SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant
ACTUALIDAD LICENSEE 1020AM, LLC

PURPOSE OF AUTHORIZATION APPLIED FOR (check one) 2018 FEB 12 AM 10: 13

[✓] Station License [ ] Direct Measurement of Power

2018 FEB 12 AM 10: 13

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
WVLJ	BMP-20160504AAL	1020	UNLIIMITED	1.5	4.7

2. Station location	
State	City or Town
FLORIDA	BOYNTON BEACH

3. Transmitter location			
State	County	City or Town	Street address (or other identification)
FL	Palm Beach	BOYNTON BEACH	2.3 KM N of US 441and 806 Intersection

4. Main studio location			
State	County	City or Town	Street address (or other identification)
FL	Palm Beach	West Palm Beach	2701 Vista Parkway, Unit A-8

5. Remote control point location (specify only if authorized directional antenna)			
State	County	City or Town	Street address (or other identification)
FL	Miami-Dade	Doral	2090 NW 79th Avenue

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.
TECH EXHIBIT

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
5.69	10.08

Measured antenna or common point resistance (in ohms) at operating frequency		Measured antenna or common point reactance (in ohms) at operating frequency	
Night	Day	Night	Day
50.0	50.0	-j5.0	-j5.0

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 (SE)	+ 3.2	+3.5	0.798	0.487	N/A	N/A
2 (SW)	+ 92.4	- 24.3	0.669	0.303	N/A	N/A
3 (NE)	0.0	0.0	1.000	1.000	N/A	N/A
4 (NW)	+ 63.0	- 31.5	0.929	0.719	N/A	N/A
					-	

Manufacturer and type of antenna monitor: POTOMAC INSTRUMENTS AM-1901

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	56.1	57.0	57.0	Exhibit No. N/A

Excitation ☑ 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 26 ° 28 ' 26 "	West Longitude 80 ° 12 ' 11 "

If not fully described above, attach as an Exhibit further details and dimensions including any other antenna mounted on tower and associated isolation circuits. — Exhibit No. N/A

Also, if necessary for a complete description, attach as an Exhibit a sketch of the details and dimensions of ground system. — Exhibit No. N/A

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

NONE

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

NEW CONSTRUCTION

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
RONALD D. RACKLEY, P.E.	[signature]
Address (include ZIP Code) DTR/H&D JOINT VENTURE C/O DUTREIL, LUNDIN & RACKLEY, INC. 3135 SOUTHGATE CIRCLE SARASOTA, FL 34239	Date FEBRUARY 9, 2018 Telephone No. (Include Area Code) 941-329-6008

☐ Technical Director ☑ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☐ Other (specify)

APPLICATION FOR LICENSE INFORMATION
RADIO STATION WLVJ
BOYNTON BEACH, FLORIDA

1020 KHZ 4.7 KW – D 1.5 KW - N DA-2

February 9, 2018

APPLICATION FOR LICENSE
INFORMATION
RADIO STATION WLVJ
BOYNTON BEACH, FLORIDA

1020 KHZ 4.7 KW - D 1.5 KW – N DA-2

Table of Contents

Executive Summary - WLVJ

This engineering exhibit supports an application for License for the directional antenna system of radio station WLVJ in Boynton Beach. Florida. WLVJ holds a construction permit, file number BMP-20160504AAL authorizing operation fulltime on 1020 kilohertz with 4.7 kilowatts in the daytime and 1.5 kilowatt at night, employing different directional antenna patterns during daytime and nighttime hours.

The towers and ground system are in accordance with the terms of the WLVJ construction permit and specifications that were provided in the application for construction permit. New directional antenna phasing and coupling equipment has been installed and it has been adjusted to produce the authorized directional antenna patterns. The antenna monitor operating parameters specified herein were derived through Method of Moments modeling.

The directional antenna system uses towers that were employed in the former WLVJ directional antenna system that was once licensed on 1040 kilohertz. The tower geometry has not been altered and no new tower has been added to the array. There is, therefore, not any survey requirement for this proof of performance according to the provisions of the Third Report and Order of the Revitalization of the AM Radio Service rulemaking, MB Docket No. 13-249.

The internal antenna system measurements presented herein were made by Ronald D. Rackley, P.E. and Benjamin F. Dawson, P.E. of this Joint Venture engineering team. The reference point field strength measurements were made by Mr. Rick Rieke. All are well experienced in AM directional antenna engineering and their qualifications are a matter of record with the FCC.

Information is provided herein demonstrating that the directional antenna parameters have been determined in accordance with the requirements of section 73.151(c) of the FCC Rules. The antenna 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. Information regarding direct measurement of power is also included herein.

Benj. F. Dawson III, P.E.

Ronald D. Rackley, P.E.

February 9, 2018

Analysis of Tower Impedance Measurements to Verify Method of Moments Model – WLVJ

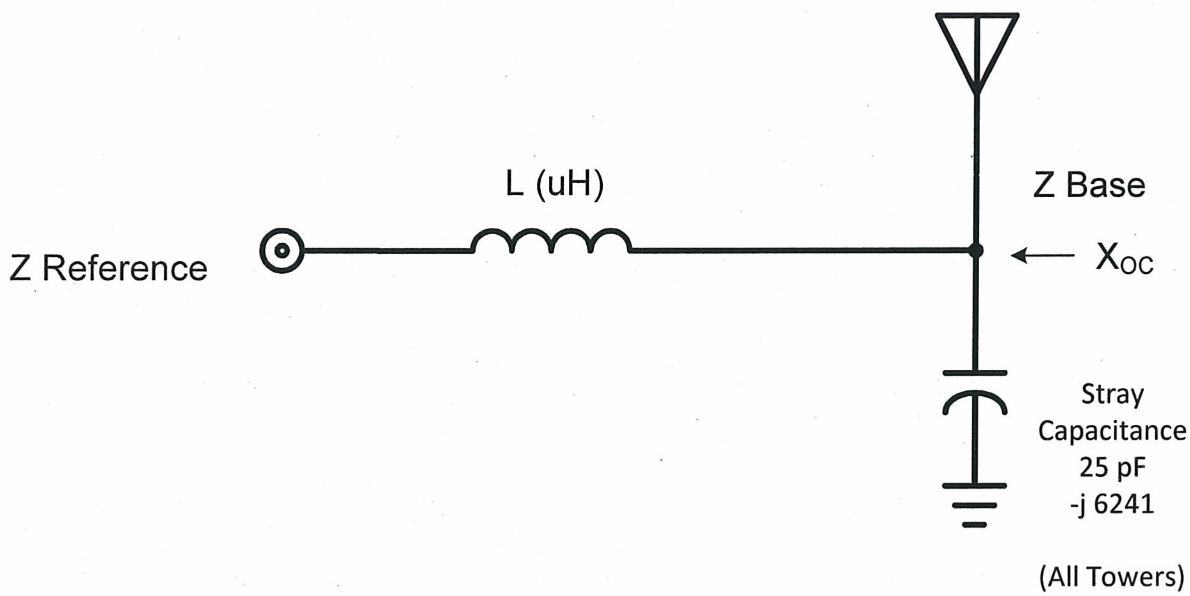
Tower base impedance measurements were made at the final J-plugs within the antenna tuning units ("ATUs") using an Advantest R3753AH network analyzer with an external power amplifier and directional couplers in a calibrated measurement system. The other towers were all open circuited at the same points where impedance measurements were made for them (the "reference points") for each of the measurements.

The reference point at each tower is adjacent to the sampling transformer of the antenna monitor system at the output of the ATU enclosure. The current passes directly from that point over conductors through the enclosure insulator and on to the tower above the base insulator. There are no adjustable shunt components following the sampling transformers. An assumed value for the sum of the base insulator and base region stray capacitances across the ATU output was employed in the base circuit calculations for each tower. The static drain coils across the tower bases have high impedances that do not require consideration, as evidenced by the fact that satisfactory analysis was possible with typical base shunt capacitances and all other assumptions well within the range limitations of the FCC Rules. Circuit calculations were performed to relate the method of moments modeled impedances of the tower feedpoints to the ATU output measurement (reference) points as shown on the following pages. The Xoc shown for each tower, which was calculated for the assumed base conditions, was used in the method of moments model as a load at ground level for the open circuited case.

In addition to the page showing the schematic of the assumed circuit and tabulation of calculated values, pages showing the results of calculations using the WCAP network analysis program from Westberg Consulting are provided. WCAP performs such calculations using nodal analysis, as do other modern circuit analysis programs such as the commonly available ones based on SPICE software.

In each of the WCAP tabulations, node 2 represents the ATU output reference point and node 3 represents the tower feedpoint. Node 0 represents ground potential. The numerals in the file names shown on the tabulations correspond to the tower numbers. It should be noted that the calculated reference point impedances appear under the "TO NODE IMPEDANCE" columns of the WCAP tabulations, following the phantom 1.0 ohm resistors (R 1 - 2) that were included in series with the drive current sources (I 0 -1)) to provide calculation points for the impedances. The tower base impedances from the method of moments model are represented by complex loads from node 3 to ground (R 3 - 0). The shunt capacitances shown for the towers on the schematic were used for the calculations, although they only appear to the nearest 0.0001 microfarad on the WCAP printout due to rounding.

The modeled and measured base impedances at the ATU output jacks with the other towers open circuited at their filter unit output jacks agree within +/- 2 ohms and +/- 4 percent for resistance and reactance, as required by the FCC Rules.



TOWER	L (uH)	X_L	X_{OC}	Z Base (Modeled)	Z Reference (Modeled)	Z Reference (Measured)
1 (SE)	1.732	+ j 11.1	- j 6241	22.8 -j 64.1	22.4 -j 52.4	22.4 -j 52.4
2 (SW)	0.468	+ j 3.0	- j 6241	23.6 -j 58.5	23.2 -j 55.1	23.6 -j 55.0
3 (NE)	0.296	+ j 1.9	- j 6241	24.6 -j 52.4	24.2 -j 50.2	25.3 -j 50.2
4 (NW)	0.733	+ j 4.7	- j 6241	24.1 -j 55.6	23.7 -j 50.5	24.2 -j 50.5

ANALYSIS OF TOWER IMPEDANCE MEASUREMENTS TO VERIFY METHOD OF MOMENTS MODEL

RADIO STATION WLVJ
BOYNTON BEACH, FLORIDA
1020 KHZ 4.7 KW-D 1.5 KW-N DA-2

DTR/H&D JOINT VENTURE

Tower 1 Individually Driven Base Circuit Analysis

```
WESTBERG CIRCUIT ANALYSIS PROGRAM


 FILE NAME = WLVJ1OC.TXT

 I  1000.0000    0    1      .0000      .0000      .0000
 R     1.0000    1    2      .0000      .0000      .0000
 L     1.7320    2    3      .0000      .0000      .0000
 C      .0000    3    0      .0000      .0000      .0000
 R    22.8300    3    0   -64.0800      .0000      .0000
 EX     .0000    0    0      .0000      .0000      .0000

 FREQ = 1.020

   NODE       VOLT MAG      VOLT PHASE
     1     57383.2200        -65.9692
     2     56983.3100        -66.8876
     3     67333.6300        -70.5978
                           BRANCH VOLTAGE        BRANCH CURRENT FROM NODE IMPEDANCE  TO NODE IMPEDANCE
                           MAG      PHASE         MAG      PHASE RESISTANCE REACTANCE RESISTANCE
REACTANCE     VSWR
 R     1-  2      1.000   1000.00     .000    1000.00     .000     23.37    -52.41     22.37    -52.41
 L     2-  3      1.732  11100.13   90.000    1000.00     .000     22.37    -52.41     22.37    -63.51
 C     3-  0       .000  67333.63  -70.598      10.79   19.402       .00  -6241.37       .00       .00
 R     3-  0     22.830  67333.63  -70.598     989.83    -.207     22.83    -64.08       .00       .00
```

Tower 2 Individually Driven Base Circuit Analysis

```
WESTBERG CIRCUIT ANALYSIS PROGRAM


 FILE NAME = WLVJ2OC.TXT

 I     1.0000    0    1      .0000      .0000      .0000
 R     1.0000    1    2      .0000      .0000      .0000
 L      .4680    2    3      .0000      .0000      .0000
 C      .0000    3    0      .0000      .0000      .0000
 R    23.6000    3    0   -58.5100      .0000      .0000
 EX     .0000    0    0      .0000      .0000      .0000

 FREQ = 1.020

   NODE       VOLT MAG      VOLT PHASE
     1        60.1233        -66.3032
     2        59.7284        -67.1816
     3        62.5039        -68.2480
                           BRANCH VOLTAGE        BRANCH CURRENT FROM NODE IMPEDANCE  TO NODE IMPEDANCE
                           MAG      PHASE         MAG      PHASE RESISTANCE REACTANCE RESISTANCE
REACTANCE     VSWR
 R     1-  2      1.000      1.00     .000       1.00     .000     24.16    -55.05     23.16    -55.05
 L     2-  3       .468      3.00   90.000       1.00     .000     23.16    -55.05     23.16    -58.05
 C     3-  0       .000     62.50  -68.248        .01   21.752       .00  -6241.37       .00       .00
 R     3-  0     23.600     62.50  -68.248        .99    -.215     23.60    -58.51       .00       .00
```

Tower 3 Individually Driven Base Circuit Analysis

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = WLVJ3OC.TXT

I	1.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	.2960	2	3	.0000	.0000	.0000
C	.0000	3	0	.0000	.0000	.0000
R	24.6000	3	0	-52.4200	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = 1.020

NODE	VOLT MAG	VOLT PHASE
1	56.1492	-63.3427
2	55.7078	-64.2619
3	57.4225	-65.0839

REACTANCE	VSWR	BRANCH VOLTAGE MAG	BRANCH VOLTAGE PHASE	BRANCH CURRENT MAG	BRANCH CURRENT PHASE	FROM NODE IMPEDANCE RESISTANCE	FROM NODE IMPEDANCE REACTANCE	TO NODE IMPEDANCE RESISTANCE	TO NODE IMPEDANCE REACTANCE
R 1- 2	1.000	1.00	.000	1.00	.000	25.19	-50.18	24.19	-50.18
L 2- 3	.296	1.90	90.000	1.00	.000	24.19	-50.18	24.19	-52.08
C 3- 0	.000	57.42	-65.084	.01	24.916	.00	-6241.37	.00	.00
R 3- 0	24.600	57.42	-65.084	.99	-.224	24.60	-52.42	.00	.00

Tower 4 Individually Driven Base Circuit Analysis

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = WLVJ4OC.TXT

I	1.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	.7330	2	3	.0000	.0000	.0000
C	.0000	3	0	.0000	.0000	.0000
R	24.1300	3	0	-55.6300	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = 1.020

NODE	VOLT MAG	VOLT PHASE
1	56.2477	-63.9458
2	55.8157	-64.8680
3	60.1018	-66.7703

REACTANCE	VSWR	BRANCH VOLTAGE MAG	BRANCH VOLTAGE PHASE	BRANCH CURRENT MAG	BRANCH CURRENT PHASE	FROM NODE IMPEDANCE RESISTANCE	FROM NODE IMPEDANCE REACTANCE	TO NODE IMPEDANCE RESISTANCE	TO NODE IMPEDANCE REACTANCE
R 1- 2	1.000	1.00	.000	1.00	.000	24.71	-50.53	23.71	-50.53
L 2- 3	.733	4.70	90.000	1.00	.000	23.71	-50.53	23.71	-55.23
C 3- 0	.000	60.10	-66.770	.01	23.230	.00	-6241.37	.00	.00
R 3- 0	24.130	60.10	-66.770	.99	-.220	24.13	-55.63	.00	.00

Derivation of Operating Parameters for Daytime Directional Antenna - WLVJ

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. With these voltage sources, the tower currents were calculated. The currents at the ATU unit outputs, where the antenna monitor samples are taken, were calculated from the method of moments tower currents for directional antenna operation using WCAP circuit modeling with the assumptions that were derived from the single tower measurements on the array and the method of moments calculated tower operating impedances. In each of the following WCAP tabulations, node 2 represents the reference point and node 3 represents the tower feedpoint. Node 0 represents ground potential. The tower operating impedances are represented by complex loads from node 3 to ground (R 3 - 0). It should be noted that the calculated reference point current magnitudes and phases appear in the first and fourth columns following the drive current sources (I 0 -1)). As the current transformers and sampling lines are identical, the antenna monitor ratios and phases corresponding to the theoretical parameters were calculated directly from the modeled reference point currents.

Tower	Modeled Current Pulse	Modeled Current Magnitude @ Toroid (amperes)	Modeled Current Phase @ Toroid (degrees)	Modeled Antenna Monitor Ratio	Modeled Antenna Monitor Phase (degrees)
1	1	4.7671	+5.9	0.487	+3.5
2	11	2.9636	-21.9	0.303	-24.3
3	21	9.7847	+2.4	1.000	0.0
4	31	7.0304	-29.1	0.719	-31.5

Tower 1 Day-DA Base Circuit Analysis

FILE NAME = WLVJ1DAD.TXT

I	476.7100	0	1	5.9200	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	1.7320	2	3	.0000	.0000	.0000
C	.0000	3	0	.0000	.0000	.0000
R	13.1900	3	0	-80.3700	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = 1.020

NODE	VOLT MAG	VOLT PHASE
1	33210.8900	-72.6074
2	33119.3600	-73.4156
3	38332.0200	-74.8795

VSWR				BRANCH VOLTAGE MAG	BRANCH VOLTAGE PHASE	BRANCH CURRENT MAG	BRANCH CURRENT PHASE	FROM NODE IMPEDANCE RESISTANCE	FROM NODE IMPEDANCE REACTANCE	TO NODE IMPEDANCE RESISTANCE	TO NODE IMPEDANCE REACTANCE
R	1-	2	1.000	476.71	5.920	476.71	5.920	13.86	-68.27	12.86	-68.27
L	2-	3	1.732	5291.54	95.920	476.71	5.920	12.86	-68.27	12.86	-79.38
C	3-	0	.000	38332.02	-74.879	6.14	15.121	.00	-6241.37	.00	.00
R	3-	0	13.190	38332.02	-74.879	470.65	5.800	13.19	-80.37	.00	.00

Tower 2 Day-DA Base Circuit Analysis

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = WLVJ2DAD.TXT

I	296.3600	0	1	-21.8600	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	.4680	2	3	.0000	.0000	.0000
C	.0000	3	0	.0000	.0000	.0000
R	59.5800	3	0	-97.7300	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = 1.020

NODE	VOLT MAG	VOLT PHASE
1	32792.9700	-79.7898
2	32636.5800	-80.2307
3	33396.6800	-81.0304

VSWR				BRANCH VOLTAGE MAG	BRANCH VOLTAGE PHASE	BRANCH CURRENT MAG	BRANCH CURRENT PHASE	FROM NODE IMPEDANCE RESISTANCE	FROM NODE IMPEDANCE REACTANCE	TO NODE IMPEDANCE RESISTANCE	TO NODE IMPEDANCE REACTANCE
R	1-	2	1.000	296.36	-21.860	296.36	-21.860	58.75	-93.77	57.75	-93.77
L	2-	3	.468	888.89	68.140	296.36	-21.860	57.75	-93.77	57.75	-96.77
C	3-	0	.000	33396.68	-81.030	5.35	8.970	.00	-6241.37	.00	.00
R	3-	0	59.580	33396.68	-81.030	291.78	-22.399	59.58	-97.73	.00	.00

Currents are multiplied X 100 for improved resolution.

Tower 3 Day-DA Base Circuit Analysis

```
WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = WLVJ3DAD.TXT

 I   978.4700    0    1    2.4100     .0000     .0000
 R     1.0000    1    2     .0000     .0000     .0000
 L      .2960    2    3     .0000     .0000     .0000
 C      .0000    3    0     .0000     .0000     .0000
 R    22.8070    3    0  -72.2620     .0000     .0000
 EX     .0000    0    0     .0000     .0000     .0000

 FREQ = 1.020

   NODE      VOLT MAG       VOLT PHASE
    1     71829.5100        -69.0947
    2     71525.1300        -69.8381
    3     73295.1100        -70.2805
                             BRANCH VOLTAGE        BRANCH CURRENT FROM NODE IMPEDANCE  TO NODE IMPEDANCE
                             MAG        PHASE      MAG        PHASE RESISTANCE REACTANCE RESISTANCE REACTANCE
VSWR
 R    1-  2      1.000    978.47      2.410    978.47     2.410     23.29    -69.62     22.29    -69.62
 L    2-  3       .296   1856.17     92.410    978.47     2.410     22.29    -69.62     22.29    -71.52
 C    3-  0       .000  73295.11    -70.280     11.74    19.720       .00  -6241.37       .00       .00
 R    3-  0     22.807  73295.11    -70.280    967.26     2.203     22.81    -72.26       .00       .00
```

Tower 4 Day-DA Base Circuit Analysis

```
WESTBERG CIRCUIT ANALYSIS PROGRAM

 FILE NAME = WLVJ4DAD.TXT

 I   703.0400    0    1  -29.0700     .0000     .0000
 R     1.0000    1    2     .0000     .0000     .0000
 L      .7330    2    3     .0000     .0000     .0000
 C      .0000    3    0     .0000     .0000     .0000
 R    36.4950    3    0  -64.9830     .0000     .0000
 EX     .0000    0    0     .0000     .0000     .0000

 FREQ = 1.020

   NODE      VOLT MAG       VOLT PHASE
    1     49358.0900        -87.5100
    2     48993.7900        -88.2106
    3     51856.5700        -90.0826
                             BRANCH VOLTAGE        BRANCH CURRENT FROM NODE IMPEDANCE  TO NODE IMPEDANCE
                             MAG        PHASE      MAG        PHASE RESISTANCE REACTANCE RESISTANCE REACTANCE
VSWR
 R    1-  2      1.000    703.04    -29.070    703.04   -29.070     36.75    -59.82     35.75    -59.82
 L    2-  3       .733   3302.67     60.930    703.04   -29.070     35.75    -59.82     35.75    -64.52
 C    3-  0       .000  51856.57    -90.083      8.31     -.083       .00  -6241.37       .00       .00
 R    3-  0     36.495  51856.57    -90.083    695.78   -29.402     36.50    -64.98       .00       .00
```

Currents are multiplied X 100 for improved resolution.

Derivation of Operating Parameters for Nighttime Directional Antenna - WLVJ

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. With these voltage sources, the tower currents were calculated. The currents at the ATU unit outputs, where the antenna monitor samples are taken, were calculated from the method of moments tower currents for directional antenna operation using WCAP circuit modeling with the assumptions that were derived from the single tower measurements on the array and the method of moments calculated tower operating impedances. In each of the following WCAP tabulations, node 2 represents the reference point and node 3 represents the tower feedpoint. Node 0 represents ground potential. The tower operating impedances are represented by complex loads from node 3 to ground (R 3 - 0). It should be noted that the calculated reference point current magnitudes and phases appear in the first and fourth columns following the drive current sources (I 0 -1)). As the current transformers and sampling lines are identical, the antenna monitor ratios and phases corresponding to the theoretical parameters were calculated directly from the modeled reference point currents.

Tower	Modeled Current Pulse	Modeled Current Magnitude @ Toroid (amperes)	Modeled Current Phase @ Toroid (degrees)	Modeled Antenna Monitor Ratio	Modeled Antenna Monitor Phase (degrees)
1	1	4.1581	+7.6	0.798	+3.2
2	11	3.4879	+96.8	0.669	+92.4
3	21	5.2123	+4.4	1.000	0.0
4	31	4.8429	+67.4	0.929	+63.0

Tower 1 Night-DA Base Circuit Analysis

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WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = WLVJ1DAN.TXT

 I    415.8100    0    1     7.6300      .0000      .0000
 R      1.0000    1    2      .0000      .0000      .0000
 L      1.7320    2    3      .0000      .0000      .0000
 C       .0000    3    0      .0000      .0000      .0000
 R     14.3830    3    0   -64.9230      .0000      .0000
 EX      .0000    0    0      .0000      .0000      .0000

 FREQ = 1.020

   NODE        VOLT MAG       VOLT PHASE
    1       22988.2100         -66.5321
    2       22878.2200         -67.5340
    3       27365.4300         -70.0092
                                BRANCH VOLTAGE        BRANCH CURRENT FROM NODE IMPEDANCE  TO NODE IMPEDANCE
                                MAG        PHASE       MAG        PHASE RESISTANCE REACTANCE RESISTANCE REACTANCE
VSWR
 R     1-  2      1.000    415.81      7.630    415.81      7.630      15.09     -53.19      14.09     -53.19
 L     2-  3      1.732   4615.54     97.630    415.81      7.630      14.09     -53.19      14.09     -64.29
 C     3-  0       .000  27365.43    -70.009      4.38     19.991        .00   -6241.37        .00        .00
 R     3-  0     14.383  27365.43    -70.009    411.53      7.499      14.38     -64.92        .00        .00
```

Tower 2 Night-DA Base Circuit Analysis

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WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = WLVJ2DAN.TXT

 I    348.7900    0    1    96.8400      .0000      .0000
 R      1.0000    1    2      .0000      .0000      .0000
 L       .4680    2    3      .0000      .0000      .0000
 C       .0000    3    0      .0000      .0000      .0000
 R    -18.1860    3    0   -79.8910      .0000      .0000
 EX      .0000    0    0      .0000      .0000      .0000

 FREQ = 1.020

   NODE        VOLT MAG       VOLT PHASE
    1       27119.8200          -5.5846
    2       27197.0000          -6.3022
    3       28216.7500          -5.8192
                                BRANCH VOLTAGE        BRANCH CURRENT FROM NODE IMPEDANCE  TO NODE IMPEDANCE
                                MAG        PHASE       MAG        PHASE RESISTANCE REACTANCE RESISTANCE REACTANCE
VSWR
 R     1-  2      1.000    348.79     96.840    348.79     96.840     -16.73     -75.93     -17.73     -75.93
 L     2-  3       .468   1046.14   -173.160    348.79     96.840     -17.73     -75.93     -17.73     -78.93
 C     3-  0       .000  28216.75     -5.819      4.52     84.181        .00   -6241.37        .00        .00
 R     3-  0    -18.186  28216.75     -5.819    344.38     97.005     -18.19     -79.89        .00        .00
```

Currents are multiplied X 100 for improved resolution.

Tower 3 Night-DA Base Circuit Analysis

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = WLVJ3DAN.TXT

I	521.2300	0	1	4.4000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	.2960	2	3	.0000	.0000	.0000
C	.0000	3	0	.0000	.0000	.0000
R	43.4650	3	0	-54.2550	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = 1.020

NODE	VOLT MAG	VOLT PHASE
1	35483.8800	-45.6461
2	35151.4400	-46.2974
3	35922.0300	-47.2964

				BRANCH VOLTAGE		BRANCH CURRENT		FROM NODE IMPEDANCE		TO NODE IMPEDANCE	
				MAG	PHASE	MAG	PHASE	RESISTANCE	REACTANCE	RESISTANCE	REACTANCE
			VSWR								
R	1-	2	1.000	521.23	4.400	521.23	4.400	43.72	-52.19	42.72	-52.19
L	2-	3	.296	988.78	94.400	521.23	4.400	42.72	-52.19	42.72	-54.08
C	3-	0	.000	35922.03	-47.296	5.76	42.704	.00	-6241.37	.00	.00
R	3-	0	43.465	35922.03	-47.296	516.73	4.005	43.47	-54.26	.00	.00

Tower 4 Night-DA Base Circuit Analysis

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = WLVJ4DAN.TXT

I	484.2900	0	1	67.4000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	.7330	2	3	.0000	.0000	.0000
C	.0000	3	0	.0000	.0000	.0000
R	13.5840	3	0	-69.8290	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = 1.020

NODE	VOLT MAG	VOLT PHASE
1	31940.3500	-10.0909
2	31838.9600	-10.9418
3	34070.1800	-11.7149

				BRANCH VOLTAGE		BRANCH CURRENT		FROM NODE IMPEDANCE		TO NODE IMPEDANCE	
				MAG	PHASE	MAG	PHASE	RESISTANCE	REACTANCE	RESISTANCE	REACTANCE
			VSWR								
R	1-	2	1.000	484.29	67.400	484.29	67.400	14.28	-64.39	13.28	-64.39
L	2-	3	.733	2275.04	157.400	484.29	67.400	13.29	-64.39	13.29	-69.09
C	3-	0	.000	34070.18	-11.715	5.46	78.285	.00	-6241.37	.00	.00
R	3-	0	13.584	34070.18	-11.715	478.93	67.277	13.58	-69.83	.00	.00

Currents are multiplied X 100 for improved resolution.

Method of Moments Model Details for Towers Driven Individually – WLVJ

The array of towers was modeled using Expert MININEC Broadcast Professional Version 14.5. One wire was used to represent each tower. The tower geometry was specified using the geographic coordinate system. Each tower was modeled using 10 wire segments. The towers are all physically 68.7 degrees in electrical height and their segment length is 6.87 electrical degrees.

The individual tower characteristics were adjusted to provide a match of their modeled impedances, when presented to a circuit model which included branches representing the shunt capacitances and feedline hookup inductances, with the base impedances that were measured at the output jacks of the filter units while the other towers of the array were open circuited. The method of moments model assumed loads at ground level having the reactances that were 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 percent and each modeled radius falls within the required range of 80 percent to 150 percent of the radius of a circle having a circumference equal to the sum of the widths of the tower sides. The array consists of triangular uniform cross section towers having a face width of 16 ¾ inches.

TOWER	Physical Height (degrees)	Modeled Height (degrees)	Modeled Percent of Height	Modeled Radius (meters)	Percent Equivalent Radius
1	68.7	75.0	109.2	0.180	88.6
2	68.7	76.0	110.6	0.180	88.6
3	68.7	77.0	112.1	0.180	88.6
4	68.7	76.5	111.4	0.180	88.6

The following pages show the details of the method of moments models for the individually driven towers. The numerals in the file names shown on the tabulations correspond to the tower numbers.

Tower 1 Driven Individually

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IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.02	22.83	-64.082	68.027	289.6	6.0796	-2.8836	-3.1408

GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	185.1	176.5	0	.18	10
		185.1	176.5	75.		
2	none	133.2	195.6	0	.18	10
		133.2	195.6	76.		
3	none	0	0	0	.18	10
		0	0	77.		
4	none	105.6	334.2	0	.18	10
		105.6	334.2	76.5		

Number of wires = 4

current nodes = 40

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	7.5	3	7.7
radius	1	.18	1	.18

ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.02	0	1	.0208333	.0213889

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	-6,241.	0	0	0
2	21	0	-6,241.	0	0	0
3	31	0	-6,241.	0	0	0

Tower 2 Driven Individually

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IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 11, sector 1							
1.02	23.6	-58.505	63.085	292.	5.3027	-3.3157	-2.7249

GEOMETRY

Wire coordinates in degrees; other dimensions in meters

Environment: perfect ground

wire	caps	Distance	Angle	Z	radius	segs
1	none	185.1	176.5	0	.18	10
		185.1	176.5	75.		
2	none	133.2	195.6	0	.18	10
		133.2	195.6	76.		
3	none	0	0	0	.18	10
		0	0	77.		
4	none	105.6	334.2	0	.18	10
		105.6	334.2	76.5		

Number of wires = 4

current nodes = 40

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	7.5	3	7.7
radius	1	.18	1	.18

ELECTRICAL DESCRIPTION

Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.02	0	1	.0208333	.0213889

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	-6,241.	0	0	0
2	21	0	-6,241.	0	0	0
3	31	0	-6,241.	0	0	0

Tower 3 Driven Individually

```
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IMPEDANCE
   normalization = 50.
freq     resist    react    imped    phase     VSWR    S11      S12
(MHz)    (ohms)    (ohms)   (ohms)   (deg)             dB       dB
source =  1; node 21, sector 1
1.02     24.598   -52.416  57.901   295.1     4.5381  -3.8918  -2.2779


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

wire   caps Distance      Angle         Z            radius      segs
 1     none 185.1         176.5         0            .18          10
            185.1         176.5         75.
 2     none 133.2         195.6         0            .18          10
            133.2         195.6         76.
 3     none 0             0             0            .18          10
            0             0             77.
 4     none 105.6         334.2         0            .18          10
            105.6         334.2         76.5

Number of wires          =  4
          current nodes  =  40

                        minimum                     maximum
Individual wires       wire     value              wire  value
segment length          1       7.5                 3    7.7
radius                  1       .18                 1    .18


ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                    no. of   segment length (wavelengths)
 no. lowest        step           steps    minimum         maximum
 1   1.02          0               1       .0208333        .0213889

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             -6,241.       0           0            0
 2     11    0             -6,241.       0           0            0
 3     31    0             -6,241.       0           0            0
```

Tower 4 Driven Individually

```
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IMPEDANCE
   normalization = 50.
freq      resist    react     imped     phase     VSWR      S11       S12
(MHz)     (ohms)    (ohms)    (ohms)    (deg)               dB        dB
source =   1; node 31, sector 1
1.02      24.127    -55.628   60.635    293.4     4.9166    -3.5832   -2.5042


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

wire   caps Distance      Angle         Z              radius       segs
 1     none 185.1         176.5         0              .18           10
            185.1         176.5         75.
 2     none 133.2         195.6         0              .18           10
            133.2         195.6         76.
 3     none 0             0             0              .18           10
            0             0             77.
 4     none 105.6         334.2         0              .18           10
            105.6         334.2         76.5

Number of wires            =  4
          current nodes    =  40

                          minimum                     maximum
Individual wires        wire     value              wire  value
segment length           1       7.5                 3     7.7
radius                   1       .18                 1     .18


ELECTRICAL DESCRIPTION
Frequencies (MHz)
     frequency                    no. of   segment length (wavelengths)
 no. lowest        step           steps    minimum          maximum
 1   1.02          0               1       .0208333         .0213889

Sources
source node      sector  magnitude        phase           type
 1       31       1      1.               0               voltage

Lumped loads
             resistance     reactance      inductance   capacitance passive
load   node  (ohms)         (ohms)         (mH)         (uF)          circuit
 1      1    0              -6,241.        0            0             0
 2      11   0              -6,241.        0            0             0
 3      21   0              -6,241.        0            0             0
```

Method of Moments Model Details for Daytime Directional Antenna - WLVJ

The array of towers was modeled using Expert MININEC Broadcast Professional Version 14.5 with the 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 pattern. The following pages contain details of the method of moments model of the directional antenna pattern.

Tower	Wire	Base Node
1	1	1
2	2	11
3	3	21
4	4	31

It should be noted that voltages and currents shown on the tabulations that are not specified as "rms" values are the corresponding peak values.

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MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = 1.02 MHz

tower	field ratio magnitude	phase (deg)
1	.47	4.5
2	.288	-28.1
3	1.	0
4	.725	-32.8

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	383.323	285.1	4.7065	5.8
11	333.963	279.	2.91782	337.6
21	732.95	289.7	9.67266	2.2
31	518.565	269.9	6.95783	330.6

Sum of square of source currents = 345.273
Total power = 4,700. Watts

NOTE: The array synthesis calculations (above) were performed to solve for the base voltage drives required to produce the specified field parameters. The following information is from the final model.

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	185.1	176.5	0	.18	10
		185.1	176.5	75.		
2	none	133.2	195.6	0	.18	10
		133.2	195.6	76.		
3	none	0	0	0	.18	10
		0	0	77.		
4	none	105.6	334.2	0	.18	10
		105.6	334.2	76.5		

Number of wires = 4
current nodes = 40

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	7.5	3	7.7
radius	1	.18	1	.18

ELECTRICAL DESCRIPTION
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.02	0	1	.0208333	.0213889

Sources

source	node	sector	magnitude	phase	type
1	1	1	542.101	285.1	voltage
2	11	1	472.295	279.	voltage
3	21	1	1,036.55	289.7	voltage
4	31	1	733.362	269.9	voltage

IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.02	13.192	-80.37	81.446	279.3	13.775	-1.2634	-5.9789
source = 2; node 11, sector 1							
1.02	59.577	-97.729	114.46	301.4	5.0385	-3.4942	-2.575
source = 3; node 21, sector 1							
1.02	22.807	-72.262	75.775	287.5	7.0865	-2.4679	-3.6303
source = 4; node 31, sector 1							
1.02	36.495	-64.983	74.53	299.3	4.1746	-4.2437	-2.0508

CURRENT rms
Frequency = 1.02 MHz
Input power = 4,700. watts
Efficiency = 100. %
coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-184.755	-11.3001	0	4.7065	5.8	4.68269	.47281
2	-184.755	-11.3001	7.5	4.41954	5.3	4.40093	.405142
3	-184.755	-11.3001	15.	4.12884	4.9	4.11377	.352495
4	-184.755	-11.3001	22.5	3.78948	4.6	3.77736	.302768
5	-184.755	-11.3001	30.	3.39805	4.3	3.3885	.254645
6	-184.755	-11.3001	37.5	2.95602	4.	2.9487	.207944
7	-184.755	-11.3001	45.	2.46653	3.8	2.46115	.162854
8	-184.755	-11.3001	52.5	1.93297	3.5	1.92926	.119675
9	-184.755	-11.3001	60.	1.35722	3.3	1.35494	.0786543
10	-184.755	-11.3001	67.5	.734939	3.1	.733863	.0397457
END	-184.755	-11.3001	75.	0	0	0	0
GND	-128.293	35.8201	0	2.91781	337.6	2.69741	-1.11249
12	-128.293	35.8201	7.6	2.70874	335.3	2.46024	-1.13337
13	-128.293	35.8201	15.2	2.51246	333.6	2.25042	-1.11718
14	-128.293	35.8201	22.8	2.2934	332.2	2.02801	-1.07091
15	-128.293	35.8201	30.4	2.04771	330.9	1.789	-.996299
16	-128.293	35.8201	38.	1.77527	329.7	1.53326	-.894822
17	-128.293	35.8201	45.6	1.47724	328.7	1.26192	-.767988
18	-128.293	35.8201	53.2	1.15509	327.7	.976366	-.617212
19	-128.293	35.8201	60.8	.809505	326.8	.677304	-.443347
20	-128.293	35.8201	68.4	.437572	325.9	.362471	-.245119
END	-128.293	35.8201	76.	0	0	0	0
GND	0	0	0	9.67267	2.2	9.66565	.368386
22	0	0	7.7	9.12338	1.3	9.12104	.206515
23	0	0	15.4	8.54717	.7	8.54658	.0997911
24	0	0	23.1	7.86085	.1	7.86083	.0176792
25	0	0	30.8	7.05936	359.6	7.05922	-.0436816
26	0	0	38.5	6.14696	359.2	6.14637	-.0855069
27	0	0	46.2	5.13152	358.8	5.13038	-.10823
28	0	0	53.9	4.02148	358.4	4.01992	-.112012

29	0	0	61.6	2.82223	358.	2.82057	-
.0967986							
30	0	0	69.3	1.5264	357.7	1.52514	-
.0618899							
END	0	0	77.	0	0	0	0
GND	95.0737	45.9604	0	6.95782	330.6	6.0606	-3.41766
32	95.0737	45.9604	7.65	6.59778	329.2	5.66604	-3.38033
33	95.0737	45.9604	15.3	6.20635	328.2	5.27487	-3.27026
34	95.0737	45.9604	22.95	5.7293	327.4	4.82529	-3.08892
35	95.0737	45.9604	30.6	5.16322	326.6	4.31277	-2.83881
36	95.0737	45.9604	38.25	4.51109	326.	3.73942	-2.52323
37	95.0737	45.9604	45.9	3.77831	325.4	3.10971	-2.14599
38	95.0737	45.9604	53.55	2.97062	324.8	2.42851	-1.71083
39	95.0737	45.9604	61.2	2.09154	324.3	1.69886	-1.22001
40	95.0737	45.9604	68.85	1.135	323.8	.916148	-.669996
END	95.0737	45.9604	76.5	0	0	0	0

Method of Moments Model Details for Nighttime Directional Antenna - WLVJ

The array of towers was modeled using Expert MININEC Broadcast Professional Version 14.5 with the 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 pattern. The following pages contain details of the method of moments model of the directional antenna pattern.

Tower	Wire	Base Node
1	1	1
2	2	11
3	3	21
4	4	31

It should be noted that voltages and currents shown on the tabulations that are not specified as "rms" values are the corresponding peak values.

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MEDIUM WAVE ARRAY SYNTHESIS FROM FIELD RATIOS

Frequency = 1.02 MHz

tower	field ratio magnitude	phase (deg)
1	.764	6.3
2	.631	98.6
3	1.	0
4	.897	66.

VOLTAGES AND CURRENTS - rms

source node	voltage magnitude	phase (deg)	current magnitude	phase (deg)
1	273.656	290.	4.11532	7.5
11	282.169	354.2	3.44381	97.
21	359.216	312.7	5.16722	4.
31	340.703	348.3	4.78932	67.3

Sum of square of source currents = 156.867
Total power = 1,500. Watts

NOTE: The array synthesis calculations (above) were performed to solve for the base voltage drives required to produce the specified field parameters. The following information is from the final model.

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

wire	caps	Distance	Angle	Z	radius	segs
1	none	185.1	176.5	0	.18	10
		185.1	176.5	75.		
2	none	133.2	195.6	0	.18	10
		133.2	195.6	76.		
3	none	0	0	0	.18	10
		0	0	77.		
4	none	105.6	334.2	0	.18	10
		105.6	334.2	76.5		

Number of wires = 4
current nodes = 40

Individual wires	minimum wire	minimum value	maximum wire	maximum value
segment length	1	7.5	3	7.7
radius	1	.18	1	.18

ELECTRICAL DESCRIPTION
Frequencies (MHz)

no.	frequency lowest	step	no. of steps	segment length (wavelengths) minimum	maximum
1	1.02	0	1	.0208333	.0213889

Sources

source	node	sector	magnitude	phase	type
1	1	1	387.008	290.	voltage
2	11	1	399.047	354.2	voltage
3	21	1	508.009	312.7	voltage
4	31	1	481.826	348.3	voltage

IMPEDANCE

normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.02	14.383	-64.923	66.497	282.5	9.5203	-1.8315	-4.6334
source = 2; node 11, sector 1							
1.02	-18.186	-79.891	81.935	257.2	****	****	****
source = 3; node 21, sector 1							
1.02	43.465	-54.255	69.518	308.7	3.0458	-5.9228	-1.2825
source = 4; node 31, sector 1							
1.02	13.584	-69.829	71.138	281.	11.041	-1.5777	-5.1625

CURRENT rms

Frequency = 1.02 MHz

Input power = 1,500. watts

Efficiency = 100. %

coordinates in degrees

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	-184.755	-11.3001	0	4.11532	7.5	4.07986	.539054
2	-184.755	-11.3001	7.5	3.90408	7.	3.87509	.47489
3	-184.755	-11.3001	15.	3.67313	6.6	3.64864	.423526
4	-184.755	-11.3001	22.5	3.39113	6.3	3.3705	.373482
5	-184.755	-11.3001	30.	3.05632	6.1	3.03917	.323328
6	-184.755	-11.3001	37.5	2.67058	5.9	2.65662	.272644
7	-184.755	-11.3001	45.	2.23712	5.7	2.22615	.221307
8	-184.755	-11.3001	52.5	1.75935	5.5	1.75119	.169255
9	-184.755	-11.3001	60.	1.23922	5.4	1.23375	.116305
10	-184.755	-11.3001	67.5	.672978	5.3	.670136	.0617817
END	-184.755	-11.3001	75.	0	0	0	0
GND	-128.293	35.8201	0	3.44382	97.	-.420275	3.41808
12	-128.293	35.8201	7.6	3.23306	97.7	-.433468	3.20387
13	-128.293	35.8201	15.2	3.01913	98.2	-.429726	2.98839
14	-128.293	35.8201	22.8	2.76925	98.6	-.41295	2.73829
15	-128.293	35.8201	30.4	2.48115	98.9	-.384198	2.45122
16	-128.293	35.8201	38.	2.15612	99.2	-.344407	2.12843
17	-128.293	35.8201	45.6	1.79678	99.4	-.294543	1.77247
18	-128.293	35.8201	53.2	1.40597	99.6	-.235561	1.38609
19	-128.293	35.8201	60.8	.985438	99.8	-.168196	.970978
20	-128.293	35.8201	68.4	.532472	100.	-.0923559	.524402
END	-128.293	35.8201	76.	0	0	0	0
GND	0	0	0	5.16723	4.	5.15479	.35843
22	0	0	7.7	4.93463	2.3	4.93061	.199193
23	0	0	15.4	4.66476	1.2	4.6638	.0948668
24	0	0	23.1	4.32392	.2	4.32389	.0152453
25	0	0	30.8	3.91046	359.4	3.91022	-.0436502
26	0	0	38.5	3.42706	358.6	3.42605	-.0832441
27	0	0	46.2	2.87806	357.9	2.87617	-.104225
28	0	0	53.9	2.26814	357.3	2.26561	-.107031
29	0	0	61.6	1.60021	356.7	1.59757	-.0918899

30	0	0	69.3	.869887	356.1	.867924	-.0584094
END	0	0	77.	0	0	0	0
GND	95.0737	45.9604	0	4.78931	67.3	1.84703	4.41882
32	95.0737	45.9604	7.65	4.52549	66.8	1.78351	4.15922
33	95.0737	45.9604	15.3	4.24502	66.4	1.69844	3.89043
34	95.0737	45.9604	22.95	3.9084	66.1	1.58405	3.57301
35	95.0737	45.9604	30.6	3.51335	65.8	1.44041	3.20451
36	95.0737	45.9604	38.25	3.06211	65.5	1.26868	2.78693
37	95.0737	45.9604	45.9	2.55859	65.3	1.07051	2.32388
38	95.0737	45.9604	53.55	2.00695	65.	.847517	1.81922
39	95.0737	45.9604	61.2	1.40979	64.8	.600643	1.27544
40	95.0737	45.9604	68.85	.763287	64.5	.328017	.689211
END	95.0737	45.9604	76.5	0	0	0	0

Sampling System Measurements – WLVJ

Impedance measurements were made of the antenna monitor sampling system using a calibrated measurement system employing an Advantest R3753AH network analyzer with an external power amplifier and directional couplers. The measurements were made looking into the antenna monitor ends of the sampling lines for two conditions – with them open circuited at their tower ends and with them connected to the sampling devices at the tower bases.

The following table shows the frequencies above and below the carrier frequency where resonance – zero reactance corresponding with low resistance – was found. As the length of a distortionless transmission line is 180 electrical degrees at the difference frequency between adjacent frequencies of resonance, and 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 in terms of the ratio of frequencies – was found to be 270 electrical degrees. The electrical lengths at carrier frequency appearing in the table below were calculated by ratioing the frequencies.

Tower	Sampling Line Open-Circuited Resonance Below 1020 kHz (kHz)	Sampling Line Open-Circuited Resonance Above 1020 kHz (kHz)	Sampling Line Calculated Electrical Length at 1020 kHz (degrees)	1020 kHz Measured Impedance with Toroid Connected (Ohms)
1	353	1080	255.0	51.1 – j 4.1
2	355	1082	254.5	51.4 – j 3.3
3	358	1082	254.5	52.7 – j 2.7
4	358	1080	255.0	50.4 – j 2.4

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

The characteristic impedance was calculated using the following formula, where R_1 +j X_1 and R_2 +j X_2 are the measured impedances at the +45 and –45 degree offset frequencies relative to the frequencies at which the lengths are 270 electrical degrees, respectively:

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

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	900	5.8 –j 49.8	1260	8.3 +j 49.0	49.9
2	901	6.0 –j 50.5	1262	8.4 +j 48.4	50.0
3	901	5.4 –J 50.4	1262	7.9 +J 49.3	50.3
4	900	5.6 –j 50.0	1260	7.6 +j 47.8	49.3

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

The toroidal transformers were calibrated by measuring their outputs with a common reference signal while connected to the antenna monitor through identical test cables. They were placed side-by-side with a conductor carrying the reference signal passing through them and their outputs were fed into the antenna monitor to measure the relative ratios and phases of their output voltages. Tower 3 was the antenna monitor's reference tower for the measurements. The following results were found for carrier frequency, 1020 kilohertz:

Tower	Toroid Ratio	Toroid Phase (Degrees)
1	1.000	-0.2
2	0.999	-0.1
3	1.000	0.0
4	1.000	-0.1

Delta type TCT-3 toroidal transformers are rated for absolute magnitude accuracy of +/- 2% and absolute phase accuracy of +/- 3 degrees. As the maximum measured transformer-to-transformer variations among the four were no more than 0.1 percent and 0.2 degree, they provide far more accurate relative indications than could be the case within their rated accuracies.

Reference Field Strength Measurements – WLVJ

Reference field strength measurements were made at three locations each along radials at the azimuths specified for monitoring by the WLVJ construction permit, at 151.0 and 333.5 degrees true for the daytime pattern and at 13.0, 140.0, 212.0, 328.5 degrees true for the nighttime pattern. Additionally, measurements were made on major lobe radials at 265.0 degrees true for the daytime pattern and at 85.0 degrees true for the nighttime pattern.

The measurements were made with Potomac Instruments PI-4100 field strength meter serial number 154. Its readings were checked against those of PI-4100 serial number 249, which was most recently calibrated by its manufacturer on January 1, 2016, and the two meters were found to be in agreement within their manufacturer's specifications.

The measured field strengths, descriptions and GPS coordinates for the reference measurement points are shown on the following tabulation.

WLVJ Reference Field Strength Measurements

Radial	Point	Dist (kM)	Field (mV/M)	NAD 83 Coordinates		Description
Day Pattern						
151	1	1.51	13	26°27'42.2"	80°11'44.7"	20' No. of Bailey Tree Farm Entrance, West side of Smith Sundy Road
151	2	2.57	16	26°27'12"	80°11'29.5"	In Median, 100' East of where E, W Atlantic Avenue comes together
151	3	3.1	14.9	26°26'54.8"	80°11'15.3"	50' So of Nursey Building on plant access road
265	1	0.15	4010	26°28'24.7"	80°12'16.6"	150' So of Power Pole, east side of US 441.
265	2	0.18	3700	26°28'24.6"	80°12'17.6"	In Median, So corner of US 441 Crossover To Transfer Plant
265	3	0.22	3100	26°28'24.6"	80°12'19.1"	On Sidewalk, west side of US 441.
333.5	1	0.48	790	26°28'18.8"	80°12'18.8'	West Side of US 441, 500' north of Transfer Plant Driveway
333.5	2	3.03	100	26°29'54.0"	80°12'59.9"	120th St. 175' West of Administration Road, South side of road
333.5	3	3.33	80	26°30'02.5"	80°13'04.6"	West side of Warehouse Road at canal before building
Night Pattern						
13	1	0.21	1020	26°28'31.8"	80°12'9.6"	200' E of Transmitter Access road next to the Canal
13	2	6.12	1.9	26°31'38.7"	80°11'21.2"	20' W of Boynton Beach Blvd and Lyons intersection, south side
13	3	6.34	1.3	26°31'45.8"	80°11'19.4	S of Welcome Agriculture Reserve sign, east side of Lyons road
85	1	0.71	904	26°28'27.1"	80°11'45.6"	300' So of Canal Access road to Tx off Smith Sundy road
85	2	1.51	398	26°28'29.3"	80°11'17.1	West side of Lyons Road at Dirt Road going West
85	3	1.54	428	26°28'29.4"	80°11'15.9"	East side of Lyons Road on Sidewalk
140	1	1.12	46.7	26°27'57.2"	80°11'45.1"	Smith Sunday Road, 100' No of Driveway on east side
140	2	2.36	31.5	26°27'26.5"	80°11'16.4"	20' No of sidewalk end, west side of Lyons Road
140	3	2.44	29.3	26°27'24.4"	80°11'14.4"	East side of Lyons Road at Sidewalk flair
212	1	0.29	230	26°28'17"	80°12'16.9"	500' So of Transfer Plant Entrance, east side of US 441
212	2	0.4	130	26°28'14.1"	80°12'19.0"	100' No of one way stop sign on US 441
212	3	2.66	57.2	26°27'11.9"	80°13'2.2"	So side of Atlantic Avenue across from Metal gate
328.5	1	0.3	106	26°28'35.5"	80°12'18.6"	100' No of Transfer Plant entrance on East side of US 441
328.5	2	0.42	670	26°28'36.8"	80°12'19.3"	200' No of Transfer Plant entrance on West side of US 441 on sidewalk
328.5	3	1.21	70	26°28'58.6"	80°12'34.4"	West on SFWM Canal Road, just past the North/South Power lines

Direct Measurement of Power - WLVJ

Common point impedance measurements were made using a calibrated measurement system employing an Advantest R3753AH network analyzer with an external power amplifier and directional couplers. The common point impedance was adjusted to 50.0 – j 5.0 ohms for both directional patterns. The reactance was set to – j 5.0 to compensate for series inductance in the circuit between the transmitter and the common point in the phasor cabinet, including the main-auxiliary transmitter switching contactor, in order to provide a non-reactive load for the transmitter's output port at carrier frequency.

Section 73.51(b)(1) of the FCC Rules specifies that the authorized antenna input power of a directional antenna for up to 5.0 kilowatts nominal power shall be increased by 8 percent above the nominal power. For the 1.5 kilowatt nighttime pattern, the common point current was calculated for 1,620 watts antenna input power to be 5.69 amperes. For the 4.7 kilowatt daytime pattern, the common point current was calculated for 5,076 watts antenna input power to be10.08 amperes.

Antenna Monitor and Sampling System - WLVJ

The antenna monitor is a Potomac Instruments model AM-1901-4. The sampling devices are Delta Electronics Type TCT-3 shielded toroidal transformers located at the ATU output reference points. The TCT-3 transformers have a sensitivity of 1.0 volt per ampere of RF current. The toroids are connected through equal length foam heliax sampling lines to the antenna monitor. The outdoor portions of the sampling lines are buried underground.

The antenna monitor was calibrated by comparing the tower current ratios and phases observed using an Advantest R3753AH network analyzer, with its reference signal amplified and fed into the directional antenna common point, to those observed on the antenna monitor with full power operation. The network analyzer was calibrated using its internal calibration function prior to the observations, which were made with the tower 3 sampling line connected to its "B" receiver input and the tower 1, 3 and 4 sampling lines alternately connected to its "A" receiver input. The measurements with the antenna monitor were made immediately upon activation of the transmitter after a cool-off period, during which the low power network analyzer measurements were made, to minimize warm-up effects. For that reason, the parameters observed for the antenna monitor may differ slightly from those reported elsewhere herein that were made with a warmed-up system.

Tower	Antenna Monitor Measured		Network Analyzer Measured	
	Ratio	Phase	Ratio	Phase
1	0.486	+3.7	0.493	+3.1
2	0.302	-24.1	0.312	-25.1
3	1.000	0.0	1.000	0.0
4	0.712	-31.1	0.719	-32.1

The network analyzer and antenna monitor agreed within the antenna monitor manufacturer's rated accuracies of 0.010 ratio and 1.0 degree phase.

Radio Frequency Radiation Considerations - WLVJ

The operation of WLVJ will not result in the exposure of workers or the general public to levels of radio frequency radiation in excess of the limits specified in 47 CFR 1.1310. Fences have been installed about the tower bases to restrict access beyond the distances necessary to prevent electric and magnetic field exposure above the required levels.

No changes have been made to the WLVJ antenna system other than replacement of the antenna tuning enclosures located at the tower bases and the phasor cabinet located inside the transmitter building to accommodate a reduction in maximum power from the formerly licensed 25 kilowatts on 1040 kilohertz to the new maximum power of 4.7 kilowatts on 1020 kilohertz. All RF networks are inside shielding enclosures. The towers and ground system remain unchanged. The fences to restrict access to areas near the towers to ensure compliance with the radiofrequency exposure requirements of the FCC rules remain in place. The measures to restrict human exposure to radio frequency fields previously provided to the FCC remain in force at the WLVJ transmitter site.