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March 8, 2022

VIA e-mail: audiofilings@fcc.gov

Marlene H. Dortch, Secretary
Federal Communications Commission
45 L Street NE
Washington, DC 20554

Re: Salem Communications Holding Corporation FRN: 0003760352
WTBN(AM), Pinellas Park, FL (Fac. ID 51985)
Request for Special Temporary Authority

Dear Ms. Dortch:

Salem Communications Holding Corporation, licensee of WTBN(AM), Pinellas Park, FL, facility ID 51985, by its counsel, hereby requests Special Temporary Authority ("STA") to operate WTBN at its permitted and newly constructed diplex site with commonly owned station WGUL(AM), Dunedin, FL. WTBN holds construction permit File No. BP-20200615AAD for operation at this site. The facility has been constructed and proofed, and a license application on FCC Form 302-AM was filed on March 7, 2022. Because the currently licensed WTBN site will not be available for transmitting this week and will be demolished by March 17, 2022, the licensee seeks STA to operate WTBN daytime and nighttime under the parameters of BP-20200615AAD while awaiting program test authority and the processing of the covering license application. The attached Phasetek, Inc. Engineering Statement provides additional details.

The licensee has authorized undersigned counsel to certify on its behalf that the licensee is not subject to denial of Federal benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. § 862.

If you have any questions regarding the foregoing, please contact the undersigned.

Sincerely,

Kathleen A. Kirby

Enclosure

ENGINEERING STATEMENT CONCERNING

APPLICATION FOR LICENSE INFORMATION

EMPLOYING MOMENT METHOD MODELING

WTBN, 570 KHZ, DA-2

PINELLAS PARK, FLORIDA

FEBRUARY, 2022

PHASETEK INC.

ENGINEERING STATEMENT CONCERNING
APPLICATION FOR LICENSE INFORMATION
EMPLOYING MOMENT METHOD MODELING
WTBN, 570 KHZ, DA-2
PINELLAS PARK, FLORIDA
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SUMMARY

Adjustment of the Antenna System and a Proof of Performance employing Moment Method Modeling was performed on Radio Station WTBN, 570 KHz, Pinellas Park, Florida, after installation of Antenna Phasing equipment, filtering, transmission lines, and Sampling Lines. WTBN holds Construction Permit Number: BP-202006154AAD to change transmitter site and patterns. This report was prepared on behalf of Salem Communications Holding Corporation, licensee of Radio Station WTBN.

SITE MODIFICATIONS

The WTBN Transmitter site is that as currently licensed for Radio Station WGUL, 860 KHz. New phasing equipment and lines have been installed. Filtering has been installed at all towers. The site consists of three (3) towers. WTBN operates on towers #1 and #2. All Towers remain unchanged. A License Application employing Moment Method Modeling as set forth in Section 73.151(C) has been done to cover the Radio Station WTBN Construction Permit and license under the new rules.

REFERENCE POINTS

Reference Points were measured at pattern minima and maxima for the Directional modes of operation. These Points and their measured field intensity are shown in Figure 12.

SPECIAL OPERATING CONDITION #4/SPURIOUS EMISSIONS

Due to the common usage of the Transmitter site by both Radio Stations WTBN, 570 KHz and WGUL, 860 KHz, filtering is installed at all Towers to prevent interaction and spurious radiation products. No changes have been made to the existing WGUL sampling system except for three equal length sampling line jumpers. Figure 14 shows measurement of any spurious radiation products. All filter circuits are located on the matching network side of the Sampling TCT's for both stations. The "reject" Filters (located at each tower) measure greater than 50,000 ohms, and are not included in the circuit model.

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ADDITIONAL TOWERS CO-LOCATED ON THE SITE

Located on the WTBN/WGUL transmitter site property are three (3) towers. Towers #1 and #2 are base insulated and series fed. Tower #3 is self supporting and grounded at the base with a six (6) wire skirt. This skirt is used for both feed/detuning. Tower #1 supports an FM antenna. Tower #2 supports a STL antenna. The ASRN for tower #3 is: 1008412. All Towers have aviation obstruction lighting. WTBN, 570 kHz, operates on towers #1 and #2. Tower #3 is detuned with the existing 860 kHz skirt at 570 kHz. All towers were included in the measured open circuit impedance matrix for 570 kHz to verify any influence on the model. With the skirt open circuited for tower #3, this appears as a low impedance to ground for the measurement process, and is included in the individual tower calculations that way. Since tower #3 is detuned for 570 kHz, it is included in the directional model for 570 kHz with an equivalent base reactance to detune at 570 kHz.

METHOD OF MOMENTS DETAIL

All Moment Method Modeling was done with Expert MININEC Broadcast Professional, Version 23. One wire was used to represent towers #1 and #2. Three wires were used to represent tower #3. Towers were driven individually to verify the Model compared to measured impedance data. Once the Model was verified, the Day Directional Antenna System was computed. WTBN utilizes the same radiation pattern for Day/Night modes of operation with a change in the input power. All feed point currents were computed for the Day mode, and when normalized, are the same for the Night mode. For the Directional mode, the complex voltage values for sources located at ground level were computed. These sources produce current moment sums for each Tower that, when normalized, equate to the Theoretical Field Parameters for each respective Tower. The computed Day current moments are shown in Figure 15.

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MEASURING EQUIPMENT AND PERSONNEL

All Tower Resistance and Reactance measurements were made with a HP 8753ES Network analyzer with a Tunwall directional coupler and a Delta Electronics OIB-3 Operating Impedance Bridge. Before use, tests of known impedances were made to verify operation. All Field Intensity Measurements were made with a Potomac Instruments Field Intensity Meter, model PI 4100, Serial Number 249, calibrated on January 21, 2016. The meter was calibrated by Potomac Instruments, Frederick, Maryland. The meter was compared to a Potomac Instruments PI 4100, Serial Number 188, calibrated on October 14, 2020, and agreed. All measurements were taken by Phasetek Inc. personnel supervised by Kurt Gorman of Phasetek Inc.

SPECIAL OPERATING CONDITION #4/WGUL OPERATION

After installation and adjustment of all filtering, the WGUL, 860 kHz antenna monitor parameters were adjusted to licensed values for Day/Night modes of operation. Measurement of monitored radials and monitoring points was performed. All licensed parameters, Common point impedances, and monitoring points are within currently licensed values. Therefore, a 302-AM is not required for the WGUL system.

SPECIAL OPERATING CONDITION #1/RF RADIATION COMPLIANCE

The WTBN/WGUL transmitter site towers are enclosed with individual perimeter fences that have the appropriate warning signs. As specified in the construction permit, WTBN/WGUL will reduce power or cease operation, as necessary, to protect persons having access to the site.

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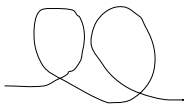
CONCLUSION

It is believed that the WTBN Antenna System has been constructed and adjusted in accordance with all applicable Commission rules and regulations. The foregoing was prepared on behalf of Salem Communications Holding Corporation, under the immediate supervision of Kurt Gorman, Phasetek Inc., Quakertown, Pennsylvania, whose qualifications are a matter of record with the Federal Communications Commission. The statements herein are true and correct of his knowledge, except such statements made on information and belief, and as to these statements he believes them to be true and correct.



Kurt Gorman, President
Phasetek Inc.
Quakertown, Pennsylvania

ANTENNA SYSTEM AS ADJUSTED

APPLICATION FOR LICENSE INFORMATION
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ANTENNA SYSTEM DESCRIPTION

1. The Antenna System consists of two (2) uniform, guyed, vertical steel transmitting Towers. Both Towers stand 85.31M (58.4°) above their Base Insulators. The Towers are arranged with Tower 1 as a reference; Tower 2 is spaced 61.2° on a bearing of 16.5°T. Both towers have aviation obstruction lighting.

2. The Ground System for each Tower remains as currently licensed for Radio Station WGUL and consists of (120) buried copper Radials, 85.3M in length except where they intersect with copper transverse straps between Towers or property boundaries. In addition, a 9.8M square copper ground screen is installed at each tower base. Copper strap connects all Towers to the main Transmitter grounding point.

3. The Sampling System consists of two (2), Phasetek Inc. P600-203, 1.0 V/A Toroidal Current Transformers. All TCT's are at the Output of each diplexing filter. These TCT's are connected to a Potomac Instruments 1901-4 antenna Monitor via two (2) equal lengths of Andrew, LDF-4-50A, 1/2" phase stabilized foam coaxial cable.

4. Tower registration numbers:
   Tower 1: 1008410
   Tower 2: 1008411

FIGURE 1
ANTENNA SYSTEM AS ADJUSTED

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ANTENNA SYSTEM DESCRIPTION – Continued

DIRECTIONAL OPERATION (DAY)

COMMON POINT

Impedance = 50.0 + j 0.0 Ohms
Current = 2.32 Amperes
Power = 270 Watts

DIRECTIONAL OPERATION (NIGHT)

COMMON POINT

Impedance = 50.0 + j 0.0 Ohms
Current = 3.95 Amperes
Power = 780 Watts

Directional Antenna Monitor indications are within ±5% and ±3° of the modeled TCT values.

FIGURE 2
WTBN SAMPLING SYSTEM DESCRIPTION/MEASUREMENTS

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SAMPLING SYSTEM DESCRIPTION

The Sampling System consists of Phasetek Inc. P600-203 Toroidal Sampling Transformers (1.0 volt/amp) mounted at the base of each Tower. The sampling devices are connected to the Antenna Monitor with equal lengths of Andrew LDF-4-50A. The Antenna Monitor is a Potomac Instruments Model 1901-4, Serial Number 712.

SAMPLE LINE MEASUREMENTS

Impedance measurements were made of the Antenna Sampling Lines using an Array Solutions VNA-2180 network analyzer . Measurements were done with the lines open circuited and then connected to the TCT's.

The table below shows the frequencies where resonance, defined as zero reactance corresponding with low resistance, was found. Frequencies of resonance occur at odd multiples of 90 degrees electrical length, the Sample Line length at the first resonant frequency above the carrier frequency, which is the closest one to the carrier frequency, was found to be 90 electrical degrees. The electrical length at carrier frequency appearing in the table below was calculated by ratioing the frequencies. Due to the length of the lines and the carrier frequency, both resonant frequencies are above the carrier frequency.

SAMPLE LINE MEASUREMENTS

	First Resonant Frequency (KHz) above 570 KHz	Second Resonant Frequency (KHz) above 570 KHz	Calculated Electrical Length (deg) at 570 KHz	Measured Impedance (ohms) Connected to TCT @ 570 KHz
Tower 1	671.03	2023.68	76.4	55.1 –j 6.8
Tower 2	671.32	2027.36	76.4	55.3 –j 6.9

FIGURE 2
WTBN SAMPLING SYSTEM DESCRIPTION/MEASUREMENTS

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SAMPLE LINE MEASUREMENTS (CONTINUED)

To determine the characteristic impedance values of the Sample 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:

$$Z_0 = ((R_1^2 + X_1^2)^{1/2} \bullet (R_2^2 + X_2^2)^{1/2})^{1/2}$$

Tower	+ 45 Degree Offset Frequency (kHz)	+ 45 Degree Measured Impedance (Ohms)	- 45 Degree Offset Frequency (kHz)	- 45 Degree Measured Impedance (Ohms)	Calculated Characteristic Impedance (Ohms)
1	1006.55	2.9 +j 49.7	335.52	0.4 –j 51.0	50.39
2	1006.98	2.7 +j 49.7	335.66	0.4 –j 51.2	50.48

SAMPLING TCT MEASUREMENTS

Measurements of the Phasetek Inc. Model P600-203, 1.0 V/A Toroidal Current Transformers were performed by a Hewlett Packard 8752A, Network Analyzer. Measurements are normalized to Tower #1 and are within the manufacturer's rating of ± 1.5% and ± 2.0°.

FIGURE 2
WTBN SAMPLING SYSTEM DESCRIPTION/MEASUREMENTS

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SAMPLING TCT MEASUREMENTS CONT'D

TOWER	TCT SERIAL #	MAGNITUDE	PHASE
1	773	1.000	0.0^{o}
2	774	.996	0.2^{o}

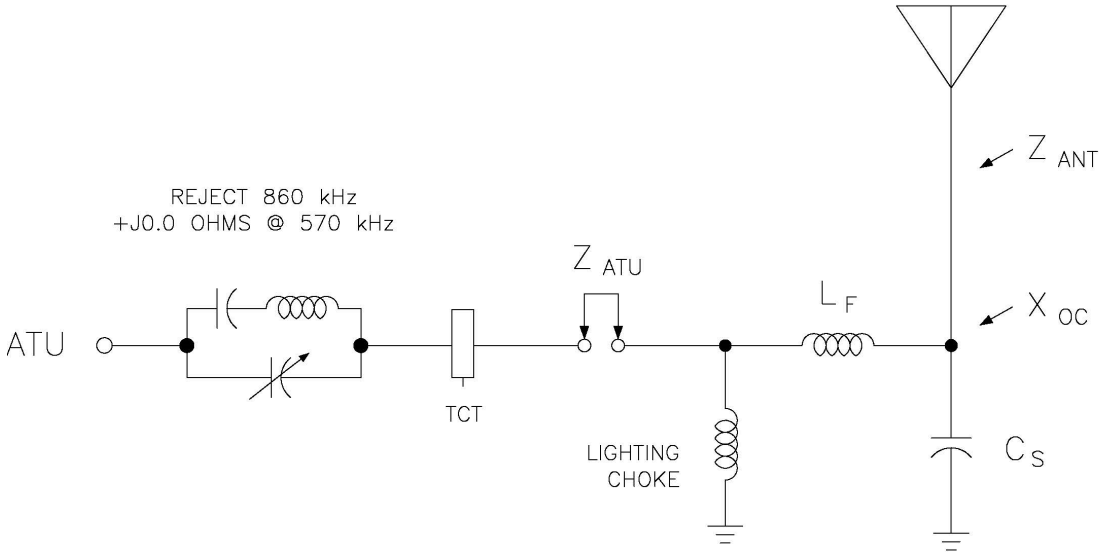
ANTENNA MONITOR MEASUREMENT

Measurement of the Potomac Instruments Model 1901-4 Antenna Monitor was performed to verify calibration. A single RF Voltage was applied to the Day/Night Reference Input (Tower #1) and each other Input by use of a "T" divider and equal electrical length coaxial cables. This yields the following:

Tower	Ratio	Phase
1	1.000	0.0^{0}
2	1.004	-0.3^{0}

The above is within the manufacturer's rating of $\pm$ 1.0% and $\pm$ 1.0^{o}.

FIGURE 3
WTBN TOWER IMPEDANCE MEASUREMENTS COMPARED TO METHOD OF MOMENTS MODEL



TOWER	Specified	Measured	Measured	Modeled	Modeled	Measured
	Cs (pf)	L_F (µH)	X_F (Ω)	Z_{ANT} (Ω)	Z_{ATU} (Ω)	Z_{ATU} (Ω)
1	28	0.56	+j2.0	16.64 –j 110.98	20.10 –j 119.47	21.4 –j 119.0
2	20	1.95	+j7.0	16.09 –j 116.54	19.58 –j 120.48	20.0 –j 120.2

Tower	Calculated X_{OC} (Ω)
1	+j 1,206.6
2	+j 1,172.2

FIGURE 4
WTBN MOMENT MODEL PARAMETERS

Tower #	Wire #	# of Segments	Base Node
1	1	10	1
2	2	10	11
3*	3-5	9	21

Tower #	Physical Height Degrees	Modeled Height Degrees	Modeled Radius Meters	% of Equivalent Radius
1	58.4	67.0	.2911	100.0
2	58.4	66.0	.2911	100.0
3*	37.0	37.0	2.1466/.9217	100.0/140.7

* Used for 860 kHz only

Towers #1 and #2 are uniform cross section and guyed. Tower #3 is tapered, self supporting, and grounded at base. Towers #1 and #2 have Base Insulators and are three (3) sided, 24" face width. Tower #3 is a stepped face, three sided, with 177" face width at base and 54" face width at top. Base insulators were manufactured by Austin with an assumed capacity of 15pF (-j18,614.6 ohms @ 570 kHz). Tower #3 is grounded at the base with a six (6) wire skirt. Tower #1 has a FM choke assembly with a capacity of 13pF, for a total of 28pF across the base (-j9,972.1 ohms @ 570 kHz). Tower #2 has a Mosely STL isocoupler with a capacity of 5pF, for a total of 20pF across the base (-j13,961.0 ohms @ 570 kHz).

Towers #1 and #2 have a Phasetek Inc. lighting choke. These measure +j1,074.4 ohms @ 570 kHz.

FIGURE 5
WTBN MOMENT SUMMARY FOR INDIVIDUAL TOWERS

WTBN TOWER 1

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.2911	10
		0	0	67.		
2	none	61.2	16.5	0	.2911	10
		61.2	16.5	66.		
3	none	53.7	154.6	0	2.1466	3
		53.7	154.6	12.33		
4	none	53.7	154.6	12.33	1.4008	3
		53.7	154.6	21.66		
5	none	53.7	154.6	21.66	.9217	3
		53.7	154.6	37.		

Number of wires = 5
current nodes = 29

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	3.11	1	6.7
radius	1	.2911	3	2.1466

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.57	0	1	8.64E-03	.0186111

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	11	0	1,172.2	0	0	0

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
.57	16.639	-110.98	112.22	278.5	18.087	-.96145	-7.0204

FIGURE 5
WTBN MOMENT SUMMARY FOR INDIVIDUAL TOWERS

WTBN TOWER 2

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	0	0	0	.2911	10
		0	0	67.		
2	none	61.2	16.5	0	.2911	10
		61.2	16.5	66.		
3	none	53.7	154.6	0	2.1466	3
		53.7	154.6	12.33		
4	none	53.7	154.6	12.33	1.4008	3
		53.7	154.6	21.66		
5	none	53.7	154.6	21.66	.9217	3
		53.7	154.6	37.		

Number of wires = 5
current nodes = 29

	minimum		maximum	
Individual wires	wire	value	wire	value
segment length	4	3.11	1	6.7
radius	1	.2911	3	2.1466

ELECTRICAL DESCRIPTION
Frequencies (MHz)

	frequency		no. of	segment length (wavelengths)	
no.	lowest	step	steps	minimum	maximum
1	.57	0	1	8.64E-03	.0186111

Sources

source	node	sector	magnitude	phase	type
1	11	1	1.	0	voltage

Lumped loads

load	node	resistance (ohms)	reactance (ohms)	inductance (mH)	capacitance (uF)	passive circuit
1	1	0	1,206.6	0	0	0

IMPEDANCE
normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 11, sector 1							
.57	16.086	-116.54	117.65	277.9	20.268	-.85778	-7.4659

FIGURE 6
WTBN MOMENT MODEL ARRAY SYNTHESIS (DIRECTIONAL DAY)

WTBN DAY

MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = .57 MHz

tower	field ratio magnitude	phase (deg)
1	1.	0
2	.95	117.2
3	0	0

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	334.58	280.7	3.40582	1.3
11	430.034	30.3	3.41977	117.8
21	42.7093	9.6	.0849283	100.9

Sum of square of source currents = 46.6033
Total power = 250. watts

TOWER ADMITTANCE MATRIX

admittance	real (mhos)	imaginary (mhos)
Y(1, 1)	.00118788	.00876754
Y(1, 2)	.000796631	-.000659063
Y(1, 3)	.00020681	-.000173048
Y(2, 1)	.000796661	-.000659037
Y(2, 2)	.00103646	.00837594
Y(2, 3)	5.9758E-05	-.000184846
Y(3, 1)	.000206738	-.000172483
Y(3, 2)	5.9794E-05	-.000184626
Y(3, 3)	6.0819E-05	.0051591

TOWER IMPEDANCE MATRIX

impedance	real (ohms)	imaginary (ohms)
Z(1, 1)	16.6832	-110.992
Z(1, 2)	12.7069	-5.6011
Z(1, 3)	5.56085	-3.02984
Z(2, 1)	12.7066	-5.60167
Z(2, 2)	16.0567	-116.697
Z(2, 3)	2.61929	-3.63727
Z(3, 1)	5.56488	-3.04207
Z(3, 2)	2.62069	-3.64275
Z(3, 3)	2.72836	-193.779

FIGURE 7
WTBN MOMENT MODEL SUMMARY FOR DIRECTIONAL DAY MODE

```
WTBN DAY

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

wire  caps Distance     Angle        Z            radius      segs
 1    none 0            0            0            .2911        10
           0            0            67.
 2    none 61.2         16.5         0            .2911        10
           61.2         16.5         66.
 3    none 53.7         154.6        0            2.1466       3
           53.7         154.6        12.33
 4    none 53.7         154.6        12.33        1.4008       3
           53.7         154.6        21.66
 5    none 53.7         154.6        21.66        .9217        3
           53.7         154.6        37.

Number of wires          =  5
          current nodes  =  29

                         minimum                  maximum
Individual wires      wire    value             wire  value
segment length         4      3.11               1    6.7
radius                 1      .2911              3    2.1466


ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                no. of  segment length (wavelengths)
 no. lowest       step         steps   minimum        maximum
 1   .57          0             1      8.64E-03       .0186111

Sources
source node    sector  magnitude      phase          type
 1      1       1      473.168        280.7          voltage
 2      11      1      608.16         30.3           voltage

Lumped loads
            resistance    reactance     inductance  capacitance passive
load  node  (ohms)        (ohms)        (mH)        (uF)        circuit
 1     21   0             502.76        0           0            0


IMPEDANCE
   normalization = 50.
freq     resist   react    imped    phase    VSWR    S11      S12
(MHz)    (ohms)   (ohms)   (ohms)   (deg)            dB       dB
source =  1; node 1, sector 1
.57      16.072   -96.917  98.24    279.4    15.054  -1.1557  -6.3146

source =  2; node 11, sector 1
.57      5.445    -125.63  125.75   272.5    67.252  -.25833  -12.385
```

CURRENT rms
Frequency = .57 MHz
Input power = 250. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	3.40504	1.3	3.40419	.076294
2	0	0	6.7	3.18452	.7	3.18425	.0409448
3	0	0	13.4	2.96867	.4	2.96861	.0187093
4	0	0	20.1	2.72149	.1	2.72149	2.5E-03
5	0	0	26.8	2.43953	359.8	2.43952	-8.84E-03
6	0	0	33.5	2.12304	359.6	2.12298	-.0159289
7	0	0	40.2	1.77348	359.4	1.77337	-.0192152
8	0	0	46.9	1.39244	359.2	1.39231	-.019097
9	0	0	53.6	.980305	359.1	.980176	-.0159067
10	0	0	60.3	.532763	358.9	.532672	-9.83E-03
END	0	0	67.	0	0	0	0
GND	58.6798	-17.3817	0	3.41903	117.8	-1.59556	3.0239
12	58.6798	-17.3817	6.6	3.14502	117.6	-1.45827	2.78651
13	58.6798	-17.3817	13.2	2.89745	117.5	-1.33653	2.57078
14	58.6798	-17.3817	19.8	2.62937	117.3	-1.2067	2.33612
15	58.6798	-17.3817	26.4	2.33575	117.2	-1.06638	2.07812
16	58.6798	-17.3817	33.	2.01614	117.	-.91546	1.79632
17	58.6798	-17.3817	39.6	1.6716	116.8	-.754683	1.49154
18	58.6798	-17.3817	46.2	1.30339	116.7	-.584895	1.16479
19	58.6798	-17.3817	52.8	.911727	116.5	-.40653	.816075
20	58.6798	-17.3817	59.4	.492557	116.3	-.218141	.441618
END	58.6798	-17.3817	66.	0	0	0	0
GND	-48.5091	-23.0338	0	.084993	98.9	-.0131501	.0839695
22	-48.5091	-23.0338	4.11	.0258445	98.6	-3.88E-03	.025552
23	-48.5091	-23.0338	8.22	8.97E-03	95.9	-9.18E-04	8.92E-03
J3	-48.5091	-23.0338	12.33	5.68E-03	289.5	1.9E-03	-5.35E-03
2J1	-48.5091	-23.0338	12.33	5.68E-03	289.5	1.9E-03	-5.35E-03
25	-48.5091	-23.0338	15.44	.0108112	286.3	3.03E-03	-.0103774
26	-48.5091	-23.0338	18.55	.0147639	285.7	4.E-03	-.0142122
J4	-48.5091	-23.0338	21.66	.0170927	285.9	4.67E-03	-.0164413
2J1	-48.5091	-23.0338	21.66	.0170927	285.9	4.67E-03	-.0164413
28	-48.5091	-23.0338	26.7733	.0168333	286.6	4.82E-03	-.0161289
29	-48.5091	-23.0338	31.8867	.0122502	287.7	3.73E-03	-.0116672
END	-48.5091	-23.0338	37.	0	0	0	0

FIGURE 10
DERIVED DIRECTIONAL PARAMETERS

APPLICATION FOR LICENSE INFORMATION
EMPLOYING MOMENT METHOD MODELING
WTBN, 570 KHZ, DA-2
PINELLAS PARK, FLORIDA
FEBRUARY, 2022

DAY:

	Theoretical		Base Network Input Current		Normalized TCT	
Tower	**Field**	**Phase**	**Amplitude**	**Phase**	**Amplitude**	**Phase**
1 (C)	1.000	0.0^{o}	3.14	0.46^{o}	1.000	0.0^{o}
2 (N)	.950	117.2^{o}	3.07	117.52^{o}	.978	117.1^{o}

FIGURE 11
WTBN TOWER BASE CIRCUIT ANALYSIS DESCRIPTION

APPLICATION FOR LICENSE INFORMATION
EMPLOYING MOMENT METHOD MODELING
WTBN, 570 KHZ, DA-2
PINELLAS PARK, FLORIDA
FEBRUARY, 2022

CIRCUIT ANALYSIS

Circuit Analysis was performed on each Tower of the WTBN model. "Phasetek" nodal Circuit Analysis program was used to compute base model Input/Output voltages and currents. For the Directional modes, the calculated Mininec Tower Base Drive Voltage was used to determine the Base Network Input Current. This point is the location of the Sampling TCT. "Z_1" represents the ATU Shunt impedance, "Z_2" represents the Tower Feed impedance, and "Z_3" represents the Tower Base Shunt impedance.

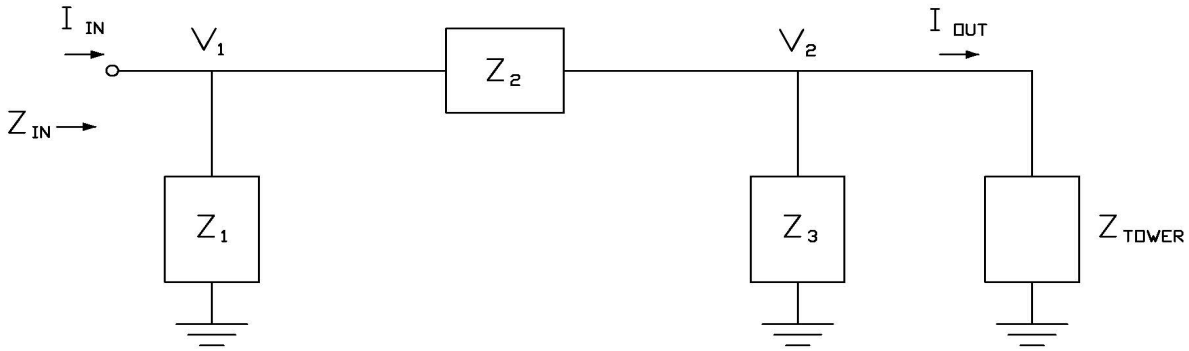


FIGURE 12
WTBN CIRCUIT ANALYSIS FOR INDIVIDUAL TOWERS

CUSTOMER : WTBN
NETWORK ID : TOWER 1

FREQUENCY : 570.00 kHz
ATU SHUNT IMPEDANCE (R,X) : 0.00, 1074.40 OHMS
TOWER FEED IMPEDANCE (R,X) : 0.00, 2.00 OHMS
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -9972.10 OHMS
TOWER IMPEDANCE (R,X) : 16.64, -110.98 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	1074.40
2	GROUND	16.28	-109.79
1	2	0.00	2.00

NODE	VOLTAGE MAGNITUDE	PHASE
1	100.00	0.00
2	101.81	-0.15

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	20.10	-119.47	121.15	-80.45
INPUT CURRENT (AMPS) :	0.14	0.81	0.83	80.45
OUTPUT CURRENT (AMPS) :	0.14	0.90	0.91	81.32

INPUT/OUTPUT CURRENT RATIO = 0.9098
INPUT/OUTPUT PHASE = -0.87 DEGREES

CUSTOMER : WTBN
NETWORK ID : TOWER 2

FREQUENCY : 570.00 kHz
ATU SHUNT IMPEDANCE (R,X) : 0.00, 1074.40 OHMS
TOWER FEED IMPEDANCE (R,X) : 0.00, 7.00 OHMS
TOWER SHUNT IMPEDANCE (R,X) : 0.00,-13961.00 OHMS
TOWER IMPEDANCE (R,X) : 16.09, -116.54 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	1074.40
2	GROUND	15.82	-115.59
1	2	0.00	7.00

NODE	VOLTAGE MAGNITUDE	PHASE
1	100.00	0.00
2	106.32	-0.50

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	19.58	-120.48	122.06	-80.77
INPUT CURRENT (AMPS) :	0.13	0.81	0.82	80.77
OUTPUT CURRENT (AMPS) :	0.13	0.89	0.90	81.64

INPUT/OUTPUT CURRENT RATIO = 0.9066
INPUT/OUTPUT PHASE = -0.87 DEGREES

FIGURE 13
WTBN CIRCUIT ANALYSIS FOR DIRECTIONAL DAY MODE

CUSTOMER : WTBN
NETWORK ID : TOWER 1 DAY

FREQUENCY : 570.00 kHz
ATU SHUNT IMPEDANCE (R,X) : 0.00, 1074.40 OHMS
TOWER FEED IMPEDANCE (R,X) : 0.00, 2.00 OHMS
TOWER SHUNT IMPEDANCE (R,X) : 0.00, -9972.10 OHMS
TOWER IMPEDANCE (R,X) : 16.07, -96.92 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	1074.40
2	GROUND	15.76	-96.01
1	2	0.00	2.00

NODE	VOLTAGE MAGNITUDE	PHASE
1	327.80	-79.11
2	334.58	280.70

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	18.93	-102.72	104.45	-79.56
INPUT CURRENT (AMPS) :	3.14	0.02	3.14	0.46
OUTPUT CURRENT (AMPS) :	3.40	0.08	3.41	1.29

INPUT/OUTPUT CURRENT RATIO = 0.9215
INPUT/OUTPUT PHASE = -0.83 DEGREES

CUSTOMER : WTBN
NETWORK ID : TOWER 2 DAY

FREQUENCY : 570.00 kHz
ATU SHUNT IMPEDANCE (R,X) : 0.00, 1074.40 OHMS
TOWER FEED IMPEDANCE (R,X) : 0.00, 7.00 OHMS
TOWER SHUNT IMPEDANCE (R,X) : 0.00,-13961.00 OHMS
TOWER IMPEDANCE (R,X) : 5.45, -125.63 OHMS

NODE	TO NODE	IMPEDANCE (OHMS) R	X
1	GROUND	0.00	1074.40
2	GROUND	5.35	-124.51
1	2	0.00	7.00

NODE	VOLTAGE MAGNITUDE	PHASE
1	405.90	30.45
2	430.03	30.30

	REAL	IMAGINARY	MAGNITUDE	PHASE
INPUT IMPEDANCE (OHMS) :	6.75	-131.91	132.08	-87.07
INPUT CURRENT (AMPS) :	-1.42	2.73	3.07	117.52
OUTPUT CURRENT (AMPS) :	-1.60	3.02	3.42	117.82

INPUT/OUTPUT CURRENT RATIO = 0.8987
INPUT/OUTPUT PHASE = -0.30 DEGREES

FIGURE 15
WTBN REFERENCE FIELD INTENSITY MEASUREMENTS
FEBRUARY, 2022

WTBN DAY REFERENCE POINT MEASUREMENTS – FEBRUARY 25, 2022

					CO-ORD NAD27				
Radial		**Dist km**	**mV/m**	**Time**		**Deg**	**Min**	**Sec**	**Description**
16.5°	1	0.50	17.7	1625	N	28	00	12.5	Marshall St. at pole
					W	82	41	55.8	
	2	0.74	16.4	1619	N	28	00	19.9	Huntington Lane opposite #1115
					W	82	41	53.2	
	3	1.47	10.8	1608	N	28	00	42.6	Enterprise Rd., South side, at cover
					W	82	41	45.7	
196.5°	1	0.68	124	1637	N	27	59	36.0	#1410 Dr. MLK St.
					W	82	42	08.1	
	2	1.04	163	1658	N	27	59	24.8	#100 Crestwood Drive
					W	82	42	11.9	
	3	1.30	90.0	1643	N	27	59	16.5	#1429 Oak Haven St.
					W	82	42	14.5	

FIGURE 15 CONTINUED
WTBN REFERENCE FIELD INTENSITY MEASUREMENTS
FEBRUARY, 2022

WTBN NIGHT REFERENCE POINT MEASUREMENTS – FEBRUARY 25, 2022

						CO-ORD NAD27			
Radial		**Dist km**	**mV/m**	**Time**		**Deg**	**Min**	**Sec**	**Description**
16.5°	1	0.50	29.9	1626	N	28	00	12.5	Marshall St. at pole
					W	82	41	55.8	
	2	0.74	28.1	1618	N	28	00	19.9	Huntington Lane opposite #1115
					W	82	41	53.2	
	3	1.47	18.1	1610	N	28	00	42.6	Enterprise Rd., South side, at cover
					W	82	41	45.7	
196.5°	1	0.68	212	1636	N	27	59	36.0	#1410 Dr. MLK St.
					W	82	42	08.1	
	2	1.04	255	1657	N	27	59	24.8	#100 Crestwood Drive
					W	82	42	11.9	
	3	1.30	150	1644	N	27	59	16.5	#1429 Oak Haven St.
					W	82	42	14.5	

FIGURE 16

WTBN CERTIFIED ARRAY GEOMETRY SURVEY/ANALYSIS
FEBRUARY, 2022

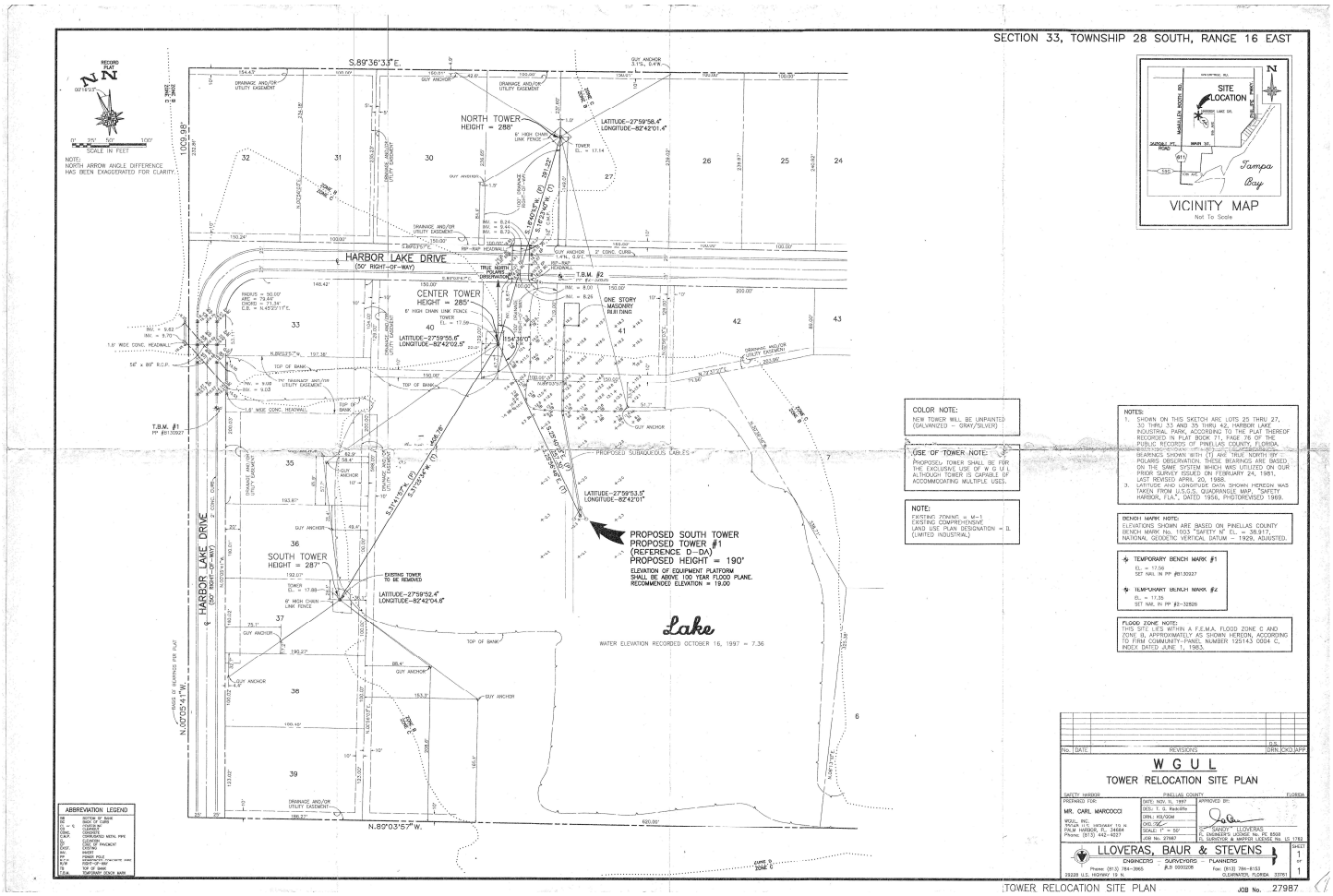


FIGURE 16 CONTINUED

WTBN CERTIFIED ARRAY GEOMETRY SURVEY/ANALYSIS
FEBRUARY, 2022

Station Tower Geometry Analysis

- *Enter Requested Data in Yellow Blocks*

Callsign:	WTBN	*Reference Tower:*	1
Freq. (kHz):	570 kHz	*Feet per wavelength:*	1725.563257

Tower Pair Studied	*Licensed Spacing (Electrical degrees)*	*Licensed Azimuth (Degrees True)*	*Measured Distance (feet)*	*Measured Azimuth (Degrees True)*	*Tower Location Error from Licensed (Result in Feet)*	*Tower Location Error from Licensed (Electrical Degrees)*	*Tower No. & (Loc)*
1 (ref)	0.0	0.0	0.0	0.0	0.00	0.00 °	#1(C)
1 to 2	61.2	16.5	291.220	16.3940	2.19	0.46 °	#2(N)
					–	–	
					–	–	
					–	–	
					–	–	
					–	–	
					–	–	
					–	–	

Law of Cosines Analysis

Tower Pair Studied	Licensed Specification (Side "a") of Triangle (Feet)	Licensed Azimuth Versus Measured Azimuth Difference	Included Angle A Converted to Radians	Tower Location Error from licensed position (Result in Feet)	Error in Feet Converted to Electrical Degrees	*Error Greater Greater Than 1.5° ? (7.19 ft)*
1 (ref)	--	--	--	0.00	0.00 °	N/A
1 to 2	293.35	0.1060 °	0.001850049	2.19	0.46 °	No - Therefore Okay
0	--	--	--	--	–	–
0	--	--	--	--	–	–
0	--	--	--	--	–	–
0	--	--	--	--	–	–
0	--	--	--	--	–	–
0	--	--	--	--	–	–
0	--	--	--	--	–	–

FIGURE 17
WTBN SPURIOUS RADIATION MEASUREMENTS
JULY, 2021

WTBN, 570 kHz, 0.25 kW DA- Day
WGUL, 860 kHz, 5.0 kW, DA- Day

FREQUENCY (kHz)	FIELD (mV/M)	dB to WTBN	dB to WGU
570	163		
860	490		
580	0.01	-84.2438	-93.8039
850	0.01	-84.2438	-93.8039
870	0.015	-80.7219	-90.2821
1140	0.031	-74.4165	-83.9767
1150	0.01	-84.2438	-93.8039
1430	0.04	-72.2026	-81.7627
1440	0.031	-74.4165	-83.9767
1710	0.012	-82.6601	-92.2203
1720	0.018	-79.1383	-88.6985
2000	0.01	-84.2438	-93.8039
2010	0.026	-75.9443	-85.5045
2290	0.011	-83.4159	-92.9761
2570	0.009	-85.1589	-94.7191
2580	0.012	-82.6601	-92.2203
2860	0.009	-85.1589	-94.7191
3150	0.0091	-85.0629	-94.6231
3430	0.0093	-84.8741	-94.4343
3720	0.0096	-84.5983	-94.1585
4290	0.0097	-84.5083	-94.0685

Above taken at point 1.04 kM from antenna
Point coordinates (NAD 27): N 27° 59' 24.8", W 82° 42' 11.9"
with Potomac Instruments PI 4100, SN 273
Above meet required 67dB (WTBN Day) and 80dB (WGUL Day)

FIGURE 17 CONTINUED
WTBN SPURIOUS RADIATION MEASUREMENTS
JULY, 2021

WTBN, 570 kHz, 0.73 kW DA- Night
WGUL, 860 kHz, 1.5 kW, DA- Night

FREQUENCY (kHz)	FIELD (mV/M)	dB to WTBN	dB to WGU
570	255		
860	442		
580	0.01	-88.1308	-92.9084
850	0.01	-88.1308	-92.9084
870	0.015	-84.609	-89.3866
1140	0.029	-78.8828	-83.6605
1150	0.01	-88.1308	-92.9084
1430	0.039	-76.3095	-81.0872
1440	0.04	-76.0896	-80.8672
1710	0.012	-86.5472	-91.3248
1720	0.02	-82.1102	-86.8878
2000	0.02	-82.1102	-86.8878
2010	0.024	-80.5266	-85.3042
2290	0.012	-86.5472	-91.3248
2570	0.0096	-88.4854	-93.263
2580	0.011	-87.3029	-92.0806
2860	0.0096	-88.4854	-93.263
3150	0.0094	-88.6682	-93.4459
3430	0.0092	-88.855	-93.6327
3720	0.0096	-88.4854	-93.263
4290	0.0098	-88.3063	-93.0839

Above taken at point 1.04 kM from antenna
Point coordinates (NAD 27): N 27° 59' 24.8", W 82° 42' 11.9"
with Potomac Instruments PI 4100, SN 273
Above meet required 71.6dB (WTBN Night) and 74.8dB (WGUL Night)

FIGURE 18
WTBN CALCULATED CURRENT MOMENTS
FEBRUARY, 2022

WTBN DAY

CURRENT MOMENTS(amp-degrees) rms

Frequency = .57 MHz
Input power = 250. watts

			vertical current moment	
wire	magnitude	phase (deg)	magnitude	phase (deg)
1	274.342	0.0	274.342	0.0
2	260.628	117.2	260.628	117.2
3	.656425	98.5	.656425	98.5
4	.206644	286.7	.206644	286.7
5	.452443	286.7	.452443	286.7

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	274.342	0.0
2	260.628	117.2
3	.0945946	11.