SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT Cox Radio, LLC		
MAILING ADDRESS 1601 West Peachtree Street, NE		
CITY Atlanta	STATE GA	ZIP CODE 30328

2. This application is for:

[X] Commercial [ ] Noncommercial

[X] AM Directional [ ] AM Non-Directional

Call letters	Community of License	Construction Permit File No.	Modification of Construction Permit File No(s).	Expiration Date of Last Construction Permit
WDBO(AM)	Orlando, FL	N/A	N/A	N/A

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

[ ] Yes [ ] No

If No, explain in an Exhibit.

Exhibit No. N/A

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

[ ] Yes [ ] No

If No, state exceptions in an Exhibit.

Exhibit No. N/A

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

[ ] Yes [ ] No

If Yes, explain in an Exhibit.

Exhibit No. N/A

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

[ ] Yes [ ] No [X] Does not apply

If No, explain in an Exhibit.

Exhibit No.

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

[ ] Yes [X] No

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

Exhibit No.

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

☐ Yes ☒ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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

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

CERTIFICATION

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

☒ Yes ☐ No

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

Name	Signature	
Eric Greenberg	/s/ Eric Greenberg	
Title: Vice President & Secretary	Date: 3/24/2023	Telephone Number: 404-897-7000

WILLFUL FALSE STATEMENTS ON THIS FORM ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. CODE, TITLE 18, SECTION 1001), AND/OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION

FCC NOTICE TO INDIVIDUALS REQUIRED BY THE PRIVACY ACT AND THE PAPERWORK REDUCTION ACT

The solicitation of personal information requested in this application is authorized by the Communications Act of 1934, as amended. The Commission will use the information provided in this form to determine whether grant of the application is in the public interest. In reaching that determination, or for law enforcement purposes, it may become necessary to refer personal information contained in this form to another government agency. In addition, all information provided in this form will be available for public inspection. If information requested on the form is not provided, the application may be returned without action having been taken upon it or its processing may be delayed while a request is made to provide the missing information. Your response is required to obtain the requested authorization.

Public reporting burden for this collection of information is estimated to average 639 hours and 53 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, can be sent to the Federal Communications Commission, Records Management Branch, Paperwork Reduction Project (3060-0627), Washington, D. C. 20554. Do NOT send completed forms to this address.

THE FOREGOING NOTICE IS REQUIRED BY THE PRIVACY ACT OF 1974, P.L. 93-579, DECEMBER 31, 1974, 5 U.S.C. 552a(e)(3), AND THE PAPERWORK REDUCTION ACT OF 1980, P.L. 96-511, DECEMBER 11, 1980, 44 U.S.C. 3507.

SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant: Cox Radio, 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
WDBO		580	Unlimited	5.0	5.0

2. Station location

State	City or Town
Florida	Orlando

3. Transmitter location

State	County	City or Town	Street address (or other identification)
FL	Orange	Orlando	1245 W. Kennedy Blvd

4. Main studio location

State	County	City or Town	Street address (or other identification)
FL	Orange	Orlando	4192 N. John Young Pky

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

State	County	City or Town	Street address (or other identification)
FL	Orange	Orlando	4192 N. John Young Pky

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. Eng Rpt

8. Operating constants:

RF common point or antenna current (in amperes) without modulation for night system	RF common point or antenna current (in amperes) without modulation for day system
10.39	9.05
Measured antenna or common point resistance (in ohms) at operating frequency	**Measured antenna or common point reactance (in ohms) at operating frequency**
Night: 50 Day: 61	Night: Day:

Antenna indications for directional operation

Towers	Antenna monitor Phase reading(s) in degrees		Antenna monitor sample current ratio(s)		Antenna base currents	
	Night	Day	Night	Day	Night	Day
1	0		1			
2	-68.1		0.698			

Manufacturer and type of antenna monitor: Potomac Instruments AM-1901

SECTION III - Page 2

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

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded.	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit.
Uniform Cross-section guyed towers	133.5	#1 135.7 #2 135.9	#1 135.7 #2 135.9	Exhibit No.

Excitation [X] Series [ ] Shunt

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

North Latitude	West Longitude
28 ° 37 ' 11 "	81 ° 24 ' 35 "

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. No change - BZ-20060726AVU 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?

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

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

Name (Please Print or Type)	Signature (check appropriate box below)
Thomas S. Gorton	
Address (include ZIP Code) Hatfield & Dawson Consulting Engineers 9500 Greenwood Ave N. Seattle, WA 98103-3012	Date February 24, 2023
	Telephone No. (Include Area Code) (206) 783-9151

[ ] Technical Director

[X] Registered Professional Engineer

[ ] Chief Operator

[ ] Technical Consultant

[ ] Other (specify)

STEPHEN S. LOCKWOOD, PE, PMP

THOMAS M. ECKELS, PE
THOMAS S. GORTON, PE

JAMES B. HATFIELD, PE
BENJAMIN F. DAWSON III, PE
ERIK C. SWANSON, PE, PMP
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MAURY L. HATFIELD, PE
(1942-2009)
PAUL W. LEONARD, PE
(1925-2011)

Application for Modified License
and
Method of Moments Proof of Performance

WDBO(AM)
Orlando Florida
Facility ID 48726

580 kHz
5 kW DA-N

Cox Radio, LLC

December 2022

APPLICATION FOR MODIFIED LICENSE
RADIO STATION WDBO(AM) Orlando, FL
580 kHz 5 kW DA-N

Purpose of Application

Item 1	Analysis of Tower Impedance Measurements to Verify Method of Moments Model
Item 2	Method of Moments Model Details for Towers Driven Individually
Item 3	Method of Moments Model Details for Directional Antenna Patterns
Item 4	Derivation of Operating Parameters for Directional Antenna
Item 5	Post Construction Geometry Statement
Item 6	Ground System
Item 7	Daytime Non Directional Operation
Item 8	Sampling System Measurements
Item 9	Reference Field Strength Measurements

Purpose of Application

This engineering exhibit supports an application by Cox Radio, LLC. for a modified station license for radio station WDBO(AM) Orlando, FL (Facility ID 48726). WDBO operates on 580 kHz with a power of 5 kW full time using a 2 tower directional antenna for nighttime operation. A new method of moments proof is now being submitted following the replacement of the tower obstruction lighting on the towers of the WDBO array.

Information is provided herein demonstrating that the directional antenna parameters for the pattern authorized by the WDBO license (BZ-20060726AVU) have been determined in accordance with the requirements of section §73.151 of the FCC 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.

All measurements contained in this report were made by Benjamin F. Dawson P.E and Stephen S. Lockwood P.E.

Item 1

Analysis of Tower Impedance Measurements to Verify Method of Moments Model

Tower base impedance measurements were made at the locations of the sample system current transformers using an Advantest R3754A network analyzer and a HP 8751A network analyzer in a calibrated measurement system. The other towers were open circuited at the same point where impedance measurements were made (the "reference points") for each of the measurements.

The reference point measurements are listed in the table below.

WDBO Measured "Reference Point" Impedances

Tower	Resistance	Reactance
1 (North)	63.1	+j105.9
2 (South)	58.6	+j111.3

Circuit calculations were performed to relate the method of moments modeled impedances at the tower base feed points to those at the measurement locations as shown in the diagram titled *Analysis of Tower Impedance Measurements to Verify Method of Moments Model*. The series/parallel equivalent impedance of X_{LT}, X_{SDC}, X_S and X_C was used in the moment method model as a load at ground level (lumped load) for the open circuited towers.

Item 2

Method of Moments Model Details for Towers Driven Individually - WDBO

The array of towers was modeled using Expert MININEC Broadcast Professional Version 14.0. One wire was used to represent each tower. The top and bottom wire end points were specified using electrical degrees in the geographic coordinate system, using the theoretical directional antenna specifications for tower spacing and orientation. Each tower was modeled using 20 wire segments. As the tallest tower in the WDBO model is 101.7 electrical degrees in height, the maximum segment length is 5.1 electrical degrees.

Each tower's modeled height relative to its physical height falls within the required range of 75 to 125 percent of the actual tower height. The towers are triangular with a face width of 24", thus the towers have a circumference of 72".

WDBO Tower Dimensions - Physical and Modeled

Tower	Physical Height (Degrees)	Modeled Height (degrees)	Modeled Height (percent)	Modeled Radius (meters)	Modeled Radius (percent)
1	93.0	101.7	109.4	.29	100
2	93.0	100.0	107.5	.29	100

WDBO MININEC Model Node and Wire Numbering

Tower	Wire Number	Base Node Number
1	1	1
2	2	21

The following pages show the details of the method of moments model.

WDBO Tower 1 Driven, Other Towers Open Circuit at Current Transformer Location

GEOMETRY
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.29	20
		0	0	101.7		
2	none	106.	173.5	0	.29	20
		106.	173.5	100.		

Number of wires = 2
current nodes = 40

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	2	5.	1	5.085
radius	1	.29	1	.29

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	580.	0	1	.0138889	.014125

Sources

source	node	sector	magnitude	phase	type
1	1	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	21	0	-18,600.	0	0	0

IMPEDANCE
normalization = 50.

freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
580.	**62.715**	**94.225**	113.19	56.4	4.6687	-3.7794	-2.3571

WDBO Tower 2 Driven, Other Towers Open Circuit at Current Transformer Location

```
GEOMETRY
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0           0            .29          20
           0            0           101.7
 2    none 106.         173.5       0            .29          20
           106.         173.5       100.

Number of wires          =  2
          current nodes  =  40

                         minimum                  maximum
Individual wires      wire    value             wire  value
segment length         2      5.                 1    5.085
radius                 1      .29                1    .29


ELECTRICAL DESCRIPTION
Frequencies (KHz)
     frequency                no. of  segment length (wavelengths)
 no. lowest       step         steps   minimum        maximum
 1   580.         0             1      .0138889       .014125

Sources
source node    sector  magnitude      phase          type
 1      21      1       1.             0              voltage

Lumped loads
             resistance    reactance     inductance  capacitance passive
load  node   (ohms)        (ohms)        (mH)        (uF)        circuit
 1     1     0             -18,600.      0           0            0


IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(KHz)    (ohms)   (ohms)   (ohms)   (deg)            dB       dB
source =  1; node 21, sector 1
580.     58.54    83.174   101.71   54.9     4.1473  -4.2729  -2.0333
```

Item 3

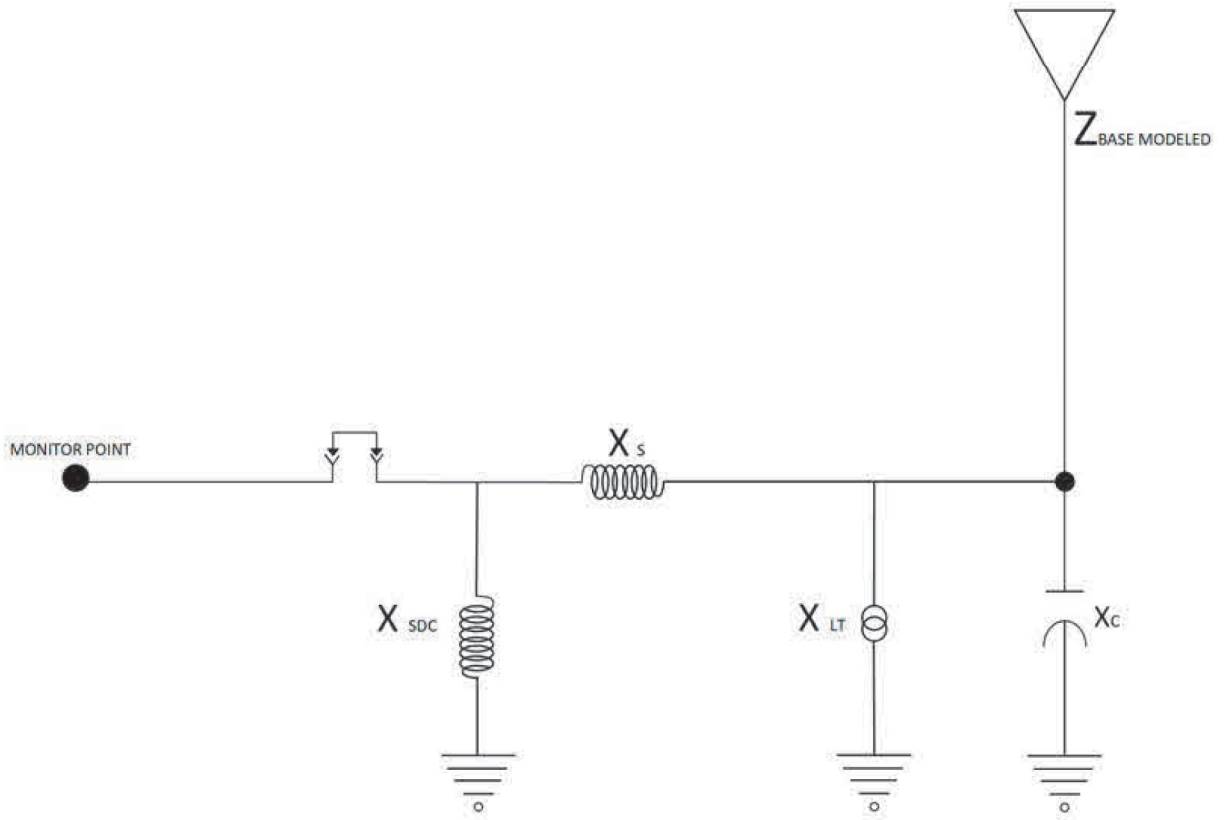
Method of Moments Model Details for Directional Antenna- WDBO

The array of towers was modeled using MININEC 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 towers that, when normalized, equated to the theoretical field parameters of the authorized directional antenna patterns. In the schematic diagram on the following page,

X_C represents the capacitance between the tower and ground, including the base insulator
X_S represents the series inductance of the feed line connecting the ATU to the tower
X_{SDC} represents the reactance of the static drain choke
X_{LT} represents reactance of the tower lighting transformer

The values used for X_{SDC} are based on measurements of the actual devises in use.

In all cases, the modeled impedance at the measurement point is within one ohm of the measured impedance at that point.



Tower	X_{SDC} (Ohms)	X_S (Ohms)	X_{LT} (Ohms)	X_C (Ohms)	Z Base Modeled	Z MP Modeled	Z MP Measured
1	+j7.67k	12	-j9.14k	-j13.7k	62.7 +j94.2	63.1 +j106.1	63.1 +j105.9
2	+j7.67k	29	-j9.14k	-j13.7k	58.6 +j83.2	58.6 +j111.6	58.6 +j111.3

WDBO Driven Array - Night Pattern

WDBO

GEOMETRY
Wire coordinates in degrees; other dimensions in meters
Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.29	20
		0	0	101.7		
2	none	106.	173.5	0	.29	20
		106.	173.5	100.		

Number of wires = 2
current nodes = 40

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	2	5.	1	5.085
radius	1	.29	1	.29

ELECTRICAL DESCRIPTION
Frequencies (KHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	580.	0	1	.0138889	.014125

Sources

source	node	sector	magnitude	phase	type
1	1	1	854.556	61.8	voltage
2	21	1	1,011.51	335.5	voltage

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IMPEDANCE
normalization = 50.

freq (KHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
580.	**46.57**	**72.614**	86.265	57.3	4.0209	-4.413	-1.9518
source = 2; node 21, sector 1							
580.	**112.87**	**92.265**	145.78	39.3	3.956	-4.4885	-1.9095

CURRENT rms
Frequency = 580 KHz
Input power = 5,000. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	**7.00339**	**4.5**	6.98206	.546207
2	0	0	5.085	7.23049	3.2	7.21907	.406176
3	0	0	10.17	7.3337	2.4	7.32717	.309512
4	0	0	15.255	7.36579	1.8	7.3623	.226421
5	0	0	20.34	7.33428	1.2	7.33268	.152968
6	0	0	25.425	7.24265	.7	7.24212	.0876903
7	0	0	30.51	7.09322	.2	7.09316	.0299923
8	0	0	35.595	6.88791	359.8	6.88788	-.0203675
9	0	0	40.68	6.62872	359.5	6.62842	-.0634683
10	0	0	45.765	6.31775	359.1	6.31697	-.099315
11	0	0	50.85	5.95727	358.8	5.9559	-.127884
12	0	0	55.935	5.5497	358.5	5.54769	-.149146
13	0	0	61.02	5.09764	358.2	5.09503	-.163082
14	0	0	66.105	4.60374	357.9	4.60062	-.169687
15	0	0	71.19	4.07068	357.6	4.06717	-.168971
16	0	0	76.275	3.50091	357.4	3.49721	-.16095
17	0	0	81.36	2.89637	357.1	2.89271	-.145624
18	0	0	86.445	2.25779	356.9	2.25444	-.122933
19	0	0	91.53	1.58297	356.6	1.58026	-.092625
20	0	0	96.615	.861402	356.4	.859717	-.0538625
END	0	0	101.7	0	0	0	0
GND	-105.319	-11.9996	0	**4.90534**	**296.2**	2.16846	-4.40001
22	-105.319	-11.9996	5.	5.11439	293.3	2.01997	-4.69859
23	-105.319	-11.9996	10.	5.22542	291.4	1.90693	-4.86504
24	-105.319	-11.9996	15.	5.28293	289.9	1.7986	-4.96733
25	-105.319	-11.9996	20.	5.29239	288.6	1.69105	-5.01495
26	-105.319	-11.9996	25.	5.25604	287.5	1.58295	-5.01201
27	-105.319	-11.9996	30.	5.17521	286.5	1.47388	-4.96089
28	-105.319	-11.9996	35.	5.05099	285.7	1.36389	-4.86337
29	-105.319	-11.9996	40.	4.8845	284.9	1.2532	-4.721
30	-105.319	-11.9996	45.	4.67696	284.1	1.14216	-4.53535
31	-105.319	-11.9996	50.	4.42979	283.5	1.03119	-4.30809
32	-105.319	-11.9996	55.	4.14452	282.8	.920742	-4.04095
33	-105.319	-11.9996	60.	3.82286	282.3	.811282	-3.73578
34	-105.319	-11.9996	65.	3.46656	281.7	.703273	-3.39447
35	-105.319	-11.9996	70.	3.07742	281.2	.597153	-3.01893
36	-105.319	-11.9996	75.	2.65708	280.7	.493314	-2.61089
37	-105.319	-11.9996	80.	2.20682	280.2	.392067	-2.17171
38	-105.319	-11.9996	85.	1.72696	279.8	.293565	-1.70183
39	-105.319	-11.9996	90.	1.21558	279.4	.19763	-1.19941
40	-105.319	-11.9996	95.	.664268	278.9	.103176	-.656206
END	-105.319	-11.9996	100.	0	0	0	0

Medium wave array vertical current moment (amps-degrees) rms
(Calculation assumes tower wires are grouped together.
The first wire of each group must contain the source.)

tower	magnitude	phase (deg)
1	1,066.11	360.
2	767.666	286.

Comparison of Current Moments with Theoretical Antenna Field Parameters - Day

Tower	Current Moment Magnitude	Current Moment Magnitude	Normalized Magnitude	Normalized Phase (Degrees)	Theoretical Ratio	Theoretical Phase (Degrees)
1	1,066.11	360.0	1.0	0	1.0	0
2	767.666	286.0	0.720	-74.0	0.720	-74.0

As shown in the tables above, the base voltages used in the Method of Moments computer model produce current moments in each of the towers that are identical to the field ratios and phases (+/- 0.1°) of the theoretical antenna parameters specified in the WDBO station license.

Item 4

Derivation of Operating Parameters for Directional Antennas - WDBO

The currents at the tower reference points have been calculated by using the computer circuit simulation program pspice. A pspice model has been made for each tower using the antenna base currents and base impedances calculated by MININEC and shown in the driven array model above, and the reactances listed previously in the table *Analysis of Tower Impedance Measurements to Verify Method of Moments Model*. The magnitude and phase of the current source in the pspice model was adjusted so that the current calculated in the output branch of the pspice model (the current through resistor R_L) was the same as the base current for the tower calculated by MININEC. The current at the reference point is the current source in the pspice model. These calculated currents are then normalized to the reference tower to obtain the antenna monitor phase and ratio readings, as shown in the tables labeled Antenna Monitor Parameters, which follow the pspice data below.

```
 ## WDBO TOWER 1 NIGHT BASE MODEL

 ****     CIRCUIT DESCRIPTION

******************************************************************************


.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 580kHz 580kHz

IIN             0                       1       AC 7.017 4.6
LXsdc           1                       0               2105uH
LXs             1                       2               3.29uH
CXc             2                       0               20pF
CXlt            2                       0               30.5pf
LL              2                       3               19.9257uH
RL              3                       0               46.57ohms

.PRINT AC IM(RL) IP(RL)

##.PROBE
.END




 ****     AC ANALYSIS                    TEMPERATURE =   27.000 DEG C


  FREQ         IM(RL)       IP(RL)

   5.800E+05   7.034E+00    4.456E+00
```

```
## WDBO TOWER 2 NIGHT BASE MODEL

 ****     CIRCUIT DESCRIPTION

********************************************************************************


.OPT LIST NOPAGE NODE NOMOD
.AC LIN 1 580kHz 580kHz

IIN             0                       1       AC 4.8995 -63.45
LXsdc           1                       0               2105uH
LXs             1                       2               7.958uH
CXc             2                       0               20pF
CXlt            2                       0               30.5pf
LL              2                       3               25.318uH
RL              3                       0               112.87ohms

.PRINT AC IM(RL) IP(RL)

##.PROBE
.END




 ****     AC ANALYSIS                     TEMPERATURE =   27.000 DEG C


  FREQ         IM(RL)       IP(RL)

    5.800E+05    4.905E+00   -6.380E+01
```

Antenna Monitor Parameters - Night Pattern - WDBO

Tower	Ref Point Current Magnitude	Ref Point Current Phase (Degrees)	Normalized Magnitude	Normalized Phase (Degrees)
1	7.017	4.6	1.0	0
2	4.8995	-63.45	0.698	-68.1

Item 5
Summary of Post Construction Array Geometry - WDBO

The WDBO antenna array has been previously licensed by means of a measurement based proof of performance. Therefore a survey of the array geometry is not required.

Item 6
Ground System

The ground system is as specified in BZ-20060726AVU.

Item 7
Daytime Non-Directional Operation

The daytime non-directional base impedance was measured with the above-referenced equipment and determined to be 61.4 +J 110.1 ohms.

Item 8

Sampling System Measurements - WDBO

Impedance measurements were made of the antenna monitor sampling system using an Advantest R3754A network analyzer in a calibrated measurement system. The measurements were made looking into the antenna monitor ends of the sampling lines for two conditions – with and without the sampling lines connected to the sampling transformers at the antenna tuning units.

The sample lines are equal lengths of 1/4 inch Heliax type cable.

The following table shows the frequency closest to the carrier frequency where series resonance – zero reactance corresponding with low resistance – was found. As frequencies of resonance occur at odd multiples of 90 degrees electrical length, the sampling line length at the resonant frequency above carrier frequency – which is the closest one to the carrier frequency – was found to be 270 electrical degrees. The electrical length at carrier frequency appearing in the table below was calculated by multiplying 270 degrees by the ratio of the carrier frequency (580 kHz) to the resonant frequency.

Sample Line Measurements - WDBO

Tower	Sample Line Open Circuited Resonant Frequency (kHz)	Sample Line Electrical Length at 580 kHz	Measured Impedance at 580 kHz with Sample Transformer Connected
1	851.167	183.98	59.2 -j14.8
2	850.333	184.16	50.2 +j1.18

The sample line lengths meet the requirement that they be equal in length to within 1 electrical degree.

In order to determine the characteristic impedance values of the sampling lines, open-circuited measurements were made with frequencies offset to produce +/- 45 degrees of electrical length from resonance. The characteristic impedance was calculated using the following formula, where R1 +j X1 and R2 +j X2 are the measured impedances at the +45 and –45 degree offset frequencies, respectively:

$$Zo = ((R_1^2 + X_1^2)^{1/2} \times (R_2^2 + X_2^2)^{1/2})^{1/2}$$

WDBO Sample Line Characteristic Impedance Calculations

Tower	-45° Offset Frequency (kHz)	-45° Offset Measured Impedance	+45° Offset Frequency (kHz)	+45° Measured Impedance	Calculated Characteristic Impedance
1	709.3055	10.85 -j48.0	993.0277	18.1 +j45.2	48.9
2	708.611	9.4 -J47.0	992.056	13.1 +j45.3	47.5

The sample line measured characteristic impedances meet the requirement that they be equal within 2 ohms.

The sample current transformers were tested by feeding their outputs to the “A” and “B” inputs of the network analyzer, while feeding the output of the network analyzer through the sample transformers and into a resistive load. The transformers were in agreement within 0.5° of phase and 0.1% of ratio.

Item 9

Reference Field Strength Measurements - WDBO

Reference field strength measurements were made along radials of minimum and maximum radiation for the directional pattern. The transmitter power was adjusted to 5.4kW for the night pattern.

The measured field strengths and descriptions including GPS (NAD83) coordinates for the reference measurement points are shown on the following pages.

WRFC-AM 01/17/23 960 KHz Engineer: Nicolas Blomstrand

	Date of Measurement	Time of measurement	Distance from site (Km)	Reading (mV/m)	Description
Radial Azimuth 46.5 Degrees					
Point 1	01/17/23	11:36	1.033	34.2	Power Pole W277G on Jefferson River Road. 34 00 21.8N 83 25 30.5W
Point 2	01/17/23	12:24	5.552	2.91	Edge of Bob Holman Rd. South corner of wooden fencing. 34 02 02.2N 83 22 01.4W
Point 3	01/17/23	12:51	8.425	1	East edge of Pleasant Acres Farm Rd. Near yellow road sign. 34 03 06.8N 83 22 01.4W
Radial Azimuth 112.5 Degrees					
Point 1	01/17/23	11:30	1.184	603	Culdusac at end of Derricotte Rd. 33 59 43.6N 83 25 16.9W
Point 2	01/17/23	11:18	2.384	150	Intersection of Bunker Dr and Club Dr. 33 59 28.5N 83 24 33.6W
Point 3	01/17/23	11:02	6.258	34.3	Corner from Northcrest Dr to Lake St. 33 58 40.7N 83 22 13.8W
Radial Azimuth 179 Degrees					
Point 1	01/17/23	10:22	1.414	116	Across from 151-1 Caroline Ave. 33 59 12.2N 83 25 58.8W
Point 2	01/17/23	10:33	3.106	44.4	Stop sign at crossing of Bethany Ct and Kirby Ln. 33 58 17.7N 83 25 57.5W
Point 3	01/17/23	10:44	5.344	12.4	190 Rivermont Rd. 33 57 05.2N 83 25 55.7W
Radial Azimuth 261.5 Degrees					
Point 1	01/17/23	2:01	1.199	32.8	Driveway of 8 Charter Oak Dr. 33 59 46.9N 83 26 46.3W
Point 2	01/17/23	1:54	2.399	0.6	Intersection of Hobbs Rd and Woodside Dr. 33 59 46.9N 83 27 32.4W
Point 3	01/17/23	1:44	5.067	2.55	Across from 105 Three Oaks Dr. 33 59 34.2N 83 29 15.5W
Radial Azimuth 311 Degrees					
Point 1	01/17/23	1:14	1.306	7.16	425 Oak Grove Rd. 34 00 26.0N 83 26 38.2W
Point 2	01/17/23	1:22	2.646	1.95	295 Lester Dr. 34 00 54.8N 83 27 17.5W
Point 3	01/17/23	1:32	5.026	0.348	Directly over creek on Mary Collier Dr. 34 01 44.5N 83 28 28.8W

Field Meter used: Potomac Instuments PI 4100 Serial number 133 Date of Calibration: June 2 2021


353.5°
N28° 38' 38.33"
W81° 24' 44.84"
110
125
N28° 38' 11.10"
W81° 24' 41.24"
160
N28° 37' 58.11"
W81° 24' 39.59"
WDBO
N28° 36' 41.20"
W81° 23' 50.19"
470
N28° 36' 32.91"
W81° 25' 8.49"
450
N28° 36' 35.81"
W81° 24' 28.95"
450
N28° 36' 6.96"
W81° 25' 32.49"
265
325
N28° 36' 8.82"
W81° 24' 25.35"
310
N28° 36' 18.42"
W81° 23' 16.79"
127.8°
145
N28° 35' 48.24"
W81° 22' 32.52"
219.2°
N28° 35' 11.13"
W81° 26' 24.45"
170
173.5°
135
Bear Lake
Lake Lotus
Spring Lake
Lake Orienta
Lake Destiny
Lake Wekiva
Lake Fairview
Lake Killarney
S BEAR LAKE RD
W MAITLAND BLVD
Piedmont
Riverside Acres
ROSE AVE
OVERLAND RD
Lockhart
CR 424
CR 438A
CLARCONA OCOEE RD
N PINE HILLS RD
Rosemont
Eatonville
Maitland
N PARK AVE
LEE RD
W FAIRBANKS AVE
MINNESOTA AVE
Fairview Shores
CR 427
CR 431
400
414
441
423
424A
426
17
90
90B
90A
88
87

Certification

This Engineering Report has been prepared personally by the undersigned or under my immediate supervision, and all representations are true and correct to the best of my knowledge. I am an experienced radio engineer whose qualifications are a matter of record with the Federal Communications Commission, I am an engineer in the firm of Hatfield & Dawson Consulting Engineers, LLC, and I am Registered as a Professional Engineer in the States of Washington and Oregon.

February 15, 2023

Thomas S. Gorton P.E.