ENGINEERING STATEMENT
IN SUPPORT OF AN
APPLICATION FOR LICENSE
WJOX(AM) – BIRMINGHAM, ALABAMA
690 kHz – 50.0 kW DAY/0.5 kW NIGHT – DA-N
FACILITY ID: 16897

Licensee: Radio License Holding CBC, LLC

February, 2021

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Consulting Engineers
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CARL T. JONES CORPORATION

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I am a Radio Engineer, an employee in the firm of Carl T. Jones Corporation, with offices located in Springfield, Virginia.

My education and experience are a matter of record with the Federal Communications Commission. I am a Registered Professional Engineer in the Commonwealth of Virginia, Registration No. 0402027914.

GENERAL

This is office has been authorized by Radio License Holding CBC, LLC ("Radio License"), licensee of Standard Broadcast Station WJOX, Birmingham, Alabama, to prepare this statement and FCC Form 302 in support of an Application for License to correct the coordinates to reflect the recently updated Antenna Structure Registration and corresponding Federal Aviation Administration airspace approval. Because the difference in coordinates exceeded 3 seconds for the daytime nondirectional antenna, an underlying construction permit was filed.[1] The night center of array coordinates and

[1] FCC File No. BP-20201103AAN.

the individual coordinates were also modified as necessary, though the differences were less than 3 seconds.

WJOX operates on 690 kHz with a power of 50.0 kilowatts during daytime hours and 0.5 kW during nighttime hours. The station operates nondirectionally during the day and employs a two tower array at night (DA-N).

The licensee seeks to correct coordinate data to conform to the recently corrected Federal Aviation Administration ("FAA") record and the FCC's Antenna Structure Registration ("ASR"). The ASR tower numbers are 1036584 and 1036585. The actual physical location and physical height of the WJOX(AM) towers remain unchanged.

CORRECTED DATA

It is proposed to correct the center of array coordinates/center tower coordinates. The NAD-27/NAD-83 coordinates are as follows:

	ASR #	NAD-27 COORDINATES (rounded)	NAD-83 COORDINATES
Center of Array		**33 – 27 – 03** **86 – 55 - 20**	**33 – 27 – 03.3** **86 – 55 – 20.2**
Tower #1 (SE tower, ND day tower)	1036584	33 – 27 – 02 86 – 55 - 20	33 – 27 – 02.6 86 – 55 – 19.1
Tower #2 (NW tower, used in night array)	1036585	33 – 27 – 04 86 – 55 - 21	33 – 27 – 04.1 86 – 55 – 21.3

OTHER MATTERS

Included herein is a Direct Measurement of Power document. The Direct Measurement of Power was conducted and prepared by Michael Patton and Associates, see Attachment A. After the process of replacing some damaged cable and ground system radials, it was determined that the monitor point on the 10 degree radial had become unusable due to the nearby power line construction. Hence, a new monitor point location has been selected for the 10 degree radial. Further details and new updated photos, point descriptions and GPS measurements are also included in Attachment A.

It was during the Direct Measurement of Power that it was determined that the coordinates for the towers were incorrect. It was decided that the correction of the coordinates was first and foremost before proceeding with the filing of the Direct Measurement of Power.

SUMMARY

No significant changes are proposed herein. No physical alterations have been made to the existing tower structures. It is respectfully requested that the Commission issue a modified licensed to reflect the change in the center of array coordinates.

CONCLUSION

This statement and FCC Form 302, Section III were prepared by me or under my direct supervision and are believed to be true and correct.

It is submitted that the proposed facility described herein complies with the technical standards of the Rules and Regulations of the Commission.

DATED: February 11, 2021

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ATTACHMENT A

Engineering Statement

in support of

FCC Form 302-AM
Direct Measurement of Power

submitted on behalf of:

WJOX
Birmingham, Alabama

licensee:

RADIO LICENSE HOLDING CBC, LLC

March, 2020

prepared by:

Michael Patton & Associates
Baton Rouge, Louisiana
www.michaelpatton.com

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Narrative Statement:

Overview: The Federal Emergency Management Agency (FEMA) has chosen WJOX, Birmingham, Alabama, a Cumulus station, to be a site in the network of radiation-hardened emergency AM station transmitter facilities that they are having installed at stations around the country. During the installation of the necessary equipment shelters for this emergency facility, a subcontractor engaged by the firm with the contract from FEMA to build out these sites damaged the 3-1/8" flexible coaxial cable running from the transmitter building to the daytime tower (#1). Since it was likely that this was not the only damaged coax, and since a nick in a buried cable could cause long-delayed failure, the licensee required the contractor replace all buried cables. My firm was engaged to open the trenches, replace all cables from the building to both towers, repair any damage to the ground system, tune the array to make the licensed DA pattern, perform a partial proof of performance on the array, and to prepare this report and filing. All this work has been completed. The instant application, with accompanying exhibits, will show that the WJOX directional array is operating within its Standard Pattern limits. WJOX is also taking advantage of this filing to move one monitor point and to update the descriptions and photos of all monitor points.

Description of array: The WJOX facility was built as a daytime-only non-directional station in the 1940s with a power of 50 kW using a 540 ft (164.6 meters) tall tower, now designated tower 1. In 1989, the station received approval to add nighttime service, and tower 2, 270 ft (82.4 M) tall, was built, and night operation at 500W DA was begun. Both towers are conventional guyed towers with base insulators. There is an STL antenna on tower 2, fed by an iso-coupler. The DA pattern is a simple cardioid with deep nulls. The only full proof was from the 1989 upgrade; there have been no changes to the array since then. All cables to both towers are buried.

Sample System: The WJOX uses as sample devices rigid, non-shielded pickup loops, with the one on the taller tower 1 located 90° down from the top, and the tower 2 loop located at the base, just above the base insulator. At both towers, there are isolation coils in the ATU doghouses. From there, the sample coaxes are buried back to the building. All sample coax segments, both on the towers, in the isolation coils, and the buried run, are composed of 3/8" heliax-type flexible cable. The antenna monitor is a Potomac AM-19D. To make both sample loop cables of equal length, approximately 50 m of the same type cable is coiled in the tower 2 doghouse.

Proof Methodology: This firm's standard practice is to choose new measurement points and then to make new non-directional & directional measurements at these points, as described in 47CFR73.154(b)(2). The nighttime pattern has three monitored radials (10.0E, 250.0E & 310.0E), so one adjacent radial (210.0E) was chosen from those used in the last Full Proof and was also measured to obtain the required minimum number of four radials in a Partial Proof, as called for by 47CFR73.154(a). Precise locations for each point were determined, carefully described, and marked using marking spray paint and/or surveyor's flags so subsequent measurements could be confidently taken at the exact same locations. All field measurements were made during daylight hours, excluding critical hours, during the month of February, 2020.

Narrative Statement, continued:

Non-Directional Operation: The Non-D pattern was measured using the normal 50 KW daytime operation mode from Tower 1. In this mode, the much shorter Tower 2 is floated at its base. The base impedance of Tower 1 was measured and the base current checked, to ensure that the proper power level was being radiated.

Calibration of Instruments Used: All field intensity measurements used in this proof were made using one Potomac F.I. meters belonging to this firm, but the calibration of this meter was checked against two others; all were found to be in substantial agreement with each other, within the manufacturer's tolerance. At the start of the project, the impedance bridge used was field-tested using precision components and found to meet its manufacturer's specifications. The Delta TCA series common point RF ammeter and non-directional base current ammeter were both checked against thermocouple type ammeters and found to give identical readings.

Urban Environment Issues: DA proofs in large cities pose many challenges, from the safety of measurement personnel to the availability of suitably stable, even meaningful, measurement points. The hilly topography and the iron-rich soil of Birmingham only exacerbates these challenges. Points in this proof range from those taken in the industrial suburbs of southeast Birmingham to ones out in the rural hills. Every effort was made to choose the best field measurement points. Nevertheless, wide variations from expected signal strength vs distance curves are evident from the data analysis, as are wide variations in ND/DA ratio at specific points. Given the depth of the nulls in this pattern, these effects are not unexpected. However, this engineer is confident that the data and analysis in the instant proof are representative of the array's actual performance within the limitations of the prescribed methodology.

Analysis Procedures: As per 47CFR73.154(c), each DA measurement was ratioed to the Non-D measurement for that point and the common logarithm of this ratio was determined for each point. The arithmetic mean of these log values was calculated, and the antilog of this mean was then multiplied by the Non-D Inverse Distance Field for that radial taken from the 1989 Full Proof. This result was considered to be an accurate representation of the current DA Inverse Distance Field for that radial.

Monitor Points: Of the three monitor points chosen in 1989, two remain suitable, but the one on the 10° radial has become unusable due to power line construction nearby. A new location on this radial with no re-radiation problems has been chosen. All monitor points have been well documented in the instant application, with new photographs, descriptions, and GPS coordinates.

Radio Frequency Radiation Guideline Compliance: The licensee of WJOX has installed and will maintain secure fences, with locked gates and appropriate warning signs, around both towers, to ensure compliance the FCC's RFR guidelines. The distance from each tower to its fence at the shortest point meets the worst-case criteria listed in OET65 (1997) for this frequency and power level.

Narrative Statement, continued:

Daytime Antenna Base Impedance: Due to a change in the type of tower lighting choke used, and other changes to the layout of components in the ATU for Tower 1, the daytime base impedance has changed from the one on the current station license. This application gives correct figures for daytime base impedance and current.

Correction of Database Entry Error: The entry for WJOX in the FCC CDBS database shows a comment stating that this station employs two separate sites for day and night operations, and lists separate coordinates for day and night operations. These data are incorrect, and apparently are left over from a construction permit filed years ago that was never built out. The station only has one site, used day and night. We ask that the database entry be updated to delete any references to two-site operations, and to show the same coordinates for both day and night, those being the ones listed in the instant Form 302-AM.

Conclusions: The replacement of the buried cables at WJOX has been completed following good engineering practices. The WJOX directional array has been adjusted to operate properly within its Standard Pattern radiation limits after this work. The instant Form 302-AM application requesting direct measurement of power has been carefully prepared in all respects and should be granted.

Respectfully Submitted,

George Michael Patton
Michael Patton & Associates
March 20, 2020

Analysis of Radial 10.0E True:

Point #:	Dist. (km):	Non-D Date/Time:	Non-D mV/m:	DA Date/Time:	DA mV/m:	Log Ratio:
10-1	3.22	2-24-20 08:35	590	2-25-20 9:29	1.50	-2.595
10-2	3.73	2-24-20 08:40	490	2-25-20 9:34	1.90	-2.411
10-3 MP	4.59	2-24-20 08:47	460	2-25-20 9:39	1.75	-2.420
10-4	5.19	2-24-20 08:53	360	2-25-20 9:42	0.65	-2.743
10-5	5.90	2-24-20 08:59	230	2-25-20 9:54	0.65	-2.549
10-6	7.25	2-24-20 09:06	315	2-25-20 10:26	2.00	-2.197
10-7	10.5	2-24-20 09:15	180	2-25-20 10:42	1.30	-2.141
10-8	11.3	2-24-20 09:23	120	2-25-20 10:51	0.68	-2.247

Non-D Inverse Distance Field from last full proof:	2250 mV/m	Current Logarithmic Average Ratio:	0.0039
DA Inverse Distance Field Limit from Standard Pattern:	10.5 mV/m	Calculated Current DA Inverse Distance Field:	8.7 mV/m

Analysis of Radial 210.0E True:

Point #:	Dist. (km):	Non-D Date/Time:	Non-D mV/m:	DA Date/Time:	DA mV/m:	Log Ratio:
210-1	3.24	2-23-20 09:29	730	2-25-20 14:45	50.0	-1.164
210-2	4.02	2-23-20 09:37	570	2-25-20 14:33	36.0	-1.200
210-3	4.90	2-23-20 09:42	360	2-25-20 14:28	21.6	-1.222
210-4	5.79	2-23-20 09:49	330	2-25-20 14:22	20.5	-1.207
210-5	6.68	2-23-20 09:55	315	2-25-20 14:16	18.4	-1.233
210-6	7.56	2-23-20 10:02	250	2-25-20 14:11	15.7	-1.202
210-7	9.26	2-23-20 10:10	185	2-25-20 14:06	12.0	-1.188
210-8	10.8	2-23-20 10:15	141	2-25-20 14:00	8.5	-1.220

Non-D Inverse Distance Field from last full proof:	2700 mV/m	Current Logarithmic Average Ratio:	0.0624
DA Inverse Distance Field Limit from Standard Pattern:	193.5 mV/m	Calculated Current DA Inverse Distance Field:	168.6 mV/m

Analysis of Radial 250.0E True:

Point #:	Dist. (km):	Non-D Date/Time:	Non-D mV/m:	DA Date/Time:	DA mV/m:	Log Ratio:
250-1 MP	3.02	2-23-20 11:34	675	2-25-20 13:07	3.40	-2.298
250-2	4.07	2-23-20 11:44	410	2-25-20 13:11	1.00	-2.613
250-3	4.56	2-23-20 11:50	430	2-25-20 13:16	1.30	-2.520
250-4	5.62	2-23-20 11:55	300	2-25-20 13:19	1.10	-2.436
250-5	6.14	2-23-20 12:01	200	2-25-20 13:23	1.05	-2.280
250-6	6.57	2-23-20 12:12	165	2-25-20 13:27	0.63	-2.418
250-7	11.2	2-23-20 12:21	75	2-25-20 13:33	0.42	-2.252
250-8	12.5	2-23-20 12:34	54	2-25-20 13:40	0.32	-2.227

Non-D Inverse Distance Field from last full proof:	2200 mV/m	Current Logarithmic Average Ratio:	0.0042
DA Inverse Distance Field Limit from Standard Pattern:	10.5 mV/m	Calculated Current DA Inverse Distance Field:	9.2 mV/m

Analysis of Radial 310.0E True:

Point #:	Dist. (km):	Non-D Date/Time:	Non-D mV/m:	DA Date/Time:	DA mV/m:	Log Ratio:
310-1	3.71	2-24-20 10:55	360	2-25-20 12:05	24.0	-1.176
310-2 MP	4.00	2-24-20 10:49	460	2-25-20 11:59	26.0	-1.248
310-3	4.79	2-24-20 10:44	300	2-25-20 11:52	16.5	-1.260
310-4	5.88	2-23-20 15:25	265	2-25-20 11:44	13.0	-1.309
310-5	6.73	2-23-20 15:17	175	2-25-20 11:37	9.0	-1.289
310-6	7.37	2-23-20 15:12	161	2-25-20 11:31	7.5	-1.332
310-7	8.20	2-23-20 15:05	122	2-25-20 11:25	9.0	-1.132
310-8	10.0	2-23-20 15:00	85	2-25-20 11:15	3.6	-1.373

Non-D Inverse Distance Field from last full proof:	2400 mV/m	Current Logarithmic Average Ratio:	0.0543
DA Inverse Distance Field Limit from Standard Pattern:	145.2 mV/m	Calculated Current DA Inverse Distance Field:	130.4 mV/m

Summary of Radials:

Radial:	Non-D Inverse Field from 1989 proof:	Calculated 2020 DA Inverse Field:	DA Inverse Field Limit [2]:
10.0E True [1]	2250 mV/m	8.7 mV/m	10.5 mV/m
210.0E True	2700 mV/m	168.6 mV/m	193.5 mV/m
250.0E True [1]	2200 mV/m	9.2 mV/m	10.5 mV/m
310.0E True [1]	2400 mV/m	130.4 mV/m	145.2 mV/m

[1] denotes a monitored radial.

[2] These figures are taken from the WJOX Standard Pattern.

Operating Parameters, Tower Data & Array Coordinates:

Currents & Impedances:

Mode:	Power:	Measurement Point:	Impedance:	Current:
Non-DA:	50.0 kW	Base of Tower #1	58 +j 193 Ù	29.4 Amps
DA-Night:	500 W	Common Point	50 ±j 0 Ù	3.29 Amps

Directional Antenna Monitor Parameters[1]:

Tower #:	Theoretical Current:	Theoretical Phase:	Ant. Mon. Current:	Ant. Mon. Phase:
1 (SE):	1.000	0.0E	0.306	- 156.3E
2 (NW):	1.000	+ 150.0E	1.000	0.0E

Tower Data:

Tower #:	Coordinates (NAD83)*:	Height of Radiator:	Overall Height w/o Lighting:	Overall Height w/Lighting:	ASR Registration #:
1 (SE):	33E 27' 02.6" 86E 55' 19.2"	164.6 M (136.3E)[2]	166.0 M	167.0 M	1036584
2 (NW):	33E 27' 04.1" 86E 55' 21.4"	82.4 M (68.2°)[2]	84.0 M	85.0 M	1036585

Notes:

[1]As shown on the station's antenna monitor, a Potomac Instruments AM-19D

[2]Electrical height at station carrier frequency (690 kHz)

Certifications & Equipment List:

Certifications:

I, George Michael Patton, do hereby swear to and affirm the following:

That I am a broadcast engineer regularly engaged in the construction, repair, and maintenance of AM directional antennas, that I have prepared and filed many reports of this nature during my career, and that my qualifications are a matter of record with the FCC;

That RADIO LICENSE HOLDING CBC, LLC, licensee of WJOX, Birmingham, Alabama, engaged my firm, Michael Patton & Associates, to oversee repairs to the array, to perform partial proof measurements on WJOX, and to prepare this form and report;

That all measurements made during the course of this work were made by me or under my direct supervision, that all the measurements made by me are true and correct, and, regarding all measurements made by others, that I believe them to be true and correct.

Sworn to this day, March 20, 2020

_____
George Michael Patton

Equipment List:

Type of Instrument:	Manu-facturer:	Model Number:	Serial Number:	Calibration Date:	By Whom Calibrated:
Imp. Bridge	Delta	OIB-3	213	09/12/2016 [1]	Patton
F. I. Meter	Potomac	FIM-41	2082	06/03/2016 [2]	Mooretronix

Notes:

1. Calibration verified using precision fixed components at the start of this project.

2. The calibration of this meters was verified against two others; all were in agreement.

Radial 10.0° True Monitor Point - Picture and Description:

10.0° looking South

Direction of 10.0° True: Point is located at the SW corner of Carnegie Ave and 45th Street Ensley. Reading is taken on the sidewalk in front of the Fairfield City Park sign.

Distance from transmitter:	GPS coordinates:	Measured DA field strength:
4.59 km	N 33° 29' 29.9" W 86° 54' 49.3"	1.75 mV/m

Radial 250.0° True Monitor Point - Picture and Description:

250.0° looking NW

Direction of 250.0° True: Point is located at the NE corner of Jaybird Rd and 7th Ave. Reading is taken on a manhole cover on a drainage culvert on the north side of 7th Ave.

Distance from transmitter:	GPS coordinates:	Measured DA field strength:
3.02 km	N 33° 26' 29.8" W 96° 57' 09.6"	3.4 mV/m

Radial 310.0° True Monitor Point - Picture and Description:

310.0° looking NW

Direction of 310.0° True: Point is located on Lewis St at the Dolomite Westfield Park. Reading is taken in front of a large outdoor barbeque pit near the West end of the parking lot on Lewis St.

Distance from transmitter:	GPS coordinates:	Measured DA field strength:
4.00 km	N 33° 28' 27.4" W 86° 57' 18.7"	26 mV/m