0.7	1.209	1.125
640	34.5 + j11.7	1.588	1.962
645	47.5 + j19.8	1.503	1.468

WMAL Characterization: Operating Impedance Measurements at Strategic Points

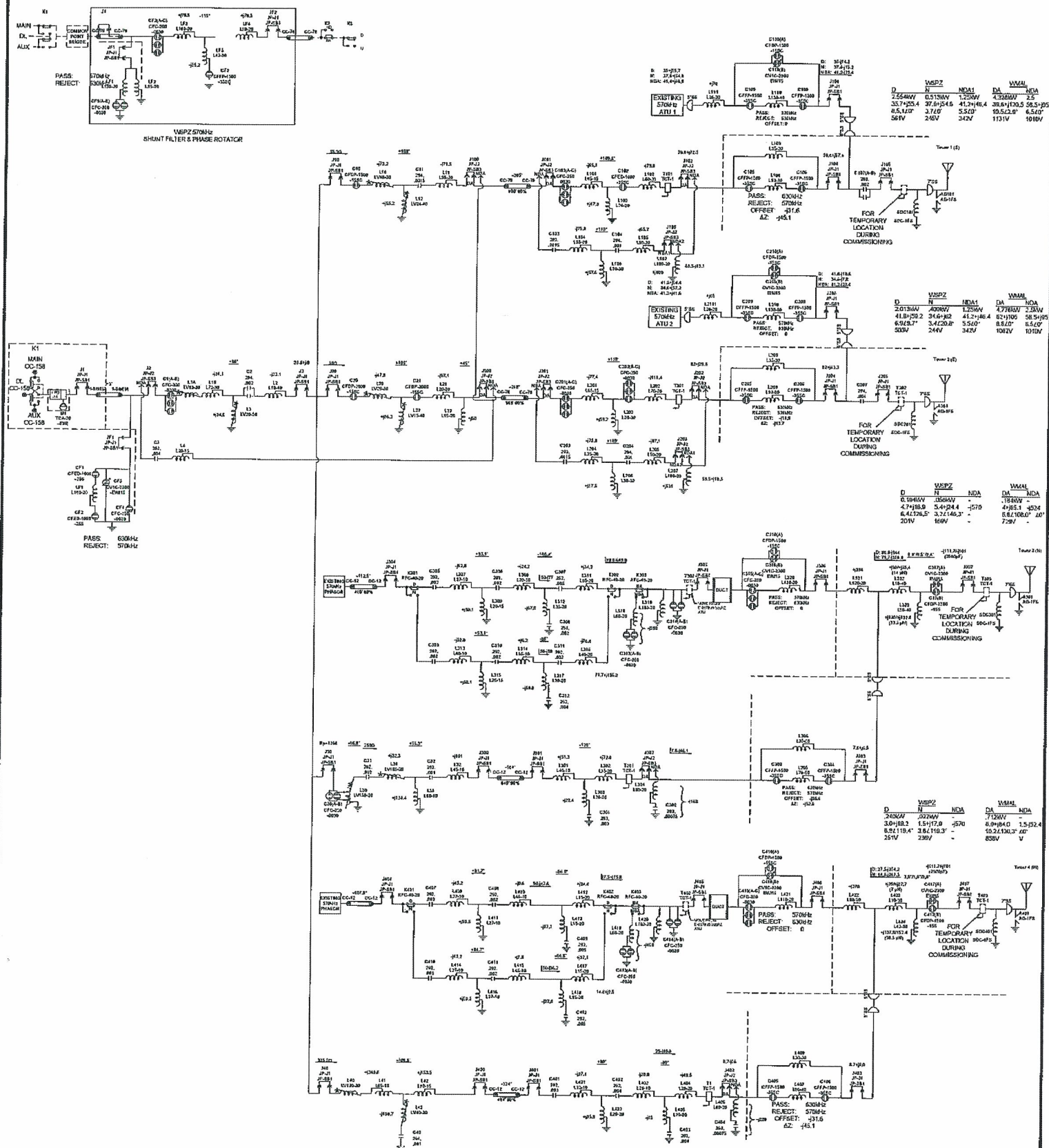
Measurements were made with a Delta Electronics OIB-3 to determine the operating impedance at various points in the WMAL system for its directional pattern. Reported measurements below are in order of "power flow," with the first being the input match at the input point of the respective ATU, and the final being the drive point impedance. Intermediate operating impedance measurements are at the intervening J-plugs. Measurements were not taken at the so-called "break point" described earlier for the WSPZ measurements. For each impedance measurement reported below, the measurement is identified by the J-plug at which measurement was made.

All measurements below were made with a Delta Electronics OIB-3, and all reported reactances have been corrected for frequency. For measurement points which correspond to a location at which a "predicted" impedance appears on the Kintronic Labs RF schematic, that impedance has been presented for comparison. The appropriate comparison for drive points, however, are those as predicted by the latest tower modeling based on the updated impedance matrix data, as shown.

Day Pattern Measurements:

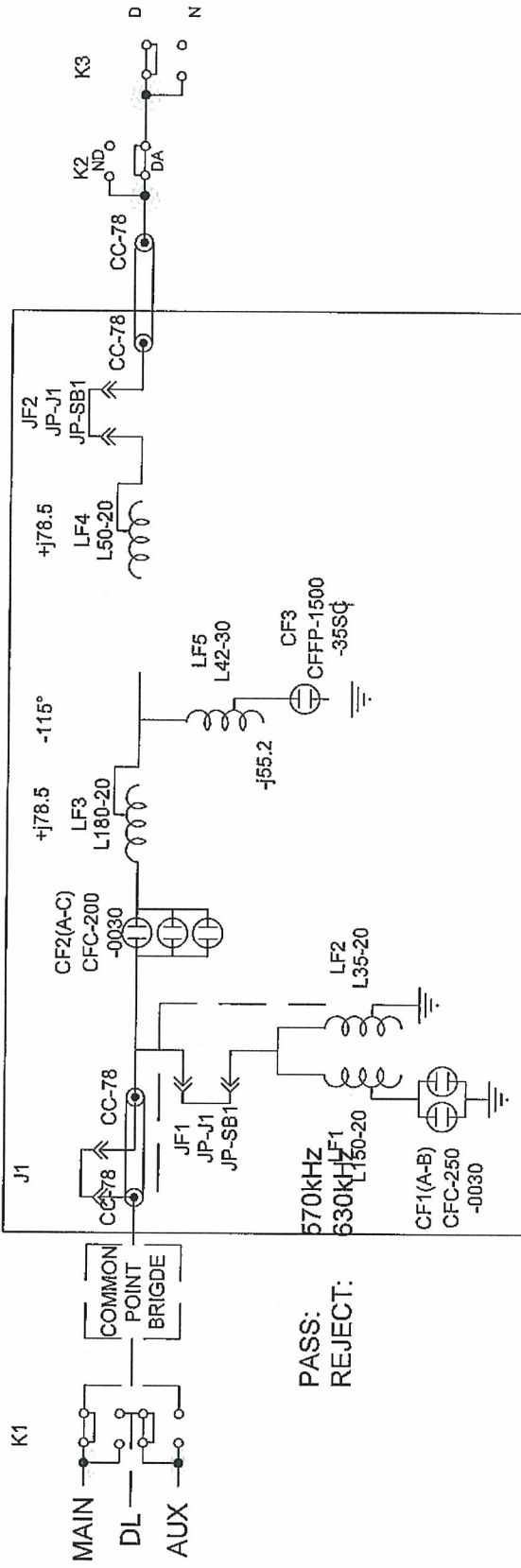
<u>Tower 1:</u>	<u>KTL RF schematic:</u>	<u>Drive point per model:</u>
J101: $50 + j0$		
J102: $48 - j7.6$	$39.6 + j12.3$	
J104: $45 + j40.3$	$39.6 + j57.4$	
J105: $43 + j104$	$39.6 + j120.5$	$44.9 + j115$
<u>Tower 2:</u>		
J201: $50 + j0$		
J202: $72.5 + j7.6$	$62 + j29.6$	
J204: $71 + j26.8$	$62 + j43.3$	
J205: $70 + j90.7$	$62 + j106$	$72.2 + j101.3$
<u>Tower 3:</u>		
J301: $62 + j3.8$		
J302: $4.6 - j71.2$	$7.6 - j46.1$	
J303: $3.5 - j13.9$	$7.6 + j6.5$	
J307: $2 + j47.3$	$4 + j65.1$	$4.9 + j53.9$
<u>Tower 4:</u>		
J401: $23 + j22.1$		
J402: $20 - j75$	$8.7 - j36$	
J403: $21 - j22.7$	$8.7 + j9.0$	
J407: $10 + j59.2$	$6.9 + j84$	$6.8 + j50.8$

EXHIBIT #10



		KINTRONIC LABORATORIES INC. BLUFF CITY, TN. COPYRIGHT 2016 KINTRONIC LABORATORIES INC.		PREQ: 530kHz 570kHz POWER: 10/2.7kW 5kW	DIPLEXED RF SCHEMATIC WMAL - WSPZ BETHESDA, MARYLAND
REV. 08	REV. DESCRIPTION: ENGINEERING CHANGES	REV. DATE: 16-Feb-17	JOB NO: 12031-RFS-01	DESIGNED: JMOSE	THE CONTENTS OF THIS DRAWING ARE THE INTELLECTUAL PROPERTY OF KINTRONIC LABS, INC. AND ARE NOT TO BE DISTRIBUTED TO ANY THIRD PARTY WITHOUT THE WRITTEN CONSENT OF KINTRONIC LABS, INC.
DWG NO: 12031-RFS-01	REF DWG:	DATE: 12-Oct-16	DRAWN: BROWLEY	APPROVED:	

- NOTES:
1. ADJUST OUTPUT COILS ON WSPZ ATU 1 & 2 AS NEEDED
 2. ADJUST ϕ AS NEEDED TO COMPENSATE WSPZ PARAMETERS



WSPZ 570KHz
SHUNT FILTER & PHASE ROTATOR



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REV. DESCRIPTION:

REV. DATE: 16-Feb-17

JOB NO:

DWG NO: 12031-RFS-01

DATE: 12-Oct-16

DRAWN: BWORLEY

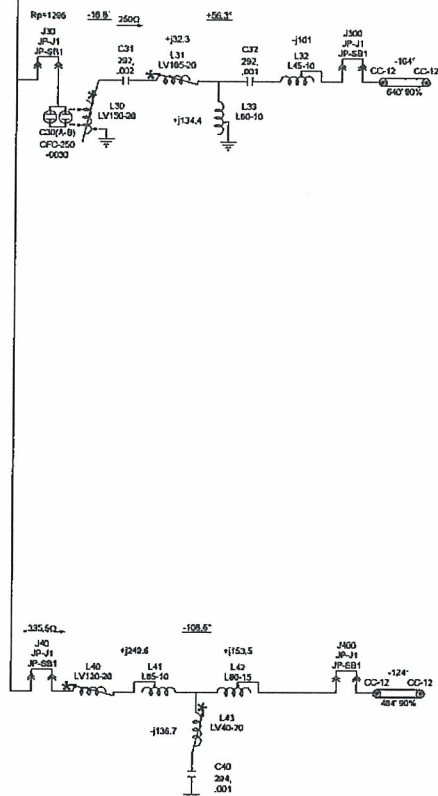
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570kHz
POWER: 10/2.7kW
5kW

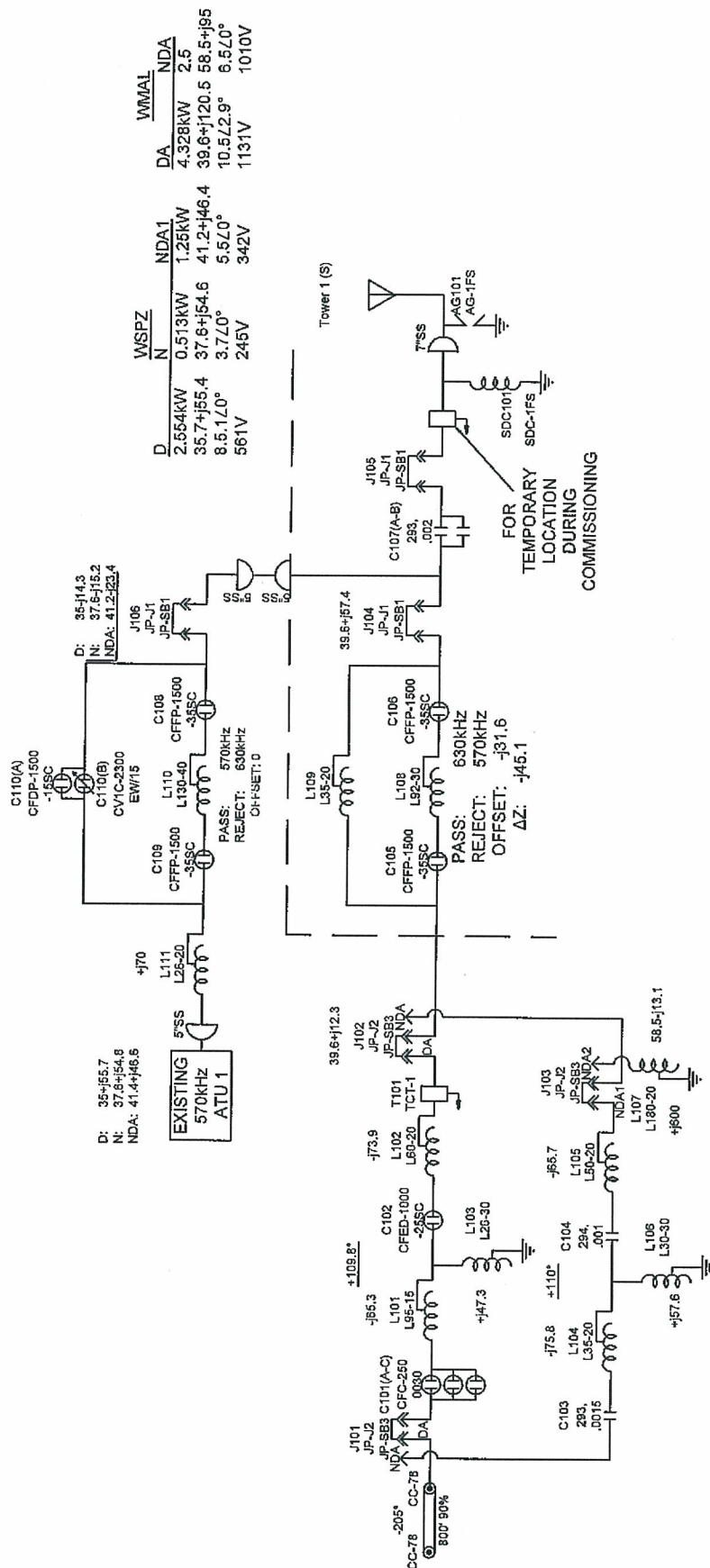
DESIGNED: JMOSE

APPROVED:

DIPLEXED RF SCHEMATIC
WMAL - WSPZ
BETHESDA, MARYLAND

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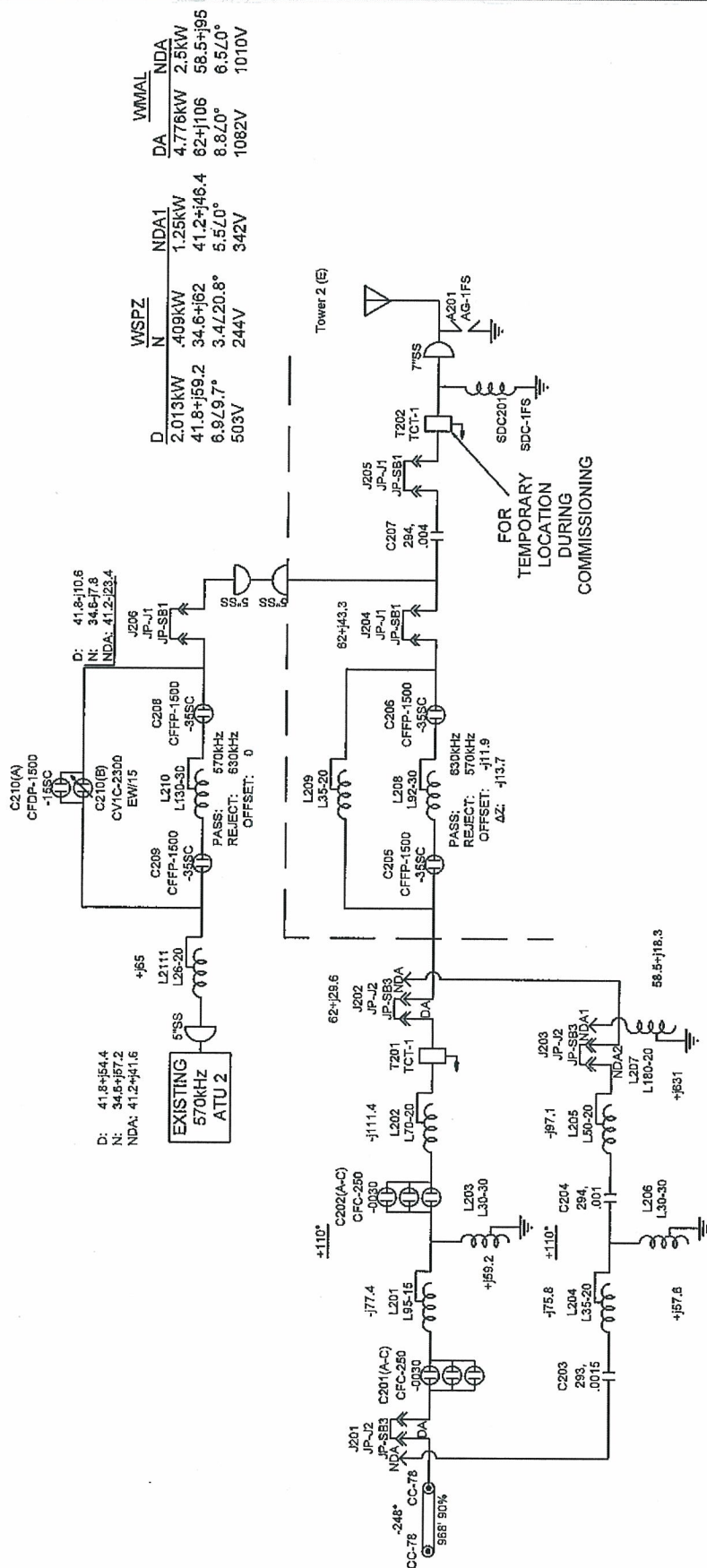
REV. REV. DESCRIPTION:

REV. DATE:	JOB NO:
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FREQ:	POWER:
630kHz	110/2.7kW
570kHz	5kW

DIPLEXED RF SCHEMATIC
WMAL - WSPZ
BETHESDA, MARYLAND

WSPZ		NDA1		DA		VMMAL	
D	N	D	N	D	N	D	N
2.594KW	0.513KW	1.25KW		4.328KW	2.5		
35.7°/55.4	37.6°/54.6	41.2°/46.4		39.6°/120.5	58.5°/95		
5.5°/1.0°	3.7°/0°	5.5°/0°		10.5°/2.9°	6°/2.0°		
561V	245V	342V		1131V	1010V		



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FREQ:
630kHz
570kHz
POWER:
10/2.7kW
5kW

DIPLEXED RF SCHEMATIC
WMAL - WSPZ
BETHESDA, MARYLAND

REV. DESCRIPTION:

REV. DATE: 16-Feb-17

DESIGNED: JMOSE

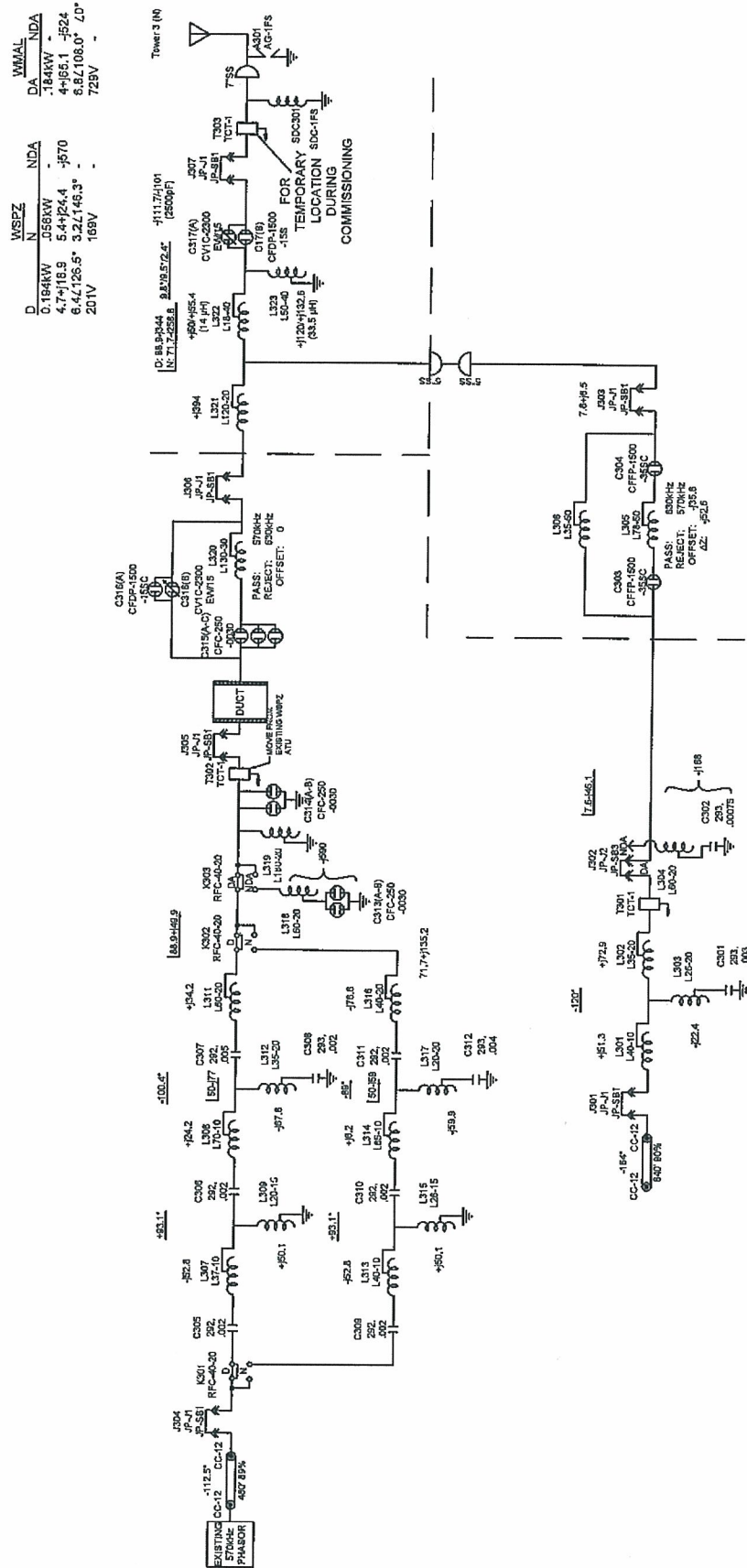
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DWG NO: 12031-RFS-01

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APPROVED:

DRAWN: BWORLEY



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REV.	REV. DESCRIPTION:
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REV. DATE:	JOB NO:
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REF DWG.

DATE: _____

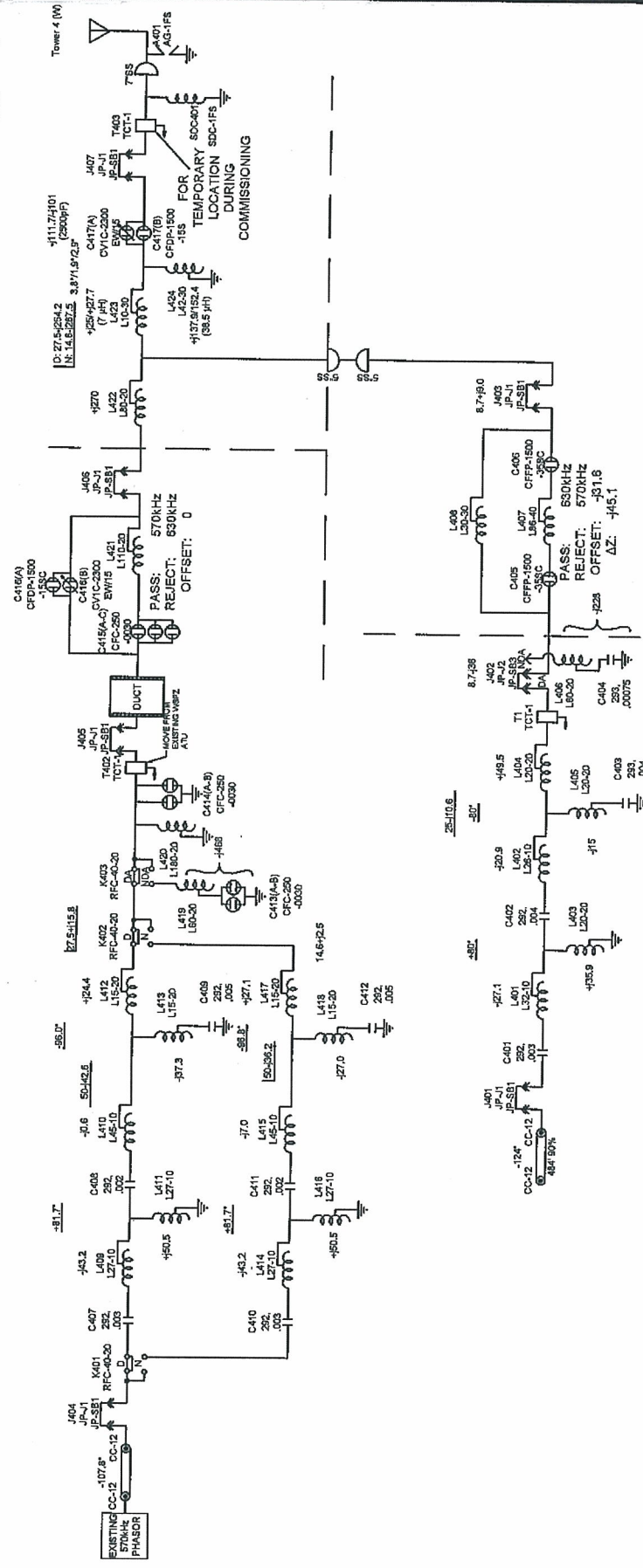
DRAWN:

FREQ:
530kHz
570kHz
POWER:
10/2.7kW
5kW

DIPLEXED RF SCHEMATIC
WMAL - WSPZ
BETHESDA, MARYLAND

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WSPZ		WMAI	
D	N	DA	NDA
240KW	022KW	772KW	-
3.0+19.2	1.5+17.8	6.9+84.0	1.5+52.4
8.9+119.4	3.8+119.3	10.2+120.3	7.0
251V	238V	858V	V



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REV. DESCRIPTION:

DWG NO: 12031-RFS-01

REF DWG.

DATE: 12-Oct-16

DRAWN: BWORLEY

DESIGNED: JMOSE

APPROVED:

FREQ: 630kHz
570kHz
POWER: 10/2.7kW
5kW

DIPLEXED RF SCHEMATIC
WMAI - WSPZ
BETHESDA, MARYLAND

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AFFIDAVIT AND QUALIFICATIONS OF CONSULTANT

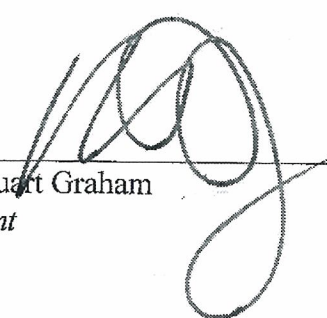
State of Georgia)
St. Simons Island) ss:
County of Glynn)

R. STUART GRAHAM, being duly sworn, deposes and says that he is an officer of Graham Brock, Inc. Graham Brock has been engaged by Radio License Holdings, LLC to prepare the attached Technical Exhibit.

His qualifications are a matter of record before the Federal Communications Commission. He has been active in Broadcast Engineering since 1979.

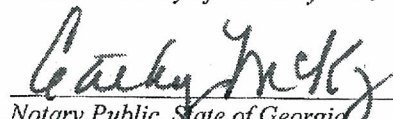
The attached report was either prepared by him or under his direction and all material and exhibits attached hereto are believed to be true and correct.

This the 15th day of February, 2018.



R. Stuart Graham
Affiant

*Sworn to and subscribed before me
this the 15th day of February 2018*



Notary Public, State of Georgia
My Commission Expires: March 12, 2019