Call KIFM
Fac. ID 67848
File No. BMML-20230706AAD

CHECKLIST FOR MOMENT METHOD PROOFS

1. Only arrays with series-fed radiators may submit moment method proofs. Arrays consisting of sectionalized towers or folded dipoles are not eligible. Antenna must have conventional ground system.
   The towers are series-fed. Tower 1 has a decoupled section for an FM antenna..

2. Surveyor's certificate (not required for mod. of license). See application comparison of tower moments with theoreticals.
   N/R

3. Sampling system.
   a. Base current sampling: tower must be
      <= 120 electrical degrees, or > 190 electrical degrees. 195.2, 209.32, 95.81

   b. Base voltage sampling: tower must be > 105 degrees.
      N/A.

   c. Sampling-loops on tower:
      i. Towers must be identical in structure.

      ii. Loops must be mounted identically with respect to leg and crossmember structure.

      iii. Loops must be mounted at height where current nulls occur in detuned condition.

   d. Length of sampling lines, as established by measurement, must be equal (within one electrical degree). 435.49 - 435.85

   e. Characteristic impedance must be equal within 2 ohms.
      48.41 - 48.87

f. If base sampling is used, applicant must include measurements to establish that sampling devices agree within the manufacturer's rated accuracy. Done.

g. Must include sampling line impedance measurements w/ sampling device connected. Done.

4. Modeling guidelines.
   a. Model does not violate internal program guidelines w/ respect to segment length, ratio, etc. Okay.

   b. Wire radius must be between 80 and 150 percent of nominal value r = 3*s/2π , where r is the radius of the wire and s is the width of the tower face. 100%

   c. Modeled height must be between 75 and 125 percent of actual tower height. 105.52 - 107.73

   d. Measured base impedances must be within 2 ohms and 4 percent of modeled impedances. Okay; see p.1 of worksheets

   e. No less than one segment/10 electrical degrees of physical height. Max is 6.55 deg/seg.

   f. Reference point at tower base must be at ground level, or within one electrical degree of actual feed point. Okay

   g. Lumped series inductance <+ 10 uH unless measured value is used. Max is 6.09 uH

   h. Shunt capacitance <=250 pF unless measured or manufacturer's stated capacitance is used. Max is 177 pf

5. Operating parameters. Confirm that the operating parameters correctly reflect the current ratios and phases computed by the model. For base sampling, include necessary circuit calculations between the tower base and the ATU. Done, see work pages.

6. Reference points. Applicant must include at least 3 measurements on null and main lobe radials. Checked via plot of antenna patterns.

KIFM:

X_{SDC} 50,000

$2\pi fL = 50{,}000$

$L = 6029$

$X_{S_1} = j50.55$

$2\pi fL = 50.55$

$L = 6.09\ mH$

X_{S_2}: $2\pi fL = 32.8$

$L = 3.95\ \mu H$

X_C: $\frac{1}{2\pi fC} = 681$

$\frac{1}{2\pi 132.681} = C$

$C = .000177$

X_{C_2}: $\frac{1}{2\pi fC} = j726$

$C = .000166$

$Z_1 = 163.56 + j204.6$

$296.06 - j119.03$

X_{S_3}: $2\pi fL = j41.3$

$L = 5.02$

$X_{C_3} = \frac{1}{2\pi fC} = 6030$

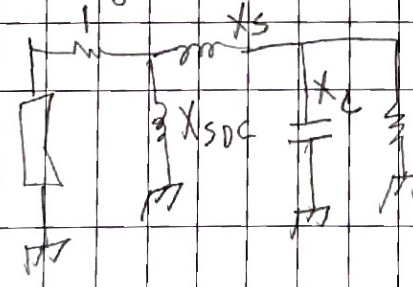
$C = .000020$

1: $180.04 - j408.72$

2: $84.121 - j300.93$

3: $68.317 + j41.52$

	Station Worked	Time	Power
Base modeling			
1.	MEAS BY APPL: $68.9 - j215.3$	$42.8 - j182.2$	$65.9 + j83.1$
	MODELED BY MBARO: $180.04 - j408.72$	$84.121 - j300.93$	$68.31 + j41.52$
	MODELED BY WCAP: $69.06 - j217.09$	$42.08 - j184.075$	$69.02 + j82.61$

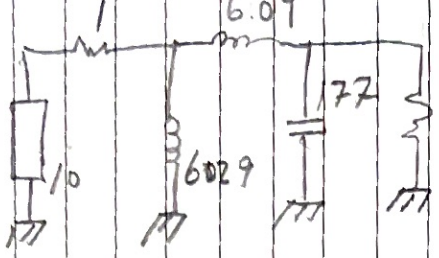


KIFM: #2

Impedances as calculated by MBARO:

	Data:	I:
1.	$371.92 - j\,574.6$	$1.733422 \angle 137.6$
2.	$-179.5 - j\,332.19$	$1.3114 \angle 238.9$
3	$84.544 + j\,38.811$	$7.04088 \angle 50.8$

1.

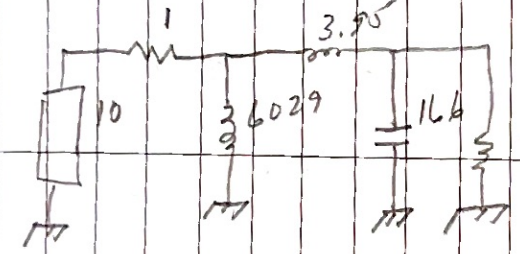


X_{SDC}: 6029
X_{S_1}: 6.09
X_{S_2}: 3.95
X_{S_3}: 5.02
X_{C_1}: 0.000177
X_{C_2}: 0.000166
X_{C_3}: .00002

$$\frac{10}{5.23 \angle -16.381} = \frac{X}{1.733422 \angle 137.6}$$

$$\frac{1}{2.3342} \angle 137.6 + 16.381 = 3.31 \angle 153.98$$

2.



$$\frac{10}{6.79 \angle 9.53} = \frac{X}{1.3114 \angle 238.9}$$

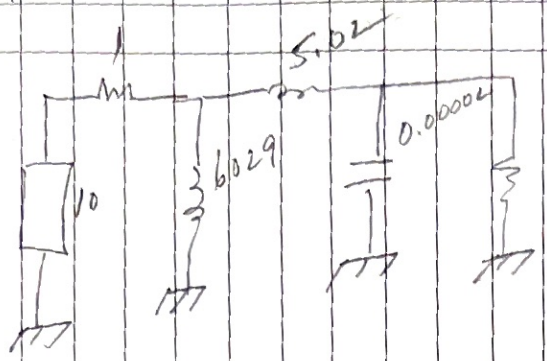
$$\frac{13.114}{6.79} \angle 238.9 - 9.53, \quad X = 1.93 \angle 229.37 = 1.93 \angle -130.6$$

Comments
Name
QSL VIA
QSL S R
QTH
Time Off
Report Rec'd Sent
Station Worked
Time
Power
Mode
Frequency
Date

KIFM #3

QSL S | R

3.



Antenna:
DA4: 5.5 mi
54.5 mi
121.5 mi
207 mi
243.5 mi
316 mi ✓ OK

$\frac{10}{10.05 \angle -0.711} = \frac{X}{7.07088 \angle 310.8}$

$\frac{70.4088}{10.05} \angle 310.8 + 0.711 = 7.006 \angle 311.51 = 7.006 \angle -48.5$

	QSL VIA	Comments Name	QTH	Time Off	Report Sent / Rec'd	Station Worked	Time
		Daytime antenna monitor parameters:					
1.			3.31 ∠ 153.98	0.473 ∠ -157.5			
2.			1.93 ∠ -130.6	0.276 ∠ -82.1			
3.			7.006 ∠ -48.5	1.0 ∠ 0			
						KIFM Nighttime	
1.				1.6737 ∠ 139.7		162.69 − j 374.82	
2.				1.19146 ∠ 158.4		78.194 − j 307.1	
3.				2.20909 ∠ 108.6		6.895 + j 52.36	

APPLICANT:
0.476 ∠ -157.5
0.277 ∠ -82.3
1 ∠ 0 ✓

Ant
NIGHT
78.5 mi
153.5 mi
235 mi
295 mi ✓ OK
359.5 mi

Date	Frequency	Mode	Power
1.			

$\frac{10}{6.39 \angle -9.05} \times \frac{}{1.6737 \angle 139.7}$

$\frac{16.737}{6.39} \angle 139.7 + 9.05 = 2.62 \angle 148.8$

KJFM #4

2. $\frac{10}{2.03 \angle -4.283} = \frac{X}{1.19146 \angle 158.4}$

$\frac{11.9146}{7.03} \angle 158.4 + 4.283 = 1.69 \angle 162.68$

3. $\frac{10}{10.07 \angle -0.058} = \frac{X}{2.20909 \angle 108.6}$

$\frac{22.0909}{10.07} \angle 108.6 + 0.058 = 2.19 \angle 108.7$

Might this antenna match parameters

Comments Name	QSL VIA	QSL S	QSL R	QTH	Time Off	Report Sent	Report Rec'd	Station Worked	Time	Frequency	Mode	Power	Date
				1. 2.62 ∠148.8	1 ∠0			Applicant values 1 ∠0					
				2. 1.69 ∠162.68	0.65 ∠13.9			0.647 ∠13.9					
				3. 2.19 ∠108.7	0.84 ∠-40.1			0.833 ∠-40.1					

Tapping Point measurements

1. (SW) $\frac{1.320}{1.362853} * 450 = 435.85$

$\frac{405}{450} * 1.362853 = 1.2266$; $((6.55^2 + 48.4^2)^{1/2} * (8.83^2 + 48.1^2)^{1/2})^{1/2} = 48.87$

2. (N) $\frac{1.32}{1.363284} * 450 = 435.71$

$\frac{405}{450} * 1.363284 = 1.227$; $((6.51^2 + 48^2)^{1/2} * (8.47^2 + 47.6^2)^{1/2})^{1/2} = 48.41$

3. (S) $\frac{1.32}{1.363587} * 450 = 435.49$

$\frac{405}{450} * 1.363587 = 1.2276$; $((6.17^2 + 48.1^2)^{1/2} * (8.41^2 + 47.8^2)^{1/2})^{1/2} = 48.52$

C:\Users\david\iCloudDrive\FCC\Teleworking 2020\KIFM tower 1 others float
12-29-2023 13:12:02

IMPEDANCE
   normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 1, sector 1							
1.32	180.04	-408.72	446.62	293.8	22.391	-.77636	-7.8596

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12-29-2023 12:04:22

IMPEDANCE
   normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 71, sector 1							
1.32	298.57	306.6	427.96	45.8	12.355	-1.4091	-5.5738

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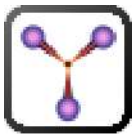
12-29-2023 13:07:52

IMPEDANCE
   normalization = 50.

freq (MHz)	resist (ohms)	react (ohms)	imped (ohms)	phase (deg)	VSWR	S11 dB	S12 dB
source = 1; node 101, sector 1							
1.32	68.317	41.52	79.944	31.3	2.1344	-8.8279	-.60971



WCAP - KIFM WCAP 1

WCAP OUTPUT AT FREQUENCY: 1.320 MHz

NODE VOLTAGES

Node:	1	228.1169 ∠	-72.1152° V
Node:	2	227.8118 ∠	-72.3545° V
Node:	3	276.5988 ∠	-75.5277° V

WCAP PART		CURRENT IN	CURRENT OUT

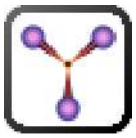
WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2 1.00000000	1.00 ∠ 0.000° V	1.00 ∠ 0.000° A
R	3→0 180.04000000	276.60 ∠ -75.528° V	0.62 ∠ -9.301° A
C	3→0 0.00017700	276.60 ∠ -75.528° V	0.41 ∠ 14.472° A
L	2→3 6.09000000	50.73 ∠ 90.079° V	1.00 ∠ 0.079° A
L	2→0 6029.00000000	227.81 ∠ -72.355° V	0.00 ∠ -162.355° A

WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2 1.00000000	70.06 - j 217.093	69.06 - j 217.093
R	3→0 180.04000000	180.04 - j 408.720	0.00 + j 0.000
C	3→0 0.00017700	0.00 - j 681.197	0.00 + j 0.000
L	2→3 6.09000000	68.46 - j 216.249	68.46 - j 266.758
L	2→0 6029.00000000	0.00 + j 50003.348	0.00 + j 0.000

WCAP PART	VSWR

WCAP INPUT DATA:

```
      1.3200      0.00000000   0
I        1.00000000   0   1      0.00000000
R        1.00000000   1   2      0.00000000
R      180.04000000   3   0   -408.72000000
C        0.00017700   3   0
L        6.09000000   2   3      0.00000000
L     6029.00000000   2   0      0.00000000
```



WCAP - KIFM WCAP 2

WCAP OUTPUT AT FREQUENCY: 1.320 MHz

NODE VOLTAGES

Node:	1	189.0498 ∠	-76.8271° V
Node:	2	188.8244 ∠	-77.1225° V
Node:	3	221.0053 ∠	-79.0157° V

WCAP PART		CURRENT IN	CURRENT OUT

WCAP PART			BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	1.00 ∠ 0.000° V	1.00 ∠ 0.000° A
R	3→0	84.12100000	221.01 ∠ -79.016° V	0.71 ∠ -4.633° A
C	3→0	0.00016600	221.01 ∠ -79.016° V	0.30 ∠ 10.984° A
L	2→3	3.95000000	32.88 ∠ 90.048° V	1.00 ∠ 0.048° A
L	2→0	6029.00000000	188.82 ∠ -77.123° V	0.00 ∠ -167.123° A

WCAP PART			FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	43.08 - j 184.075	42.08 - j 184.075
R	3→0	84.12100000	84.12 - j 300.930	0.00 + j 0.000
C	3→0	0.00016600	0.00 - j 726.337	0.00 + j 0.000
L	2→3	3.95000000	41.77 - j 183.435	41.77 - j 216.196
L	2→0	6029.00000000	0.00 + j 50003.348	0.00 + j 0.000

WCAP PART		VSWR

WCAP INPUT DATA:

	1.3200	0.00000000	0	
I	1.00000000	0	1	0.00000000
R	1.00000000	1	2	0.00000000
R	84.12100000	3	0	-300.93000000
C	0.00016600	3	0	
L	3.95000000	2	3	0.00000000
L	6029.00000000	2	0	0.00000000

WCAP - KIFM WCAP 3

WCAP OUTPUT AT FREQUENCY: 1.320 MHz

NODE VOLTAGES

Node:	1	108.2957 ∠	49.7148° V
Node:	2	107.6518 ∠	50.1208° V
Node:	3	80.3547 ∠	30.7175° V

WCAP PART	CURRENT IN	CURRENT OUT

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	1.00 ∠ 0.000° V	1.00 ∠ 0.000° A
R	3→0	68.31000000	80.35 ∠ 30.717° V	1.01 ∠ -0.574° A
C	3→0	0.00002000	80.35 ∠ 30.717° V	0.01 ∠ 120.717° A
L	2→3	5.02000000	41.57 ∠ 90.079° V	1.00 ∠ 0.079° A
L	2→0	6029.00000000	107.65 ∠ 50.121° V	0.00 ∠ -39.879° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	70.02 + j 82.612	69.02 + j 82.612
R	3→0	68.31000000	68.31 + j 41.520	0.00 + j 0.000
C	3→0	0.00002000	0.00 - j 6028.596	0.00 + j 0.000
L	2→3	5.02000000	69.25 + j 82.653	69.25 + j 41.018
L	2→0	6029.00000000	0.01 + j 50003.348	0.00 + j 0.000

WCAP PART	VSWR

WCAP INPUT DATA:

```
      1.3200      0.00000000   0
I        1.00000000   0   1      0.00000000
R        1.00000000   1   2      0.00000000
R       68.31000000   3   0     41.52000000
C        0.00002000   3   0
L        5.02000000   2   3      0.00000000
L     6029.00000000   2   0      0.00000000
```

12-29-2023 11:52:44

PROBLEM DEFINITION EVALUATION
maximum frequency = 1.32 MHz
shortest wavelength = 227.121 meters
number of wires = 4

INDIVIDUAL WIRES
segment length to wavelength ratio: No detected violations!
segment length to radius ratio:
wire 1 - warning 7.13447
wire 2 - error 1.952637
radius to wavelength ratio: No detected violations!
checking for wires in groud plane: No detected violations!

WIRE JUNCTIONS
junction segment length ratio:
node 2 wires 1 , 2 - warning 3.653761
junction radius ratio: No detected violations!

ELECTRICAL DESCRIPTION
No detected violations!

C:\Users\david\iCloudDrive\FCC\Teleworking 2020\KIFM daytime array.DGE se
12-29-2023 14:40:19

CURRENT rms
Frequency = 1.32 MHz
Input power = 5,000. watts
Efficiency = 100. %
coordinates in meters

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.73342	137.6	-1.28066	1.16819
2	0	0	4.105	1.02783	104.5	-.257085	.995154
3	0	0	8.21	.965394	65.4	.401775	.877817
4	0	0	12.315	1.25277	37.8	.990346	.767225
5	0	0	16.42	1.66892	23.3	1.53311	.659451
6	0	0	20.525	2.11248	15.2	2.03875	.55326
7	0	0	24.63	2.54886	10.1	2.50907	.448614
8	0	0	28.735	2.9634	6.7	2.94314	.345984
9	0	0	32.84	3.3478	4.2	3.33874	.246097
10	0	0	36.945	3.6962	2.3	3.69316	.149807
11	0	0	41.05	4.00396	.8	4.00354	.0580237
12	0	0	45.155	4.26722	359.6	4.26712	-.0283331
13	0	0	49.26	4.48269	358.6	4.48138	-.108366
14	0	0	53.365	4.64773	357.8	4.6442	-.181228
15	0	0	57.47	4.76021	357.	4.75385	-.24614
16	0	0	61.575	4.81861	356.4	4.80911	-.302409
17	0	0	65.68	4.82201	355.8	4.80933	-.349443
18	0	0	69.785	4.77008	355.3	4.75438	-.386759
19	0	0	73.89	4.66308	354.9	4.64467	-.41399
20	0	0	77.995	4.50186	354.5	4.48119	-.430891
21	0	0	82.1	4.28784	354.1	4.26548	-.437336
22	0	0	86.205	4.02294	353.8	3.99953	-.43332
23	0	0	90.31	3.70952	353.5	3.68579	-.418943
24	0	0	94.415	3.35033	353.2	3.32704	-.394407
25	0	0	98.52	2.94833	353.	2.92627	-.359985
26	0	0	102.625	2.50645	352.8	2.48645	-.315981
27	0	0	106.73	2.0272	352.6	2.01011	-.262669
28	0	0	110.835	1.5118	352.4	1.49849	-.20013
29	0	0	114.94	.957806	352.3	.949235	-.127848
30	0	0	119.045	.35446	352.9	.351731	-.0439022
END	0	0	123.15	.479395	170.	-.472149	.0830349
2J1	0	0	123.15	.479395	170.	-.472149	.0830349
32	0	0	124.274	.261827	170.9	-.258534	.041397
33	0	0	125.397	.206363	172.2	-.204471	.0278799
34	0	0	126.521	.159712	174.2	-.1589	.0160902
35	0	0	127.644	.125223	177.	-.12505	6.59E-03
36	0	0	128.768	.0979056	180.9	-.097894	-1.51E-03
37	0	0	129.891	.0760555	186.4	-.0755763	-8.52E-03
38	0	0	131.015	.0587547	194.5	-.0568935	-.0146714
39	0	0	132.138	.0457187	206.1	-.0410689	-.0200884
40	0	0	133.262	.0371244	222.1	-.0275616	-.0248712
41	0	0	134.385	.03319	241.2	-.0159784	-.0290907
42	0	0	135.509	.0333489	259.6	-6.02E-03	-.0328007
43	0	0	136.632	.0361327	274.	2.54E-03	-.0360435
44	0	0	137.756	.0400913	284.3	9.88E-03	-.0388537
45	0	0	138.879	.0443133	291.4	.0161657	-.0412594
46	0	0	140.003	.048332	296.4	.0215045	-.0432844

47	0	0	141.126	.0519283	300.	.0260025	-.044949
48	0	0	142.25	.0550076	302.7	.029746	-.0462711
49	0	0	143.373	.057537	304.8	.0328089	-.0472661
50	0	0	144.497	.0595139	306.3	.0352548	-.0479479
51	0	0	145.62	.0609508	307.5	.037139	-.048329
52	0	0	146.744	.0618675	308.5	.03851	-.0484207
53	0	0	147.867	.0622866	309.3	.0394106	-.048233
54	0	0	148.991	.0622319	309.9	.0398786	-.0477756
55	0	0	150.114	.0617264	310.3	.0399475	-.0470568
56	0	0	151.238	.0607925	310.7	.0396476	-.0460847
57	0	0	152.361	.059451	311.	.0390057	-.0448662
58	0	0	153.485	.0577212	311.2	.0380457	-.043408
59	0	0	154.608	.0556205	311.4	.0367892	-.0417157
60	0	0	155.732	.0531649	311.5	.0352551	-.0397942
61	0	0	156.855	.0503676	311.6	.0334601	-.0376473
62	0	0	157.979	.0472403	311.7	.0314185	-.0352778
63	0	0	159.102	.0437913	311.7	.029142	-.0326867
64	0	0	160.226	.0400258	311.7	.0266395	-.0298731
65	0	0	161.349	.035944	311.7	.0239161	-.0268326
66	0	0	162.473	.0315392	311.7	.0209721	-.0235562
67	0	0	163.596	.0267932	311.6	.0177994	-.0200264
68	0	0	164.72	.0216698	311.6	.0143781	-.0162126
69	0	0	165.843	.0160548	311.5	.0106367	-.0120257
70	0	0	166.967	.0100234	311.4	6.63E-03	-7.52E-03
END	0	0	168.09	0	0	0	0
GND	120.013	-62.4746	0	1.3114	238.9	-.676444	-1.12347
72	120.013	-62.4746	4.402	.966293	250.7	-.319424	-.91197
73	120.013	-62.4746	8.804	.763268	265.	-.0661665	-.760395
74	120.013	-62.4746	13.206	.640106	285.5	.17128	-.616765
75	120.013	-62.4746	17.608	.622573	310.1	.400843	-.476363
76	120.013	-62.4746	22.01	.710002	331.6	.624369	-.338033
77	120.013	-62.4746	26.412	.865231	346.5	.841316	-.202021
78	120.013	-62.4746	30.814	1.05238	356.2	1.0501	-.0691693
79	120.013	-62.4746	35.216	1.25011	2.7	1.2487	.0593971
80	120.013	-62.4746	39.618	1.44635	7.2	1.4348	.182422
81	120.013	-62.4746	44.02	1.6336	10.5	1.60607	.298605
82	120.013	-62.4746	48.422	1.80657	13.	1.76021	.406656
83	120.013	-62.4746	52.824	1.96125	14.9	1.89503	.505336
84	120.013	-62.4746	57.226	2.09434	16.5	2.00849	.593487
85	120.013	-62.4746	61.628	2.20317	17.7	2.09881	.670059
86	120.013	-62.4746	66.03	2.28556	18.7	2.16445	.734126
87	120.013	-62.4746	70.432	2.33975	19.6	2.20417	.784903
88	120.013	-62.4746	74.834	2.36443	20.3	2.21704	.821758
89	120.013	-62.4746	79.236	2.35871	21.	2.20246	.844222
90	120.013	-62.4746	83.638	2.32212	21.5	2.16016	.852008
91	120.013	-62.4746	88.04	2.25459	22.	2.09026	.844986
92	120.013	-62.4746	92.442	2.15645	22.4	1.99314	.8232
93	120.013	-62.4746	96.844	2.02839	22.8	1.86954	.786876
94	120.013	-62.4746	101.246	1.87143	23.2	1.72047	.736374
95	120.013	-62.4746	105.648	1.68688	23.5	1.54716	.6722
96	120.013	-62.4746	110.05	1.47616	23.8	1.35096	.594938
97	120.013	-62.4746	114.452	1.24073	24.	1.13322	.505198
98	120.013	-62.4746	118.854	.981701	24.3	.894964	.403456
99	120.013	-62.4746	123.256	.698903	24.5	.636041	.289684
100	120.013	-62.4746	127.658	.388608	24.7	.35307	.162351
END	120.013	-62.4746	132.06	0	0	0	0
GND	37.4142	-69.7772	0	7.04088	310.8	4.59964	-5.33079

102	37.4142	-69.7772	3.0225	7.18498	308.1	4.43021	-5.6566
103	37.4142	-69.7772	6.045	7.23154	306.4	4.29485	-5.81803
104	37.4142	-69.7772	9.0675	7.22105	305.1	4.15121	-5.90856
105	37.4142	-69.7772	12.09	7.15744	303.9	3.99513	-5.93867
106	37.4142	-69.7772	15.1125	7.04267	302.9	3.82524	-5.91327
107	37.4142	-69.7772	18.135	6.87809	302.	3.64135	-5.83512
108	37.4142	-69.7772	21.1575	6.66494	301.1	3.44386	-5.70625
109	37.4142	-69.7772	24.18	6.40459	300.3	3.23347	-5.52843
110	37.4142	-69.7772	27.2025	6.09853	299.6	3.01107	-5.30335
111	37.4142	-69.7772	30.225	5.74844	298.9	2.77773	-5.03277
112	37.4142	-69.7772	33.2475	5.35613	298.2	2.53458	-4.71848
113	37.4142	-69.7772	36.27	4.92352	297.6	2.2828	-4.36232
114	37.4142	-69.7772	39.2925	4.45257	297.	2.02358	-3.96617
115	37.4142	-69.7772	42.315	3.94518	296.5	1.75807	-3.53181
116	37.4142	-69.7772	45.3375	3.40297	295.9	1.48727	-3.06076
117	37.4142	-69.7772	48.36	2.82693	295.4	1.21193	-2.55397
118	37.4142	-69.7772	51.3825	2.2167	294.9	.932222	-2.01115
119	37.4142	-69.7772	54.405	1.56859	294.4	.647057	-1.42891
120	37.4142	-69.7772	57.4275	.870536	293.9	.352083	-.79616
END	37.4142	-69.7772	60.45	0	0	0	0

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12-29-2023 15:07:32

CURRENT rms
Frequency = 1.32 MHz
Input power = 620. watts
Efficiency = 100. %
coordinates in meters

current no.	X	Y	Z	mag (amps)	phase (deg)	real (amps)	imaginary (amps)
GND	0	0	0	1.6737	139.7	-1.27677	1.08219
2	0	0	4.105	1.15031	127.3	-.697139	.914997
3	0	0	8.21	.865361	111.9	-.322893	.802864
4	0	0	12.315	.698416	89.	.0125727	.698303
5	0	0	16.42	.679224	61.6	.323137	.597434
6	0	0	20.525	.79099	39.1	.613758	.498965
7	0	0	24.63	.972795	24.5	.885511	.402742
8	0	0	28.735	1.17915	15.2	1.13792	.309087
9	0	0	32.84	1.38712	9.1	1.36979	.218549
10	0	0	36.945	1.58515	4.8	1.57966	.131792
11	0	0	41.05	1.76667	1.6	1.76597	.0495242
12	0	0	45.155	1.92741	359.2	1.92721	-.0275363
13	0	0	49.26	2.06439	357.3	2.06203	-.0986917
14	0	0	53.365	2.17539	355.7	2.16925	-.163282
15	0	0	57.47	2.25875	354.4	2.24794	-.220704
16	0	0	61.575	2.31329	353.3	2.29743	-.270416
17	0	0	65.68	2.33826	352.3	2.31736	-.311953
18	0	0	69.785	2.33327	351.5	2.30763	-.344934
19	0	0	73.89	2.29829	350.8	2.26846	-.369061
20	0	0	77.995	2.23365	350.1	2.20038	-.384125
21	0	0	82.1	2.14001	349.5	2.10418	-.390013
22	0	0	86.205	2.01831	349.	1.98092	-.386693
23	0	0	90.31	1.86974	348.5	1.83191	-.374219
24	0	0	94.415	1.69572	348.	1.65863	-.352717
25	0	0	98.52	1.4978	347.6	1.46269	-.322365
26	0	0	102.625	1.27753	347.2	1.2457	-.283363
27	0	0	106.73	1.03625	346.8	1.00905	-.235865
28	0	0	110.835	.774665	346.6	.753501	-.179842
29	0	0	114.94	.491561	346.5	.477991	-.114701
30	0	0	119.045	.181459	347.7	.177323	-.0385205
END	0	0	123.15	.250783	161.8	-.23823	.0783496
2J1	0	0	123.15	.250783	161.8	-.23823	.0783496
32	0	0	124.274	.136069	163.6	-.130551	.0383568
33	0	0	125.397	.106336	166.5	-.103381	.0248949
34	0	0	126.521	.0815835	170.8	-.0805275	.0130842
35	0	0	127.644	.0637088	176.9	-.0636151	3.45E-03
36	0	0	128.768	.0503375	185.5	-.0501058	-4.82E-03
37	0	0	129.891	.0408783	197.2	-.0390596	-.0120577
38	0	0	131.015	.0351023	211.7	-.0298667	-.0184433
39	0	0	132.138	.0327279	227.4	-.0221323	-.0241097
40	0	0	133.262	.0330494	241.9	-.0155807	-.0291463
41	0	0	134.385	.035077	253.4	-.0100102	-.0336184
42	0	0	135.509	.0379429	262.	-5.27E-03	-.0375754
43	0	0	136.632	.0410748	268.3	-1.23E-03	-.0410563
44	0	0	137.756	.044146	272.8	2.18E-03	-.044092
45	0	0	138.879	.0469822	276.2	5.07E-03	-.046708
46	0	0	140.003	.0494943	278.7	7.48E-03	-.0489258

47	0	0	141.126	.0516401	280.6	9.47E-03	-.0507635
48	0	0	142.25	.0534029	282.	.0110989	-.0522368
49	0	0	143.373	.0547797	283.1	.0123925	-.0533596
50	0	0	144.497	.0557754	283.9	.0133904	-.0541442
51	0	0	145.62	.0563984	284.5	.0141233	-.0546014
52	0	0	146.744	.0566596	285.	.0146184	-.0547413
53	0	0	147.867	.0565703	285.3	.0148999	-.0545728
54	0	0	148.991	.0561424	285.5	.0149897	-.0541043
55	0	0	150.114	.0553872	285.6	.0149075	-.0533433
56	0	0	151.238	.0543155	285.7	.0146709	-.0522967
57	0	0	152.361	.0529377	285.7	.0142965	-.0509707
58	0	0	153.485	.0512631	285.6	.0137989	-.049371
59	0	0	154.608	.0493002	285.5	.0131918	-.0475025
60	0	0	155.732	.0470563	285.4	.0124875	-.0453691
61	0	0	156.855	.0445376	285.2	.0116973	-.0429741
62	0	0	157.979	.0417486	285.	.0108315	-.040319
63	0	0	159.102	.038692	284.8	9.9E-03	-.0374041
64	0	0	160.226	.0353675	284.6	8.91E-03	-.0342269
65	0	0	161.349	.0317711	284.3	7.87E-03	-.0307815
66	0	0	162.473	.0278931	284.1	6.78E-03	-.0270565
67	0	0	163.596	.0237136	283.8	5.65E-03	-.0230306
68	0	0	164.72	.0191968	283.5	4.48E-03	-.0186677
69	0	0	165.843	.0142382	283.2	3.24E-03	-.0138639
70	0	0	166.967	8.9E-03	282.8	1.97E-03	-8.68E-03
END	0	0	168.09	0	0	0	0
GND	120.013	-62.4746	0	1.19146	158.4	-1.10792	.438256
72	120.013	-62.4746	4.402	.888756	153.4	-.794958	.397403
73	120.013	-62.4746	8.804	.681516	147.4	-.574368	.36683
74	120.013	-62.4746	13.206	.499352	137.6	-.368802	.336655
75	120.013	-62.4746	17.608	.350616	119.2	-.171153	.306004
76	120.013	-62.4746	22.01	.27545	85.8	.0204056	.274693
77	120.013	-62.4746	26.412	.318198	49.7	.205646	.242816
78	120.013	-62.4746	30.814	.437504	28.8	.383486	.210591
79	120.013	-62.4746	35.216	.580511	17.9	.552452	.178297
80	120.013	-62.4746	39.618	.725792	11.6	.710905	.14625
81	120.013	-62.4746	44.02	.864807	7.6	.857156	.114783
82	120.013	-62.4746	48.422	.993161	4.9	.989583	.0842342
83	120.013	-62.4746	52.824	1.10801	2.8	1.10665	.0549395
84	120.013	-62.4746	57.226	1.20728	1.3	1.20697	.0272277
85	120.013	-62.4746	61.628	1.28933	.1	1.28933	1.41E-03
86	120.013	-62.4746	66.03	1.35291	359.1	1.35273	-.0222126
87	120.013	-62.4746	70.432	1.39708	358.2	1.3964	-.0433761
88	120.013	-62.4746	74.834	1.42115	357.5	1.41981	-.061835
89	120.013	-62.4746	79.236	1.42477	356.9	1.42267	-.0773773
90	120.013	-62.4746	83.638	1.40781	356.3	1.40494	-.0898238
91	120.013	-62.4746	88.04	1.37045	355.9	1.36687	-.0990339
92	120.013	-62.4746	92.442	1.31309	355.4	1.30889	-.104902
93	120.013	-62.4746	96.844	1.23637	355.	1.2317	-.107364
94	120.013	-62.4746	101.246	1.14116	354.7	1.13619	-.106389
95	120.013	-62.4746	105.648	1.02849	354.3	1.02342	-.101985
96	120.013	-62.4746	110.05	.899478	354.	.894533	-.0941853
97	120.013	-62.4746	114.452	.755258	353.7	.750679	-.0830399
98	120.013	-62.4746	118.854	.596735	353.4	.592781	-.0685847
99	120.013	-62.4746	123.256	.424079	353.1	.421029	-.0507713
100	120.013	-62.4746	127.658	.235288	352.9	.23346	-.0292739
END	120.013	-62.4746	132.06	0	0	0	0
GND	37.4142	-69.7772	0	2.20909	108.6	-.703079	2.09422

102	37.4142	-69.7772	3.0225	2.269	108.3	-.713966	2.15374
103	37.4142	-69.7772	6.045	2.2903	108.2	-.715989	2.17551
104	37.4142	-69.7772	9.0675	2.29118	108.1	-.712672	2.17752
105	37.4142	-69.7772	12.09	2.27377	108.	-.704432	2.1619
106	37.4142	-69.7772	15.1125	2.23915	108.	-.691483	2.12971
107	37.4142	-69.7772	18.135	2.18801	107.9	-.673971	2.08163
108	37.4142	-69.7772	21.1575	2.12094	107.9	-.65202	2.01823
109	37.4142	-69.7772	24.18	2.03848	107.9	-.625755	1.94006
110	37.4142	-69.7772	27.2025	1.94125	107.9	-.595303	1.84771
111	37.4142	-69.7772	30.225	1.82982	107.8	-.560801	1.74176
112	37.4142	-69.7772	33.2475	1.70485	107.8	-.522393	1.62284
113	37.4142	-69.7772	36.27	1.56699	107.8	-.480226	1.49159
114	37.4142	-69.7772	39.2925	1.41691	107.9	-.434447	1.34867
115	37.4142	-69.7772	42.315	1.25525	107.9	-.385189	1.19469
116	37.4142	-69.7772	45.3375	1.08253	107.9	-.332558	1.03019
117	37.4142	-69.7772	48.36	.899104	107.9	-.276597	.855501
118	37.4142	-69.7772	51.3825	.704871	107.9	-.21721	.670569
119	37.4142	-69.7772	54.405	.498667	108.	-.153971	.474301
120	37.4142	-69.7772	57.4275	.276682	108.	-.0856258	.263099
END	37.4142	-69.7772	60.45	0	0	0	0

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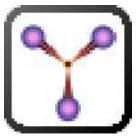
CURRENT MOMENTS(amp-meters) rms

Frequency = 1.32 MHz
Input power = 5,000. watts

			vertical current moment	
wire	magnitude	phase (deg)	magnitude	phase (deg)
1	507.759	.2	507.759	.2
2	1.85755	243.	1.85755	243.
3	248.386	12.5	248.386	12.5
4	429.354	301.4	429.354	301.4

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

tower	magnitude	phase (deg)
1	506.912	360.
2	248.386	12.5
3	429.354	301.4



WCAP - WCAP daytime 1

WCAP OUTPUT AT FREQUENCY: 1.320 MHz

NODE VOLTAGES

Node:	1	1026.1315 ∠	83.3443° V
Node:	2	1025.0388 ∠	83.1698° V
Node:	3	1185.2448 ∠	80.5123° V

	WCAP PART	CURRENT IN	CURRENT OUT

	WCAP PART	BRANCH VOLTAGE	BRANCH CURRENT
R	1→2 1.00000000	3.31 ∠ 153.980° V	3.31 ∠ 153.980° A
L	2→0 6029.00000000	1025.04 ∠ 83.170° V	0.02 ∠ -6.830° A
L	2→3 6.09000000	168.16 ∠ -115.904° V	3.33 ∠ 154.096° A
C	3→0 0.00017700	1185.24 ∠ 80.512° V	1.74 ∠ 170.512° A
R	3→0 371.92000000	1185.24 ∠ 80.512° V	1.73 ∠ 137.599° A

	WCAP PART	FROM IMPEDANCE	TO IMPEDANCE
R	1→2 1.00000000	102.79 - j 292.472	101.79 - j 292.472
L	2→0 6029.00000000	0.01 + j 50003.348	0.00 + j 0.000
L	2→3 6.09000000	100.61 - j 290.975	100.61 - j 341.484
C	3→0 0.00017700	0.00 - j 681.197	0.00 + j 0.000
R	3→0 371.92000000	371.92 - j 574.600	0.00 + j 0.000

	WCAP PART	VSWR

WCAP INPUT DATA:

	1.3200	0.00000000	0	
I	3.31000000	0	1	153.98000000
R	1.00000000	1	2	0.00000000
L	6029.00000000	2	0	0.00000000
L	6.09000000	2	3	0.00000000
C	0.00017700	3	0	
R	371.92000000	3	0	-574.60000000

WCAP - WCAP daytime 2

WCAP OUTPUT AT FREQUENCY: 1.320 MHz

NODE VOLTAGES

Node:	1	434.7297 ∠	118.0938° V
Node:	2	435.4347 ∠	117.8572° V
Node:	3	495.0756 ∠	120.5451° V

WCAP PART	CURRENT IN	CURRENT OUT

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	1.93 ∠ -130.600° V	1.93 ∠ -130.600° A
L	2→0	6029.00000000	435.43 ∠ 117.857° V	0.01 ∠ 27.857° A
L	2→3	3.95000000	63.49 ∠ -40.695° V	1.94 ∠ -130.695° A
C	3→0	0.00016600	495.08 ∠ 120.545° V	0.68 ∠ -149.455° A
R	3→0	-179.50000000	495.08 ∠ 120.545° V	1.31 ∠ -121.070° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	-81.84 - j 209.853	-82.84 - j 209.853
L	2→0	6029.00000000	0.00 + j 50003.348	0.00 + j 0.000
L	2→3	3.95000000	-82.15 - j 209.112	-82.15 - j 241.872
C	3→0	0.00016600	0.00 - j 726.337	0.00 + j 0.000
R	3→0	-179.50000000	-179.50 - j 332.190	0.00 + j 0.000

WCAP PART	VSWR

WCAP INPUT DATA:

	1.3200	0.00000000	0	
I	1.93000000	0	1	-130.60000000
R	1.00000000	1	2	0.00000000
L	6029.00000000	2	0	0.00000000
L	3.95000000	2	3	0.00000000
C	0.00016600	3	0	
R	-179.50000000	3	0	-332.19000000

WCAP - WCAP daytime 3

WCAP OUTPUT AT FREQUENCY: 1.320 MHz

NODE VOLTAGES

Node:	1	822.3824 ∠ -5.8634° V
Node:	2	817.2421 ∠ -5.5307° V
Node:	3	654.8613 ∠ -24.5526° V

WCAP PART	CURRENT IN	CURRENT OUT

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	7.01 ∠ -48.500° V	7.01 ∠ -48.500° A
L	2→0	6029.00000000	817.24 ∠ -5.531° V	0.02 ∠ -95.531° A
L	2→3	5.02000000	291.23 ∠ 41.598° V	6.99 ∠ -48.402° A
C	3→0	0.00002000	654.86 ∠ -24.553° V	0.11 ∠ 65.447° A
R	3→0	84.54400000	654.86 ∠ -24.553° V	7.04 ∠ -49.211° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	86.35 + j 79.509	85.35 + j 79.509
L	2→0	6029.00000000	0.00 + j 50003.348	0.00 + j 0.000
L	2→3	5.02000000	85.63 + j 79.489	85.63 + j 37.854
C	3→0	0.00002000	0.00 - j 6028.596	0.00 + j 0.000
R	3→0	84.54400000	84.54 + j 38.811	0.00 + j 0.000

WCAP PART	VSWR

WCAP INPUT DATA:

```
      1.3200      0.00000000   0
I        7.00600000   0   1    -48.50000000
R        1.00000000   1   2      0.00000000
L     6029.00000000   2   0      0.00000000
L        5.02000000   2   3      0.00000000
C        0.00002000   3   0
R       84.54400000   3   0     38.81100000
```

WCAP - WCAP nighttime 1

WCAP OUTPUT AT FREQUENCY: 1.320 MHz

NODE VOLTAGES

Node:	1	563.0763 ∠	77.9192° V
Node:	2	562.2236 ∠	77.6669° V
Node:	3	689.3453 ∠	74.1078° V

WCAP PART	CURRENT IN	CURRENT OUT

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	2.62 ∠ 148.800° V	2.62 ∠ 148.800° A
L	2→0	6029.00000000	562.22 ∠ 77.667° V	0.01 ∠ -12.333° A
L	2→3	6.09000000	132.87 ∠ -121.121° V	2.63 ∠ 148.879° A
C	3→0	0.00017700	689.35 ∠ 74.108° V	1.01 ∠ 164.108° A
R	3→0	169.69000000	689.35 ∠ 74.108° V	1.68 ∠ 139.750° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	70.39 - j 203.060	69.39 - j 203.060
L	2→0	6029.00000000	0.00 + j 50003.348	0.00 + j 0.000
L	2→3	6.09000000	68.83 - j 202.334	68.83 - j 252.843
C	3→0	0.00017700	0.00 - j 681.197	0.00 + j 0.000
R	3→0	169.69000000	169.69 - j 374.820	0.00 + j 0.000

WCAP PART	VSWR

WCAP INPUT DATA:

	1.3200	0.00000000	0	
I	2.62000000	0	1	148.80000000
R	1.00000000	1	2	0.00000000
L	6029.00000000	2	0	0.00000000
L	6.09000000	2	3	0.00000000
C	0.00017700	3	0	
R	169.69000000	3	0	-374.82000000

WCAP - WCAP nighttime 2

WCAP OUTPUT AT FREQUENCY: 1.320 MHz

NODE VOLTAGES

Node:	1	322.4942 ∠	84.6858° V
Node:	2	322.1469 ∠	84.3918° V
Node:	3	376.7383 ∠	82.6823° V

WCAP PART	CURRENT IN	CURRENT OUT

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	1.69 ∠ 162.680° V	1.69 ∠ 162.680° A
L	2→0	6029.00000000	322.15 ∠ 84.392° V	0.01 ∠ -5.608° A
L	2→3	3.95000000	55.57 ∠ -107.276° V	1.70 ∠ 162.724° A
C	3→0	0.00016600	376.74 ∠ 82.682° V	0.52 ∠ 172.682° A
R	3→0	78.19400000	376.74 ∠ 82.682° V	1.19 ∠ 158.397° A

	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	39.69 - j 186.651	38.69 - j 186.651
L	2→0	6029.00000000	0.01 + j 50003.348	0.00 + j 0.000
L	2→3	3.95000000	38.41 - j 185.986	38.41 - j 218.747
C	3→0	0.00016600	0.00 - j 726.337	0.00 + j 0.000
R	3→0	78.19400000	78.19 - j 307.100	0.00 + j 0.000

WCAP PART	VSWR

WCAP INPUT DATA:

	1.3200	0.00000000	0	
I	1.69000000	0	1	162.68000000
R	1.00000000	1	2	0.00000000
L	6029.00000000	2	0	0.00000000
L	3.95000000	2	3	0.00000000
C	0.00016600	3	0	
R	78.19400000	3	0	-307.10000000

WCAP - WCAP nighttime 3

WCAP OUTPUT AT FREQUENCY: 1.320 MHz

NODE VOLTAGES

Node:	1	207.1882 ∠ -166.1446° V
Node:	2	207.0147 ∠ -165.5407° V
Node:	3	116.4516 ∠ -168.8599° V

WCAP PART	CURRENT IN	CURRENT OUT

	WCAP PART		BRANCH VOLTAGE	BRANCH CURRENT
R	1→2	1.00000000	2.19 ∠ 108.700° V	2.19 ∠ 108.700° A
L	2→0	6029.00000000	207.01 ∠ -165.541° V	0.00 ∠ 104.459° A
L	2→3	5.02000000	91.01 ∠ -161.292° V	2.19 ∠ 108.708° A
C	3→0	0.00002000	116.45 ∠ -168.860° V	0.02 ∠ -78.860° A
R	3→0	6.89500000	116.45 ∠ -168.860° V	2.21 ∠ 108.642° A

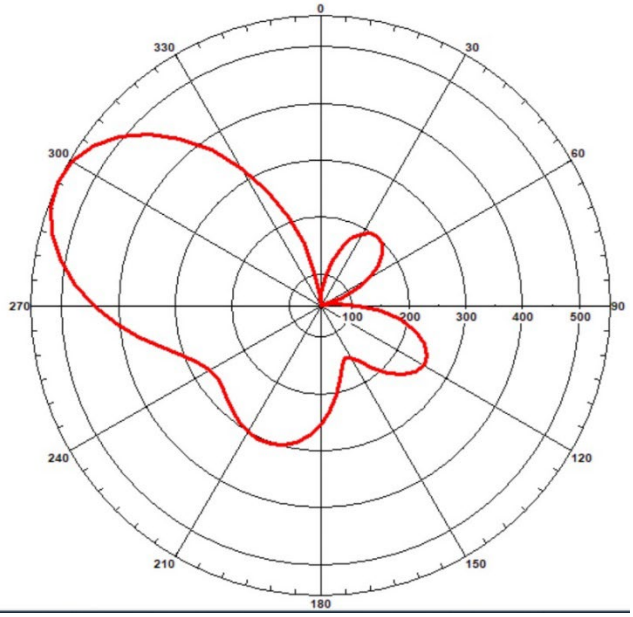
	WCAP PART		FROM IMPEDANCE	TO IMPEDANCE
R	1→2	1.00000000	7.99 + j 94.268	6.99 + j 94.268
L	2→0	6029.00000000	0.00 + j 50003.348	0.00 + j 0.000
L	2→3	5.02000000	7.02 + j 94.446	7.02 + j 52.811
C	3→0	0.00002000	0.00 - j 6028.596	0.00 + j 0.000
R	3→0	6.89500000	6.89 + j 52.360	0.00 + j 0.000

WCAP PART	VSWR

WCAP INPUT DATA:

```
      1.3200      0.00000000   0
I        2.19000000   0   1    108.70000000
R        1.00000000   1   2      0.00000000
L     6029.00000000   2   0      0.00000000
L        5.02000000   2   3      0.00000000
C        0.00002000   3   0
R        6.89500000   3   0     52.36000000
```

C:\Users\david\iCloudDrive\FCC\Teleworking 2020\KIFM nighttime array file 12-29-2023, 15:10:16
Geographic coordinates: E-theta magnitude rms, mv/m, elevation = 0 degrees
minimum = 43.1, maximum = 553., dynamic range = 509.718, scale = 1
Maximum gain: 552.87 rms, mv/m at 295. deg; -3 dB beamwidth: 323.5 to 263.5 degrees
1.32 MHz



C:\Users\david\iCloudDrive\FCC\Teleworking 2020\KIFM daytime array.DGE se 12-29-2023, 14:43:07
Geographic coordinates: E-theta magnitude rms, mv/m, elevation = 0 degrees
minimum = 163., maximum = 1,390., dynamic range = 1,224.02, scale = 1
Maximum gain: 1,387.1 rms, mv/m at 120. deg; -3 dB beamwidth: 154.8 to 86.7 degrees
1.32 MHz