Accepted / Filed

Federal Communications Commission
Washington, D. C. 20554

Approved by OMB
3060-0627
Expires 01/31/98

FOR FCC USE ONLY

DEC - 5 2016

Federal Communications Commission
Office of the Secretary

FCC 302-AM
APPLICATION FOR AM BROADCAST STATION LICENSE

(Please read instructions before filling out form.)

FOR COMMISSION USE ONLY
FILE NO. 20050104ABJ

SECTION I - APPLICANT FEE INFORMATION

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

ACM JCE IV B LLC

MAILING ADDRESS (Line 1) (Maximum 35 characters)
426 South River Road

MAILING ADDRESS (Line 2) (Maximum 35 characters)

CITY	STATE OR COUNTRY (if foreign address)	ZIP CODE
Tryon	NC	28782

TELEPHONE NUMBER (include area code)	CALL LETTERS	OTHER FCC IDENTIFIER (If applicable)
202-663-8810	WFTL(AM)	29490

2. A. Is a fee submitted with this application? ☐ Yes ☑ No

B. If No, indicate reason for fee exemption (see 47 C.F.R. Section

☐ Governmental Entity ☐ Noncommercial educational licensee ☑ Other (Please explain):Amendment to FCC File No. BMML-20050104ABJ

C. If Yes, provide the following information:

Enter in Column (A) the correct Fee Type Code for the service you are applying for. Fee Type Codes may be found in the "Mass Media Services Fee Filing Guide." Column (B) lists the Fee Multiple applicable for this application. Enter fee amount due in Column (C).

(A) FEE TYPE CODE	(B) FEE MULTIPLE	(C) FEE DUE FOR FEE TYPE CODE IN COLUMN (A)	FOR FCC USE ONLY
	0001	$	

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

(A)	(B)	(C)	FOR FCC USE ONLY
	0001	$	

	TOTAL AMOUNT REMITTED WITH THIS APPLICATION	FOR FCC USE ONLY
ADD ALL AMOUNTS SHOWN IN COLUMN C, AND ENTER THE TOTAL HERE. THIS AMOUNT SHOULD EQUAL YOUR ENCLOSED REMITTANCE.	$	

SECTION II - APPLICANT INFORMATION		
1. NAME OF APPLICANT ACM JCE IV B LLC		
MAILING ADDRESS 426 South River Road		
CITY Tryon	STATE NC	ZIP CODE 28782

2. This application is for:

☑ Commercial ☐ Noncommercial

☑ AM Directional ☐ AM Non-Directional

Call letters	Community of License	Construction Permit File No.	Modification of Construction Permit File No(s).	Expiration Date of Last Construction Permit
WFTL(AM)	West Palm Beach			

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

☐ Yes ☑ No

If No, explain in an Exhibit.

Exhibit No. directional PTA

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

☑ Yes ☐ No

If No, state exceptions in an Exhibit.

Exhibit No.

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

☐ Yes ☑ No

If Yes, explain in an Exhibit.

Exhibit No.

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

☐ Yes ☐ No

☑ Does not apply

If No, explain in an Exhibit.

Exhibit No.

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

☐ Yes ☑ No

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

Exhibit No.

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

☐ Yes ☑ No

If Yes, provide particulars as an Exhibit.

Exhibit No.

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

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

CERTIFICATION

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

☑ Yes ☐ No

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

Name	Signature	
Mark Jorgenson		
Title	Date	Telephone Number
Sole Member of Licensee's Sole Member	12/01/2016	828-859-6982

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

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

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

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

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

SECTION III - LICENSE APPLICATION ENGINEERING DATA

Name of Applicant
WFTL(AM)

PURPOSE OF AUTHORIZATION APPLIED FOR: (check one)

☑ Station License ☐ Direct Measurement of Power

1. Facilities authorized in construction permit					
Call Sign	File No. of Construction Permit (if applicable)	Frequency (kHz)	Hours of Operation	Power in kilowatts	
				Night	Day
WFTL(AM)	BMP20031024AAV	850	Unlimited	20	50

2. Station location	
State	City or Town
Florida	West Palm Beach

3. Transmitter location			
State	County	City or Town	Street address (or other identification)

4. Main studio location			
State	County	City or Town	Street address (or other identification)

5. Remote control point location (specify only if authorized directional antenna)			
State	County	City or Town	Street address (or other identification)

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. see eng stmt

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
20.5	32.4
Measured antenna or common point resistance (in ohms) at operating frequency	**Measured antenna or common point reactance (in ohms) at operating frequency**
Night: 50 Day: 50	Night: 0 Day: 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
	-95.3	-111.1	0.383	0.680		
	ref 0.0	ref 0.0	ref 1.00	ref 1.00		
	+106.9	+129.8	0.544	0.477		
	-117.4	-145.0	0.358	0.428		
	-28.1	-43.5	1.549	1.279		
	+83.2	-65.2	0.973	0.756		

Manufacturer and type of antenna monitor: Potomac Instruments 1901-6

SECTION III - Page 2

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

Type Radiator	Overall height in meters of radiator above base insulator, or above base, if grounded.	Overall height in meters above ground (without obstruction lighting)	Overall height in meters above ground (include obstruction lighting)	If antenna is either top loaded or sectionalized, describe fully in an Exhibit.
Guyed	See eng str	see eng stn	see eng stn	Exhibit No.

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	West Longitude
26 ° 32 ' 30 "	80 ° 44 ' 30 "

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

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

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

none

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

MoM proof

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

Name (Please Print or Type)	Signature (check appropriate box below)
Timothy C. Cutforth	Timothy C Cutforth
Address (include ZIP Code) Broadcast Engineering Consultants 965 S. Irving Street Denver, CO 80219	Date 12/01/ 2016
	Telephone No. (Include Area Code) 303-912-5474

☐ Technical Director ☑ Registered Professional Engineer

☐ Chief Operator ☐ Technical Consultant

☐ Other (specify)

FCC 302-AM (Page 5)
August 1995

CLEAR ALL PAGES

WFTL

SURVEYOR TO ENGINEERING TOWER LOCATION TRANSLATION

The attached survey was made by referencing all towers to the location of tower 2 which is the phase monitor reference tower. Therefore the vector distance from tower 1 to tower 2 was added to the vector from tower 2 to tower 3, tower 2 to tower 4, tower 2 to tower 5, and tower 2 to tower 6 to determine the vector distance from Tower 1 to all other towers.
All distances were converted to electrical degrees by dividing the distance in feet by 3.8143 feet per electrical degree on 850 kHz. All survey bearings are given in reference to the Florida State grid along with a statement that there is a correction factor of 06minutes 56 seconds East to give True North bearings. This coordinate system correction amount was subtracted from all survey bearings to give True North Bearings. Then AllTrue North bearings were converted from degree and minutes to decimal degrees.

The polar distances were converted to rectangular coordinates and tabulated. These distances were then easily added in the rectangular domain to get X and Y distances from Tower 1 to the as built tower locations. These were compared to the rectangular coordinate distances for the Construction Permit tower locations. The X and Y differences between the CP and the As Built tower locations were then computed to find the total length of the error vector. As can be readily seen in the tabulations the error vectors were far smaller than 1.5 electrical degree so the WFTL array As Built meets the FCC standards for filing of a Method of Moments Proof of Performance.

From the FCC CP tower 1 is used as the tower location reference.

As Built Vector Distance from Tower 1 to Tower 2

362 ft divided by 3.2143 = 112.623 electrical Degrees
Bearing conversion from FL grid to True North 101degrees minus 06 min 56 sec
Bearing from Tower 1 to Tower 2 = 100 deg 53 min 04 sec+180 = 280 deg 53 min 04 deg True North
Conversion to decimal degrees = 280.884 degrees
Rectangular Coordinate Vector location for Tower 2 X= +21.265 Y= -110.597

CP reference location for Tower 2
112.7 electrical degrees at a bearing of 281.0 Degrees True North
Rectangular Coordinate reference location for Tower 2 X= +21.504 Y= -110.630

Error Vector in Rectangular coordinates X= +0.239 Y= -0.033
Absolute magnitude of Error Vector for location of Tower 2= 0.241 <1.5 Electrical Degrees

As Built Distance from Tower 1 to Tower 3 = vector distance from Tower 1 to tower2
+ vector distance from Tower 2 to Tower 3

Rectangular Coordinate Vector from Tower1 to Tower 2 X= +21.265 Y= -110.597

As Built measured distance from Tower 2 to Tower 3 319.5 ft = 99.400 Electrical Degrees
Bearing fron Tower 2 toTower 3 276degrees43minutes
Correction to True North Bearing -06 min 56 sec = 276 deg 36 min 04 sec True North
Conversion to Decimal Degrees = 276.601 Degrees True North
Rectangular coordinate Vector Tower 2 to Tower 3 X= +11.426 Y=-98.741
Total as built rectangular Coordinate for Tower 3 X= +32.691. Y=-209.338

CP reference location for Tower 3
212.0 electrical degrees at a bearing of 279.0 Degrees True North
Rectangular Coordinate reference location for Tower 3 X= +33.163 Y= -209.390

Error Vector in Rectangular coordinates X= -0.472 Y= +0,052
Absolute magnitude of Error Vector for location of Tower 3= 0.475<1.5 Electrical Degrees

As Built Distance from Tower 1 to Tower 4 = vector distance from Tower 1 to tower2
+ vector distance from Tower 2 to Tower 4

Rectangular Coordinate Vector from Tower1 to Tower 2 X= +21.265 Y= -110.597

As Built measured distance from Tower 2 to Tower 4 1015 ft = 315.776 Electrical Degrees
Bearing fron Tower 2 toTower 4 135degrees27minutes -06min 56 sec =135 deg 20min 04sec
converting to decimal degrees = 135.334 Degrees True North
Rectangular coordinate Vector Tower 2 to Tower 4 X= -224.585 Y=+221.982
Total as built rectangular Coordinate for Tower 4 X= -203.320 Y=+111.385

CP reference location for Tower 4
231.9 electrical degrees at a bearing of 151.4 Degrees True North
Rectangular Coordinate reference location for Tower 4 X= -203.604 Y= +111.009

Error Vector in Rectangular coordinates X= +0.284 Y= -0.376
Absolute magnitude of Error Vector for location of Tower 4= 0.471<1.5 Electrical Degrees

As Built Distance from Tower 1 to Tower 5 = vector distance from Tower 1 to tower2
+ vector distance from Tower 2 to Tower 5

Rectangular Coordinate Vector from Tower1 to Tower 2 X= +21.265 Y= -110.597

As Built measured distance from Tower 2 to Tower 5 738 ft = 229.599 Electrical Degrees
Bearing fron Tower 2 toTower 5 152.0 Degrees -06min 56sec= 151deg 53min 04sec True North
conversion to decimal degrees 151.884 degrees True North
Rectangular coordinate Vector Tower 2 to Tower 5 X= -202.429 Y=+108.342
Total as built rectangular Coordinate for Tower 5 X= -181.164 Y= -2.255

CP reference location for Tower 5
181.3 electrical degrees at a bearing of 180.9 Degrees True North
Rectangular Coordinate reference location for Tower 5 X= -181.278 Y= -2.847

Error Vector in Rectangular coordinates X= -0.114 Y= -0.592
Absolute magnitude of Error Vector for location of Tower 5= 0.603<1.5 Electrical Degrees

As Built Distance from Tower 1 to Tower 6 = vector distance from Tower 1 to tower2
+ vector distance from Tower 2 to Tower 6

Rectangular Coordinate Vector from Tower1 to Tower 2 X= +21.265 Y= -110.597

As Built measured distance from Tower 2 to Tower 6 is 611 ft = 190.090 Electrical Degrees
Bearing fron Tower 2 toTower 6
176degrees32minutes minus 06min 56 sec = 176deg 25min 04sec True North
converting to decimal degrees 176.418 degrees True North
Rectangular coordinate Vector Tower 2 to Tower 6 X= -189.719 Y=+11.877
Total as built rectangular Coordinate for Tower 6 X= -168.454 Y= -98.720

CP reference location for Tower 6
195,4 Electrical Degrees at a bearing of 210.5 Degrees True North
Rectangular Coordinate reference location for Tower 6 X= -168.363 Y= -99.172

Error Vector in Rectangular coordinates X= -0.091 Y= -0.548
Absolute magnitude of Error Vector for location of Tower 6= 0.556<1.5 Electrical Degrees

Therefore all tower are less than 1.5 Electrical Degrees from the authorized CP location.

SUPPLEMENTAL INFORMATION FOR WFTL(AM) LICENSE FILING

The following is provided in response to questions from FCC staff.

Item 1)
All current surveying derives distances and bearings from the differential GPS coordinates of each measurement point. The surveyor therefore in order to produce a survey document with traceable accuracy listed his determined GPS coordinates on the survey document. Prior FCC, FAA and ASR documents were not produced by this method and the exact coordinates varied from those previously determined using maps. Therefore now that exact coordinates have been redetermined by survey it will be necessary to have the FAA and ASR coordinates and data corrected to match the most recent and most accurate coordinates for each tower. That coordinate updating process is in progress at this time.

Item 2)
Although it was specifically requested that all bearings on the survey document be referenced to TRUE NORTH the document that resulted was labeled in GRID NORTH for the Florida State Grid as is state of the art practice for surveyors licensed in the state of Florida. The document also referenced the exact difference between GRID NORTH and TRUE NORTH right next to the North arrow on the exhibit. TRUE NORTH is noted to be 06 minutes and 56 seconds east (Clockwise) from GRID NORTH. Therefore the True North bearings for each bearing shown on the exhibit is the GRID NORTH bearing minus 06 minutes and 56 seconds. The surveying summary was recomputed and tabulated from the TRUE NORTH bearings after adjustment from GRID NORTH.

Item 3)
There was no perceptible change in the tower readings with the lighting choke and static drain coil attached and then with the lighting choke and static drain coil disconnected. Therefore the measured base self-impedance with and without those components are:

Tower	Self Impedance with SD and Tower Light Choke	Self Impedance W/O SD and Tower Light Choke
1	60.0 +j92.6 Ohms	60.0 +j92.6 Ohms
2	90.0 +j185.2 Ohms	90.0 +j185.2 Ohms
3	127+j229.4 Ohms	127+j229.4 Ohms
4	142 +j254.9 Ohms	142 +j254.9 Ohms
5	51.0 +j95.1 Ohms	51.0 +j95.1 Ohms
6	62.0 +j106.2 Ohms	62.0 +j106.2 Ohms

Item 4)
The Static Drain Coil measured 3184 microHenry
The Lighting Choke measured 1310 microHenry

Item 6)
The tower base circuit was revisited and it was determined that although both the Static Drain Coil and the Tower Lighting Choke were mounted inside the Antenna Tuning Unit cabinet the two were not connected to the same end of the circuit and therefore the model needed to be modified. The Lighting Choke enters the tuning cabinet through a separate pass through insulator and connects directly between the tower base and ground so the 1310 microHenry inductor should be between circuit node 2 and 0 on all six towers. The static drain coil connects at the measurement j-plug and goes to ground so the 3184 microHenry choke goes from circuit node 3 to 0 on all six towers. The ciruit models have been so corrected and the circuit model rerun and tabulated for both day and night.

Item 5) and 7) through 12) all hinge on recomputing the circuit impedance models with all appropriate corrections included attached below.

Table 1 – Analysis of Tower Impedance Measurements to Verify Moment Method Model

Twr.	Z_{BASE} (Modeled)	Z_{ATU} (Modeled)	Z_{ATU} (Measured)	Series L (uH)	Shunt C pF	Phys. Height (deg.)	Model Height (deg.)	% Phys. Height
1(NE)	58.1+j66.1	59.4+j92.9	60.0 +j92.6	5.1	80	92.5	98.0	105.9
2(NC)	84.8+j148.0	89.9+j183.4	90.0 +j185.2	6.3	80	104.6	109.9	105.1
3(NW)	116.4+j187.9	125.5+j227.9	127+j229.4	7.0	80	111.8	116.2	103.9
4(SE)	130.3+j200.7	140.9+j251.8	142 +j254.9	9.2	80	115.0	117.7	102.3
5(SC)	49.2+j60.9	50.1+j94.1	51.0 +j95.1	6.3	80	92.5	96.5	104.3
6(SW)	60.3+j67.6	61.5+j106.9	62.0 +j106.2	7.5	80	92.5	98.6	106.6

CIRCUIT MODELING for SELF IMPEDANCES

```
 WESTBERG CIRCUIT ANALYSIS PROGRAM

 FILE NAME = wftl-1.cir

 I     1.0000    0    1     .0000     .0000     .0000
 R     1.0000    1    2     .0000     .0000     .0000
 L     5.1000    2    3     .0000     .0000     .0000
 C      .0001    3    0     .0000     .0000     .0000
 L  1310.0000    2    0     .0000     .0000     .0000
 L  3184.0000    3    0     .0000     .0000     .0000
 R    58.1000    3    0   66.1000     .0000     .0000
 EX     .0000    0    0     .0000     .0000     .0000


 FREQ =  .850

   NODE      VOLT MAG     VOLT PHASE
    1        110.8293        56.9753
    2        110.2875        57.4109
    3         88.9853        47.9215
                          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     60.40     92.92     59.40     92.92
 L    2-  3     5.100     26.88    90.493       .99      .493     61.01     93.65     61.01     66.41
 C    3-  0      .000     88.99    47.922       .04   137.922       .00  -2340.51       .00       .00
 L    2-  0  1310.000    110.29    57.411       .02   -32.589       .00   6996.33       .00       .00
 L    3-  0  3184.000     88.99    47.922       .01   -42.078       .00  17004.81       .00       .00
 R    3-  0    58.100     88.99    47.922      1.01     -.764     58.10     66.10       .00       .00

Copy of file wftl-1.cir
0.85 0. 1
I 1 0 1
R 1.0000 1 2
L 5.1 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 58.1 3 0 +66.1
EX


 WESTBERG CIRCUIT ANALYSIS PROGRAM

 FILE NAME = wftl-2.cir

 I     1.0000    0    1     .0000     .0000     .0000
 R     1.0000    1    2     .0000     .0000     .0000
 L     6.3000    2    3     .0000     .0000     .0000
 C      .0001    3    0     .0000     .0000     .0000
 L  1310.0000    2    0     .0000     .0000     .0000
 L  3184.0000    3    0     .0000     .0000     .0000
 R    84.8000    3    0  148.0000     .0000     .0000
 EX     .0000    0    0     .0000     .0000     .0000


 FREQ =  .850

   NODE      VOLT MAG     VOLT PHASE
    1        204.6488        63.6375
    2        204.2067        63.8889
    3        175.6016        59.0515
                          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     90.87    183.37     89.87    183.37
 L    2-  3     6.300     32.77    90.756       .97      .756     94.76    187.05     94.76    153.40
 C    3-  0      .000    175.60    59.051       .08   149.051       .00  -2340.51       .00       .00
 L    2-  0  1310.000    204.21    63.889       .03   -26.111       .00   6996.33       .00       .00
 L    3-  0  3184.000    175.60    59.051       .01   -30.949       .00  17004.81       .00       .00
 R    3-  0    84.800    175.60    59.051      1.03    -1.137     84.80    148.00       .00       .00

COPY of file wftl-2.cir
0.85 0. 1
I 1 0 1
R 1.0000 1 2
L 6.3 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 84.8 3 0 +148.0
EX
```

CIRCUIT MODELING for SELF IMPEDANCES

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl-3.cir

I	1.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	7.0000	3	2	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	116.4000	3	0	187.9000	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	260.6639	60.9614
2	260.1799	61.1539
3	229.5338	56.6470

				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	VSWR
R	1-	2	1.000	1.00	.000	1.00	.000	126.53	227.90	125.53	227.90	
L	3-	2	7.000	36.17	-88.938	.97	-178.938	-134.08	-195.70	-134.08	-233.08	
C	3-	0	.000	229.53	56.647	.10	146.647	.00	-2340.51	.00	.00	
L	2-	0	1310.000	260.18	61.154	.04	-28.846	.00	6996.33	.00	.00	
L	3-	0	3184.000	229.53	56.647	.01	-33.353	.00	17004.81	.00	.00	
R	3-	0	116.400	229.53	56.647	1.04	-1.576	116.40	187.90	.00	.00	

COPY Of file wftl-3.cir
0.85 0. 1
I 1 0 1
R 1.0000 1 2
L 7.0 3 2
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 116.4 3 0 +187.9
EX

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl-4.cir

I	1.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	9.2000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	130.3000	3	0	200.7000	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	288.9988	60.5968
2	288.5092	60.7698
3	248.8169	55.2362

				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	VSWR
R	1-	2	1.000	1.00	.000	1.00	.000	141.88	251.77	140.88	251.77	
L	2-	3	9.200	47.38	91.197	.96	1.197	151.53	258.01	151.53	208.87	
C	3-	0	.000	248.82	55.236	.11	145.236	.00	-2340.51	.00	.00	
L	2-	0	1310.000	288.51	60.770	.04	-29.230	.00	6996.33	.00	.00	
L	3-	0	3184.000	248.82	55.236	.01	-34.764	.00	17004.81	.00	.00	
R	3-	0	130.300	248.82	55.236	1.04	-1.771	130.30	200.70	.00	.00	

COPY of file wftl-4.cir0.85 0. 1
I 1 0 1
R 1.0000 1 2
L 9.2 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 130.3 3 0 +200.7
EX

CIRCUIT MODELING for SELF IMPEDANCES

WESTBERG CIRCUIT ANALYSIS PROGRAM

```
 FILE NAME = wftl-5.cir

 I     1.0000    0    1     .0000     .0000     .0000
 R     1.0000    1    2     .0000     .0000     .0000
 L     6.3000    2    3     .0000     .0000     .0000
 C      .0001    3    0     .0000     .0000     .0000
 L  1310.0000    2    0     .0000     .0000     .0000
 L  3184.0000    3    0     .0000     .0000     .0000
 R    49.2000    3    0   60.9000     .0000     .0000
 EX     .0000    0    0     .0000     .0000     .0000


 FREQ =  .850

   NODE      VOLT MAG     VOLT PHASE
    1       107.0603        61.4940
    2       106.5867        61.9664
    3        78.9994        50.4194
                          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     51.09     94.08     50.09     94.08
 L    2-  3     6.300    33.19    90.416       .99      .416     51.47     94.99     51.47     61.34
 C    3-  0      .000    79.00    50.419       .03   140.419       .00  -2340.51       .00       .00
 L    2-  0  1310.000   106.59    61.966       .02   -28.034       .00   6996.33       .00       .00
 L    3-  0  3184.000    79.00    50.419       .00   -39.581       .00  17004.81       .00       .00
 R    3-  0    49.200    79.00    50.419      1.01     -.647     49.20     60.90       .00       .00
```

```
COPY OF FILE wftl-5.cir
0.85 0. 1
I 1 0 1
R 1.0000 1 2
L 6.3 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 49.2 3 0 +60.9
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

```
 FILE NAME = wftl-6.cir

 I     1.0000    0    1     .0000     .0000     .0000
 R     1.0000    1    2     .0000     .0000     .0000
 L     7.5000    2    3     .0000     .0000     .0000
 C      .0001    3    0     .0000     .0000     .0000
 L  1310.0000    2    0     .0000     .0000     .0000
 L  3184.0000    3    0     .0000     .0000     .0000
 R    60.3000    3    0   67.6000     .0000     .0000
 EX     .0000    0    0     .0000     .0000     .0000


 FREQ =  .850

   NODE      VOLT MAG     VOLT PHASE
    1       123.7688        59.6861
    2       123.2670        60.0874
    3        91.4612        47.4726
                          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     62.47    106.85     61.47    106.85
 L    2-  3     7.500    39.45    90.511       .98      .511     63.39    107.94     63.39     67.88
 C    3-  0      .000    91.46    47.473       .04   137.473       .00  -2340.51       .00       .00
 L    2-  0  1310.000   123.27    60.087       .02   -29.913       .00   6996.33       .00       .00
 L    3-  0  3184.000    91.46    47.473       .01   -42.527       .00  17004.81       .00       .00
 R    3-  0    60.300    91.46    47.473      1.01     -.794     60.30     67.60       .00       .00
```

```
COPY OF FILE wftl-6.cir
0.85 0. 1
I 1 0 1
R 1.0000 1 2
L 7.5 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 60.3 3 0 +67.6
EX
```

Derivation of Operating Parameters for Daytime Directional Antenna

Once calibrated against the measured individual open-circuited base impedances, the moment method model was utilized for daytime directional antenna calculations. These calculations were made to determine the complex voltage source values to be applied at ground level for each tower of the array to produce the current moment sums for the towers which, when normalized to the reference tower, equate to the theoretical field parameters of the authorized directional pattern. These voltage sources were then applied in the model and the tower currents were calculated.

Twenty segments were used for each tower. The WFTL towers are base sampled, which is permitted for towers of 120 electrical degrees or less. As such, the first (ground) segment of each tower was used to determine the model operating parameters of the array.

A circuit model was constructed to determine the effect of the series feed inductance, and shunt base region capacitance on the ATU output current. The circuit model for each tower is essentially the circuit model used for model verification above using the model-predicted operating impedance for each tower. Again, this model was used with the Westberg Circuit Analysis Program (WCAP).

This effect was, as expected, minimal, and the results are tabulated in the table below along with the base operating parameters for the daytime array.

Twr.	Node	Current Magnitude (amperes)	Current Phase (degrees)	WCAP Current Offset for Unity I_{BASE}	WCAP Phase Offset for Unity $Ø_{BASE}$ (degrees)	Antenna Monitor Ratio	Antenna Monitor Phase (degrees)
1	1	15.1554	+11.8	0.974	1.747	0.681	-111.1
2	21	22.4062	+123.9	0.968	0.767	1.00ref	0.0ref
3	42	10.8161	-105.9	0.963	0.403	0.480	129.8
4	64	9.7406	-23.3	0.962	+2.940	0.432	-145.0
5	87	28.1784	+80.9	0.9915	+0.308	1.288	-43.5
6	107	16.6179	-170.1	0.9944	-0.061	0.762	-65.2

CIRCUIT MODELING FOR DAYTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl1dof.cir

I	100.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	5.1000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	130.8130	3	0	134.0060	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	21192.3200	49.0447
2	21126.9000	49.2496
3	19228.1200	43.9440

				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	VSWR
R	1-	2	1.000	100.00	.000	100.00	.000	138.91	160.05	137.91	160.05	
L	2-	3	5.100	2661.99	91.156	97.73	1.156	144.38	160.88	144.38	133.65	
C	3-	0	.000	19228.12	43.944	8.22	133.944	.00	-2340.51	.00	.00	
L	2-	0	1310.000	21126.90	49.250	3.02	-40.750	.00	6996.33	.00	.00	
L	3-	0	3184.000	19228.12	43.944	1.13	-46.056	.00	17004.81	.00	.00	
R	3-	0	130.813	19228.12	43.944	102.68	-1.747	130.81	134.01	.00	.00	

Ratio offset 0.974 +1.747degree phase offset

COPY of WFTL1dof..cir
0.85 0. 1
I 100 0 1 0
R 1.0000 1 2
L 5.1 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 130.813 3 0 +134.006
EX

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl1d.cir

I	14.7600	0	1	13.5710	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	5.1000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	130.8130	3	0	134.0060	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	3127.9860	62.6157
2	3118.3310	62.8206
3	2838.0710	57.5150

				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	VSWR
R	1-	2	1.000	14.76	13.571	14.76	13.571	138.91	160.05	137.91	160.05	
L	2-	3	5.100	392.91	104.727	14.43	14.727	144.38	160.88	144.38	133.65	
C	3-	0	.000	2838.07	57.515	1.21	147.515	.00	-2340.51	.00	.00	
L	2-	0	1310.000	3118.33	62.821	.45	-27.179	.00	6996.33	.00	.00	
L	3-	0	3184.000	2838.07	57.515	.17	-32.485	.00	17004.81	.00	.00	
R	3-	0	130.813	2838.07	57.515	15.16	11.824	130.81	134.01	.00	.00	

COPY of File wftl1d.cir
0.85 0. 1
I 14.76 0 1 13.571
R 1.0000 1 2
L 5.1 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 130.813 3 0 +134.006
EX

CIRCUIT MODELING FOR DAYTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl2dof.cir

```
I   100.0000    0    1     .0000     .0000     .0000
R     1.0000    1    2     .0000     .0000     .0000
L     6.3000    2    3     .0000     .0000     .0000
C      .0001    3    0     .0000     .0000     .0000
L  1310.0000    2    0     .0000     .0000     .0000
L  3184.0000    3    0     .0000     .0000     .0000
R    57.0060    3    0  163.2440     .0000     .0000
EX     .0000    0    0     .0000     .0000     .0000
```

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	20987.9400	72.8570
2	20958.6900	73.1183
3	17866.5700	69.9833

				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	VSWR
R	1-	2	1.000	100.00	.000	100.00	.000	61.86	200.55	60.86	200.55	
L	2-	3	6.300	3268.33	90.513	97.14	.513	64.50	205.90	64.50	172.25	
C	3-	0	.000	17866.57	69.983	7.63	159.983	.00	-2340.51	.00	.00	
L	2-	0	1310.000	20958.69	73.118	3.00	-16.882	.00	6996.33	.00	.00	
L	3-	0	3184.000	17866.57	69.983	1.05	-20.017	.00	17004.81	.00	.00	
R	3-	0	57.006	17866.57	69.983	103.33	-.767	57.01	163.24	.00	.00	

Ratio offset =0.974 +0.767degrees phase offset

```
COPY of wftl2d0f.cir
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 6.3 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 57.006 3 0 +163.244
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl2d.cir

```
I    21.6890    0    1  124.6660     .0000     .0000
R     1.0000    1    2     .0000     .0000     .0000
L     6.3000    2    3     .0000     .0000     .0000
C      .0001    3    0     .0000     .0000     .0000
L  1310.0000    2    0     .0000     .0000     .0000
L  3184.0000    3    0     .0000     .0000     .0000
R    57.0060    3    0  163.2440     .0000     .0000
EX     .0000    0    0     .0000     .0000     .0000
```

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	4552.0750	-162.4770
2	4545.7290	-162.2157
3	3875.0800	-165.3507

				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	VSWR
R	1-	2	1.000	21.69	124.666	21.69	124.666	61.86	200.56	60.86	200.56	
L	2-	3	6.300	708.87	-144.821	21.07	125.179	64.50	205.90	64.50	172.25	
C	3-	0	.000	3875.08	-165.351	1.66	-75.351	.00	-2340.51	.00	.00	
L	2-	0	1310.000	4545.73	-162.216	.65	107.784	.00	6996.33	.00	.00	
L	3-	0	3184.000	3875.08	-165.351	.23	104.649	.00	17004.81	.00	.00	
R	3-	0	57.006	3875.08	-165.351	22.41	123.899	57.01	163.24	.00	.00	

```
COPY of wftl2d.cir
0.85 0. 1
I 21.689 0 1 124.666
R 1.0000 1 2
L 6.3 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 57.006 3 0 +163.244
EX
```

CIRCUIT MODELING FOR DAYTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl3dof.cir

```
I   100.0000    0    1     .0000     .0000     .0000
R     1.0000    1    2     .0000     .0000     .0000
L     7.0000    3    2     .0000     .0000     .0000
C      .0001    3    0     .0000     .0000     .0000
L  1310.0000    2    0     .0000     .0000     .0000
L  3184.0000    3    0     .0000     .0000     .0000
R    29.8010    3    0  186.1230     .0000     .0000
EX     .0000    0    0     .0000     .0000     .0000
```

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	23158.8800	81.7745
2	23144.7800	82.0195
3	19573.0500	80.5000

				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	VSWR
R	1-	2	1.000	100.00	.000	100.00	.000	33.13	229.21	32.13	229.21	
L	3-	2	7.000	3616.06	-89.728	96.72	-179.728	-34.35	-199.42	-34.35	-236.81	
C	3-	0	.000	19573.05	80.500	8.36	170.500	.00	-2340.51	.00	.00	
L	2-	0	1310.000	23144.78	82.020	3.31	-7.980	.00	6996.33	.00	.00	
L	3-	0	3184.000	19573.05	80.500	1.15	-9.500	.00	17004.81	.00	.00	
R	3-	0	29.801	19573.05	80.500	103.84	-.403	29.80	186.12	.00	.00	

Ratio offset 0.963 +0.403degees phase offset

```
COPY of wftl3dof.cir
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 7.0 3 2
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 29.801 3 0 +186.123
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl3d.cir

```
I    10.4160    0    1 -105.4970     .0000     .0000
R     1.0000    1    2     .0000     .0000     .0000
L     7.0000    3    2     .0000     .0000     .0000
C      .0001    3    0     .0000     .0000     .0000
L  1310.0000    2    0     .0000     .0000     .0000
L  3184.0000    3    0     .0000     .0000     .0000
R    29.8010    3    0  186.1230     .0000     .0000
EX     .0000    0    0     .0000     .0000     .0000
```

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	2412.2290	-23.7225
2	2410.7610	-23.4775
3	2038.7290	-24.9970

				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	VSWR
R	1-	2	1.000	10.42	-105.497	10.42	-105.497	33.13	229.21	32.13	229.21	
L	3-	2	7.000	376.65	164.775	10.07	74.775	-34.35	-199.42	-34.35	-236.81	
C	3-	0	.000	2038.73	-24.997	.87	65.003	.00	-2340.51	.00	.00	
L	2-	0	1310.000	2410.76	-23.477	.34	-113.477	.00	6996.33	.00	.00	
L	3-	0	3184.000	2038.73	-24.997	.12	-114.997	.00	17004.81	.00	.00	
R	3-	0	29.801	2038.73	-24.997	10.82	-105.900	29.80	186.12	.00	.00	

```
COPY of wftl3d.cir
0.85 0. 1
I 10.416 0 1 -105.497
R 1.0000 1 2
L 7.0 3 2
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 29.801 3 0 +186.123
EX
```

CIRCUIT MODELING FOR DAYTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl4dof.cir

I	100.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	9.2000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	216.3780	3	0	201.4750	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	33921.8500	46.2325
2	33852.7500	46.3547
3	30722.7300	40.0174

				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	VSWR
R	1-	2	1.000	100.00	.000	100.00	.000	234.65	244.97	233.65	244.97	
L	2-	3	9.200	4744.25	91.982	96.56	1.982	250.61	245.18	250.61	196.05	
C	3-	0	.000	30722.73	40.017	13.13	130.017	.00	-2340.51	.00	.00	
L	2-	0	1310.000	33852.75	46.355	4.84	-43.645	.00	6996.33	.00	.00	
L	3-	0	3184.000	30722.73	40.017	1.81	-49.983	.00	17004.81	.00	.00	
R	3-	0	216.378	30722.73	40.017	103.91	-2.940	216.38	201.48	.00	.00	

Ratio Offset 0.962 +2.940degrees phase offset

COPY OF FILE wftl4dof.cir

```
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 9.2 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 216.378 3 0 +201.475
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl4d.cir

I	9.3700	0	1	-20.3600	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	9.2000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	216.3780	3	0	201.4750	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	3178.4770	25.8725
2	3172.0030	25.9947
3	2878.7190	19.6574

				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	VSWR
R	1-	2	1.000	9.37	-20.360	9.37	-20.360	234.65	244.97	233.65	244.97	
L	2-	3	9.200	444.54	71.622	9.05	-18.378	250.61	245.18	250.61	196.05	
C	3-	0	.000	2878.72	19.657	1.23	109.657	.00	-2340.51	.00	.00	
L	2-	0	1310.000	3172.00	25.995	.45	-64.005	.00	6996.33	.00	.00	
L	3-	0	3184.000	2878.72	19.657	.17	-70.343	.00	17004.81	.00	.00	
R	3-	0	216.378	2878.72	19.657	9.74	-23.300	216.38	201.48	.00	.00	

COPY OF FILE wftl4d.cir

```
0.85 0. 1
I 9.370 0 1 -20.36
R 1.0000 1 2
L 9.2 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 216.378 3 0 +201.475
EX
```

CIRCUIT MODELING FOR DAYTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl5dof.cir

I	100.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	6.3000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	23.4260	3	0	58.6440	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	9550.6360	74.9312
2	9525.1270	75.5120
3	6369.1540	67.9175

			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	VSWR
R	1- 2	1.000	100.00	.000	100.00	.000	24.83	92.22	23.83	92.22	
L	2- 3	6.300	3320.31	90.198	98.68	.198	24.47	93.37	24.47	59.72	
C	3- 0	.000	6369.15	67.918	2.72	157.918	.00	-2340.51	.00	.00	
L	2- 0	1310.000	9525.13	75.512	1.36	-14.488	.00	6996.33	.00	.00	
L	3- 0	3184.000	6369.15	67.918	.37	-22.082	.00	17004.81	.00	.00	
R	3- 0	23.426	6369.15	67.918	100.86	-.308	23.43	58.64	.00	.00	

Ratio offset 0.9915 +.308 Phase Offset

COPY OF FILE wftl5dof.cir

```
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 6.3 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 23.426 3 0 +58.644
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl5d.cir

I	27.9390	0	1	81.1650	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	6.3000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	23.4260	3	0	58.6440	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	2668.3520	156.0962
2	2661.2260	156.6770
3	1779.4780	149.0825

			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	VSWR
R	1- 2	1.000	27.94	81.165	27.94	81.165	24.83	92.22	23.83	92.22	
L	2- 3	6.300	927.66	171.363	27.57	81.363	24.47	93.37	24.47	59.72	
C	3- 0	.000	1779.48	149.083	.76	-120.917	.00	-2340.51	.00	.00	
L	2- 0	1310.000	2661.23	156.677	.38	66.677	.00	6996.33	.00	.00	
L	3- 0	3184.000	1779.48	149.083	.10	59.083	.00	17004.81	.00	.00	
R	3- 0	23.426	1779.48	149.083	28.18	80.857	23.43	58.64	.00	.00	

COPY OF FILE wftl5d.cir

```
0.85 0. 1
I 27.939 0 1 81.165
R 1.0000 1 2
L 6.3 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 23.426 3 0 +58.644
EX
```

CIRCUIT MODELING FOR DAYTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl6dof.cir

I	100.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	7.5000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	-4.6402	3	0	49.7120	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	8960.5310	92.3617
2	8965.2110	93.0003
3	5020.8760	95.3935

				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	VSWR
R	1-	2	1.000	100.00	.000	100.00	.000	-3.69	89.53	-4.69	89.53	
L	2-	3	7.500	3954.27	89.961	98.72	-.039	-4.81	90.69	-4.81	50.63	
C	3-	0	.000	5020.88	95.393	2.15	-174.607	.00	-2340.51	.00	.00	
L	2-	0	1310.000	8965.21	93.000	1.28	3.000	.00	6996.33	.00	.00	
L	3-	0	3184.000	5020.88	95.393	.30	5.393	.00	17004.81	.00	.00	
R	3-	0	-4.640	5020.88	95.393	100.56	.061	-4.64	49.71	.00	.00	
				ratio offset .9944			-.061 degrees phase offset					

```
COPY OF FILE wftl6dof.cir
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 7.5 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R -4.6402 3 0 +49.712
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl6d.cir

I	16.5250	0	1	-170.1330	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	7.5000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	-4.6402	3	0	49.7120	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	1480.7280	-77.7713
2	1481.5010	-77.1327
3	829.6997	-74.7395

				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	VSWR
R	1-	2	1.000	16.52	-170.133	16.52	-170.133	-3.69	89.53	-4.69	89.53	
L	2-	3	7.500	653.44	-80.172	16.31	-170.172	-4.81	90.69	-4.81	50.63	
C	3-	0	.000	829.70	-74.740	.35	15.260	.00	-2340.51	.00	.00	
L	2-	0	1310.000	1481.50	-77.133	.21	-167.133	.00	6996.33	.00	.00	
L	3-	0	3184.000	829.70	-74.740	.05	-164.740	.00	17004.81	.00	.00	
R	3-	0	-4.640	829.70	-74.740	16.62	-170.072	-4.64	49.71	.00	.00	

```
COPY OF FILE wftl6d.cir
0.85 0. 1
I 16.525 0 1 -170.133
R 1.0000 1 2
L 7.5 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R -4.6402 3 0 +49.712
EX
```

CIRCUIT MODELING FOR NIGHTTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl1nof.cir

```
I   100.0000    0    1     .0000     .0000     .0000
R     1.0000    1    2     .0000     .0000     .0000
L     5.1000    2    3     .0000     .0000     .0000
C      .0001    3    0     .0000     .0000     .0000
L  1310.0000    2    0     .0000     .0000     .0000
L  3184.0000    3    0     .0000     .0000     .0000
R   248.6200    3    0  152.3210     .0000     .0000
EX     .0000    0    0     .0000     .0000     .0000
```

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	31369.0400	32.4497
2	31284.7000	32.5480
3	30029.0000	28.1629

			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	VSWR
R	1-	2	1.000	100.00	.000	100.00	.000	264.71	168.31	263.71	168.31	
L	2-	3	5.100	2660.22	92.212	97.67	2.212	276.46	161.78	276.46	134.55	
C	3-	0	.000	30029.00	28.163	12.83	118.163	.00	-2340.51	.00	.00	
L	2-	0	1310.000	31284.70	32.548	4.47	-57.452	.00	6996.33	.00	.00	
L	3-	0	3184.000	30029.00	28.163	1.77	-61.837	.00	17004.81	.00	.00	
R	3-	0	248.620	30029.00	28.163	102.99	-3.331	248.62	152.32	.00	.00	

ratio offset 0.971 +3.331 phase offset

```
COPY OF FILE wftl1nof.cir
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 5.1 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 248.62 3 0 +152.321
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl1n.cir

```
I     5.0306    0    1  -64.1200     .0000     .0000
R     1.0000    1    2     .0000     .0000     .0000
L     5.1000    2    3     .0000     .0000     .0000
C      .0001    3    0     .0000     .0000     .0000
L  1310.0000    2    0     .0000     .0000     .0000
L  3184.0000    3    0     .0000     .0000     .0000
R   248.6200    3    0  152.3210     .0000     .0000
EX     .0000    0    0     .0000     .0000     .0000
```

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	1578.0510	-31.6703
2	1573.8080	-31.5720
3	1510.6390	-35.9571

			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	VSWR
R	1-	2	1.000	5.03	-64.120	5.03	-64.120	264.71	168.31	263.71	168.31	
L	2-	3	5.100	133.82	28.092	4.91	-61.908	276.46	161.78	276.46	134.55	
C	3-	0	.000	1510.64	-35.957	.65	54.043	.00	-2340.51	.00	.00	
L	2-	0	1310.000	1573.81	-31.572	.22	-121.572	.00	6996.33	.00	.00	
L	3-	0	3184.000	1510.64	-35.957	.09	-125.957	.00	17004.81	.00	.00	
R	3-	0	248.620	1510.64	-35.957	5.18	-67.451	248.62	152.32	.00	.00	

```
   COPY OF FILE wwftl1n.cir
0.85 0. 1
I 5.0306 0 1 -64.120
R 1.0000 1 2
L 5.1 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 248.62 3 0 +152.321
EX
```

CIRCUIT MODELING FOR NIGHTTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl2nof.cir

I	100.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	6.3000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	86.1140	3	0	156.8190	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	21378.4700	64.3198
2	21335.3300	64.5618
3	18456.1600	60.0705

			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	VSWR
R	1-	2	1.000	100.00	.000	100.00	.000	92.64	192.67	91.64	192.67	
L	2-	3	6.300	3272.29	90.772	97.25	.772	96.89	196.82	96.89	163.17	
C	3-	0	.000	18456.16	60.071	7.89	150.071	.00	-2340.51	.00	.00	
L	2-	0	1310.000	21335.33	64.562	3.05	-25.438	.00	6996.33	.00	.00	
L	3-	0	3184.000	18456.16	60.071	1.09	-29.929	.00	17004.81	.00	.00	
R	3-	0	86.114	18456.16	60.071	103.16	-1.157	86.11	156.82	.00	.00	

ratio offset 0.9694 +1.157 phase offset

```
COPY OF FILE wftl2nof.cir
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 6.3 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 86.114 3 0 +156.819
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl2n.cir

I	13.1314	0	1	31.2230	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	6.3000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	86.1140	3	0	156.8190	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	2807.2920	95.5428
2	2801.6270	95.7848
3	2423.5520	91.2935

			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	VSWR
R	1-	2	1.000	13.13	31.223	13.13	31.223	92.64	192.67	91.64	192.67	
L	2-	3	6.300	429.70	121.995	12.77	31.995	96.89	196.82	96.89	163.17	
C	3-	0	.000	2423.55	91.294	1.04	-178.706	.00	-2340.51	.00	.00	
L	2-	0	1310.000	2801.63	95.785	.40	5.785	.00	6996.33	.00	.00	
L	3-	0	3184.000	2423.55	91.294	.14	1.294	.00	17004.81	.00	.00	
R	3-	0	86.114	2423.55	91.294	13.55	30.066	86.11	156.82	.00	.00	

```
   COPY OF FILE wftl2n.cir
0.85 0. 1
I 13.1314 0 1 31.223
R 1.0000 1 2
L 6.3 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 86.114 3 0 +156.819
EX
```

CIRCUIT MODELING FOR NIGHTTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl3nof.cir

I	100.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	7.0000	3	2	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	23.5170	3	0	164.9150	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	20818.2200	82.7962
2	20805.9200	83.0694
3	17211.8300	81.5676

			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	VSWR
R	1- 2	1.000	100.00	.000	100.00	.000	26.11	206.54	25.11	206.54	
L	3- 2	7.000	3628.16	-89.788	97.05	-179.788	-26.66	-175.34	-26.66	-212.72	
C	3- 0	.000	17211.83	81.568	7.35	171.568	.00	-2340.51	.00	.00	
L	2- 0	1310.000	20805.92	83.069	2.97	-6.931	.00	6996.33	.00	.00	
L	3- 0	3184.000	17211.83	81.568	1.01	-8.432	.00	17004.82	.00	.00	
R	3- 0	23.517	17211.83	81.568	103.32	-.317	23.52	164.91	.00	.00	

ratio offset 0.968 +.317 phase offset

```
COPY OF FILE wftl3nof.cir
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 7.0 3 2
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 29.801 3 0 +186.123
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl3n.cir

I	7.1481	0	1	138.1720	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	7.0000	3	2	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	23.5170	3	0	164.9150	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	1488.1070	-139.0318
2	1487.2280	-138.7585
3	1230.3190	-140.2604

			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	VSWR
R	1- 2	1.000	7.15	138.172	7.15	138.172	26.11	206.54	25.11	206.54	
L	3- 2	7.000	259.34	48.384	6.94	-41.616	-26.66	-175.34	-26.66	-212.72	
C	3- 0	.000	1230.32	-140.260	.53	-50.260	.00	-2340.51	.00	.00	
L	2- 0	1310.000	1487.23	-138.759	.21	131.241	.00	6996.33	.00	.00	
L	3- 0	3184.000	1230.32	-140.260	.07	129.740	.00	17004.81	.00	.00	
R	3- 0	23.517	1230.32	-140.260	7.39	137.855	23.52	164.91	.00	.00	

```
   COPY OF FILE wftl3n.cir
0.85 0. 1
I 7.1481 0 1 138.172
R 1.0000 1 2
L 7.0 3 2
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 23.517 3 0 +164.915
EX
```

CIRCUIT MODELING FOR NIGHTTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl4nof.cir

```
I   100.0000    0    1     .0000     .0000     .0000
R     1.0000    1    2     .0000     .0000     .0000
L     9.2000    2    3     .0000     .0000     .0000
C      .0001    3    0     .0000     .0000     .0000
L  1310.0000    2    0     .0000     .0000     .0000
L  3184.0000    3    0     .0000     .0000     .0000
R   252.9870    3    0  245.5880     .0000     .0000
EX     .0000    0    0     .0000     .0000     .0000
```

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	40169.7700	45.8694
2	40100.2000	45.9719
3	37006.9500	40.6773

				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	VSWR
R	1-	2	1.000	100.00	.000	100.00	.000	279.70	288.32	278.70	288.32	
L	2-	3	9.200	4715.03	92.379	95.96	2.379	302.65	288.14	302.65	239.00	
C	3-	0	.000	37006.95	40.677	15.81	130.677	.00	-2340.51	.00	.00	
L	2-	0	1310.000	40100.20	45.972	5.73	-44.028	.00	6996.33	.00	.00	
L	3-	0	3184.000	37006.95	40.677	2.18	-49.323	.00	17004.81	.00	.00	
R	3-	0	252.987	37006.95	40.677	104.96	-3.472	252.99	245.59	.00	.00	

ratio offset 0.953 +3.472 degrees phase offset

```
COPY OF FILE wftl4nof.cir
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 9.2 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 252.987 3 0 +245.588
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl4n.cir

```
I     4.7070    0    1  -86.2590     .0000     .0000
R     1.0000    1    2     .0000     .0000     .0000
L     9.2000    2    3     .0000     .0000     .0000
C      .0001    3    0     .0000     .0000     .0000
L  1310.0000    2    0     .0000     .0000     .0000
L  3184.0000    3    0     .0000     .0000     .0000
R   252.9870    3    0  245.5880     .0000     .0000
EX     .0000    0    0     .0000     .0000     .0000
```

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	1890.7910	-40.3896
2	1887.5160	-40.2871
3	1741.9170	-45.5817

				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	VSWR
R	1-	2	1.000	4.71	-86.259	4.71	-86.259	279.70	288.32	278.70	288.32	
L	2-	3	9.200	221.94	6.120	4.52	-83.880	302.65	288.14	302.65	239.00	
C	3-	0	.000	1741.92	-45.582	.74	44.418	.00	-2340.51	.00	.00	
L	2-	0	1310.000	1887.52	-40.287	.27	-130.287	.00	6996.33	.00	.00	
L	3-	0	3184.000	1741.92	-45.582	.10	-135.582	.00	17004.81	.00	.00	
R	3-	0	252.987	1741.92	-45.582	4.94	-89.732	252.99	245.59	.00	.00	

```
COPY OF FILE wftl4n.cir
0.85 0. 1
I 4.707 0 1 -86.259
R 1.0000 1 2
L 9.2 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 252.987 3 0 +245.588
EX
```

CIRCUIT MODELING FOR NIGHTTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl5nof.cir

```
I   100.0000    0    1     .0000     .0000     .0000
R     1.0000    1    2     .0000     .0000     .0000
L     6.3000    2    3     .0000     .0000     .0000
C      .0001    3    0     .0000     .0000     .0000
L  1310.0000    2    0     .0000     .0000     .0000
L  3184.0000    3    0     .0000     .0000     .0000
R    27.8110    3    0   63.8750     .0000     .0000
EX     .0000    0    0     .0000     .0000     .0000
```

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	10182.1100	73.2421
2	10153.7300	73.7825
3	7034.8430	66.1061

			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	VSWR
R	1- 2	1.000	100.00	.000	100.00	.000	29.36	97.50	28.36	97.50	
L	2- 3	6.300	3317.79	90.236	98.61	.236	29.16	98.75	29.16	65.11	
C	3- 0	.000	7034.84	66.106	3.01	156.106	.00	-2340.51	.00	.00	
L	2- 0	1310.000	10153.73	73.782	1.45	-16.218	.00	6996.33	.00	.00	
L	3- 0	3184.000	7034.84	66.106	.41	-23.894	.00	17004.81	.00	.00	
R	3- 0	27.811	7034.84	66.106	100.98	-.366	27.81	63.88	.00	.00	

ratio offset 0.9905 +.366 degree Phase offset

COPY OF FILE wftl5nof.cir

```
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 6.3 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 23.426 3 0 +58.644
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl5n.cir

```
I    20.3440    0    1    3.1420     .0000     .0000
R     1.0000    1    2     .0000     .0000     .0000
L     6.3000    2    3     .0000     .0000     .0000
C      .0001    3    0     .0000     .0000     .0000
L  1310.0000    2    0     .0000     .0000     .0000
L  3184.0000    3    0     .0000     .0000     .0000
R    27.8110    3    0   63.8750     .0000     .0000
EX     .0000    0    0     .0000     .0000     .0000
```

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	2071.4480	76.3841
2	2065.6750	76.9245
3	1431.1680	69.2481

			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	VSWR
R	1- 2	1.000	20.34	3.142	20.34	3.142	29.36	97.50	28.36	97.50	
L	2- 3	6.300	674.97	93.378	20.06	3.378	29.16	98.75	29.16	65.11	
C	3- 0	.000	1431.17	69.248	.61	159.248	.00	-2340.51	.00	.00	
L	2- 0	1310.000	2065.67	76.924	.30	-13.076	.00	6996.33	.00	.00	
L	3- 0	3184.000	1431.17	69.248	.08	-20.752	.00	17004.81	.00	.00	
R	3- 0	27.811	1431.17	69.248	20.54	2.776	27.81	63.87	.00	.00	

COPY OF FILE wftl5n.cir

```
0.85 0. 1
I 20.344 0 1 3.142
R 1.0000 1 2
L 6.3 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R 27.811 3 0 +63.875
EX
```

CIRCUIT MODELING FOR NIGHTTIME PATTERN

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl6nof.cir

I	100.0000	0	1	.0000	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	7.5000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	-10.0190	3	0	64.2050	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	10462.1200	95.0446
2	10471.3800	95.5897
3	6556.4670	99.0011

			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	VSWR
R	1- 2	1.000	100.00	.000	100.00	.000	-9.20	104.22	-10.20	104.22	
L	2- 3	7.500	3945.87	89.915	98.51	-.085	-10.51	105.78	-10.51	65.72	
C	3- 0	.000	6556.47	99.001	2.80	-170.999	.00	-2340.51	.00	.00	
L	2- 0	1310.000	10471.38	95.590	1.50	5.590	.00	6996.33	.00	.00	
L	3- 0	3184.000	6556.47	99.001	.39	9.001	.00	17004.81	.00	.00	
R	3- 0	-10.019	6556.47	99.001	100.90	.132	-10.02	64.20	.00	.00	

ratio offset 0.991 -.132 degree phase offset

```
COPY OF FILE wftl6nof.cir
0.85 0. 1
I 100 0 1
R 1.0000 1 2
L 7.5 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R -10.019 3 0 +64.205
EX
```

WESTBERG CIRCUIT ANALYSIS PROGRAM

FILE NAME = wftl6n.cir

I	12.7804	0	1	114.4500	.0000	.0000
R	1.0000	1	2	.0000	.0000	.0000
L	7.5000	2	3	.0000	.0000	.0000
C	.0001	3	0	.0000	.0000	.0000
L	1310.0000	2	0	.0000	.0000	.0000
L	3184.0000	3	0	.0000	.0000	.0000
R	-10.0190	3	0	64.2050	.0000	.0000
EX	.0000	0	0	.0000	.0000	.0000

FREQ = .850

NODE	VOLT MAG	VOLT PHASE
1	1337.1000	-150.5054
2	1338.2840	-149.9603
3	837.9427	-146.5488

			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	VSWR
R	1- 2	1.000	12.78	114.450	12.78	114.450	-9.20	104.22	-10.20	104.22	
L	2- 3	7.500	504.30	-155.635	12.59	114.365	-10.51	105.78	-10.51	65.72	
C	3- 0	.000	837.94	-146.549	.36	-56.549	.00	-2340.51	.00	.00	
L	2- 0	1310.000	1338.28	-149.960	.19	120.040	.00	6996.33	.00	.00	
L	3- 0	3184.000	837.94	-146.549	.05	123.451	.00	17004.81	.00	.00	
R	3- 0	-10.019	837.94	-146.549	12.89	114.582	-10.02	64.20	.00	.00	

```
   COPY OF FILE wftl6n.cir
0.85 0. 1
I 12.7804 0 1 114.45
R 1.0000 1 2
L 7.5 2 3
C 0.00008 3 0
L 1310. 2 0
L 3184 3 0
R -10.019 3 0 +64.205
EX
```

Derivation of Operating Parameters for Nighttime Hours Directional Antenna

Once calibrated against the measured individual open-circuited base impedances, the moment method model was utilized for nighttime directional antenna calculations. These calculations were made to determine the complex voltage source values to be applied at ground level for each tower of the array to produce the current moment sums for the towers which, when normalized to the reference tower, equate to the theoretical field parameters of the authorized directional pattern. These voltage sources were then applied in the model and the tower currents were calculated.

Twenty segments were used for towers 1, 5, and 6, and the number of segments increasing with the actual tower height so that the segments are similar length for all towers. The WFTL towers are base sampled, which is permitted for towers of 120 electrical degrees or less. As such, the first (ground) segment of each tower was used to determine the model operating parameters of the array.

A circuit model was constructed to determine the effect of the series feed inductance, and shunt base region capacitance on the ATU output current. The circuit model for each tower is essentially the circuit model used for model verification above using the model-predicted operating impedance for each tower. Again, this model was used with the Westberg Circuit Analysis Program (WCAP).

This effect was, as expected, minimal, and the results are tabulated in the table below along with the base operating parameters for the nighttime array.

Twr.	Node	Current Magnitude (amperes)	Current Phase (degrees)	WCAP Current Offset for Unity I_{BASE}	WCAP Phase Offset for Unity $Ø_{BASE}$ (degrees)	Antenna Monitor Ratio	Antenna Monitor Phase (degrees)
1	1	5.1810	-67.451	0.971	+3.331	0.383	-95.3
2	21	13.5459	30.066	0.969	+1.157	1.00ref	0.0ref
3	42	7.3854	137.855	0.968	+0.317	0.544	106.9
4	64	4.9409	-89.731	0.953	3.472	0.358	-117.4
5	87	20.5392	2.776	0.9905	+0.366	1.549	-28.1
6	107	12.8954	114.582	0.991	-0.132	0.973	+83.2