

**Description of Antenna System**

The directional SWFP32MLS/22 antenna currently installed and in use for analog operations at WBMM will be re-used with no structural changes to the existing antenna mounting height, transmission line, or the supporting tower.

Page 2-8 of this exhibit detail the antenna's horizontal and vertical pattern as supplied from the manufacturer.

Page 9 Shows the resulting pattern including calculated ERP values.



**SYSTEMS WITH RELIABILITY, Inc.**  
**Broadcast Antennas & Transmission Systems**

# SYSTEM DATA SHEET

Customer WBMM  
 Contact Don Jones  
 Location Tuskegee, AL  
 Antenna Model SWFP32MLS / 22  
 Channel / Frequency 22 / 521 MHz

## ELECTRICAL SPECIFICATION

Polarization Type	Horizontal		
Polarization Ratio			
	H-Pol. (PRH)	100.00	%
Elevation Directivity (ED)		36.901	
Azimuth Directivity (AD) H-Pol.		1.997	
Antenna Gain (GH)			
	H-Pol. (GH)	73.71	
dB Gain (AG)			
	H-Pol (AGH)	18.68	dB
Beam Tilt		-1.00	Degrees
Null Fill		0.00	%
Power rating		40.00	kW

## MECHANICAL SPECIFICATION

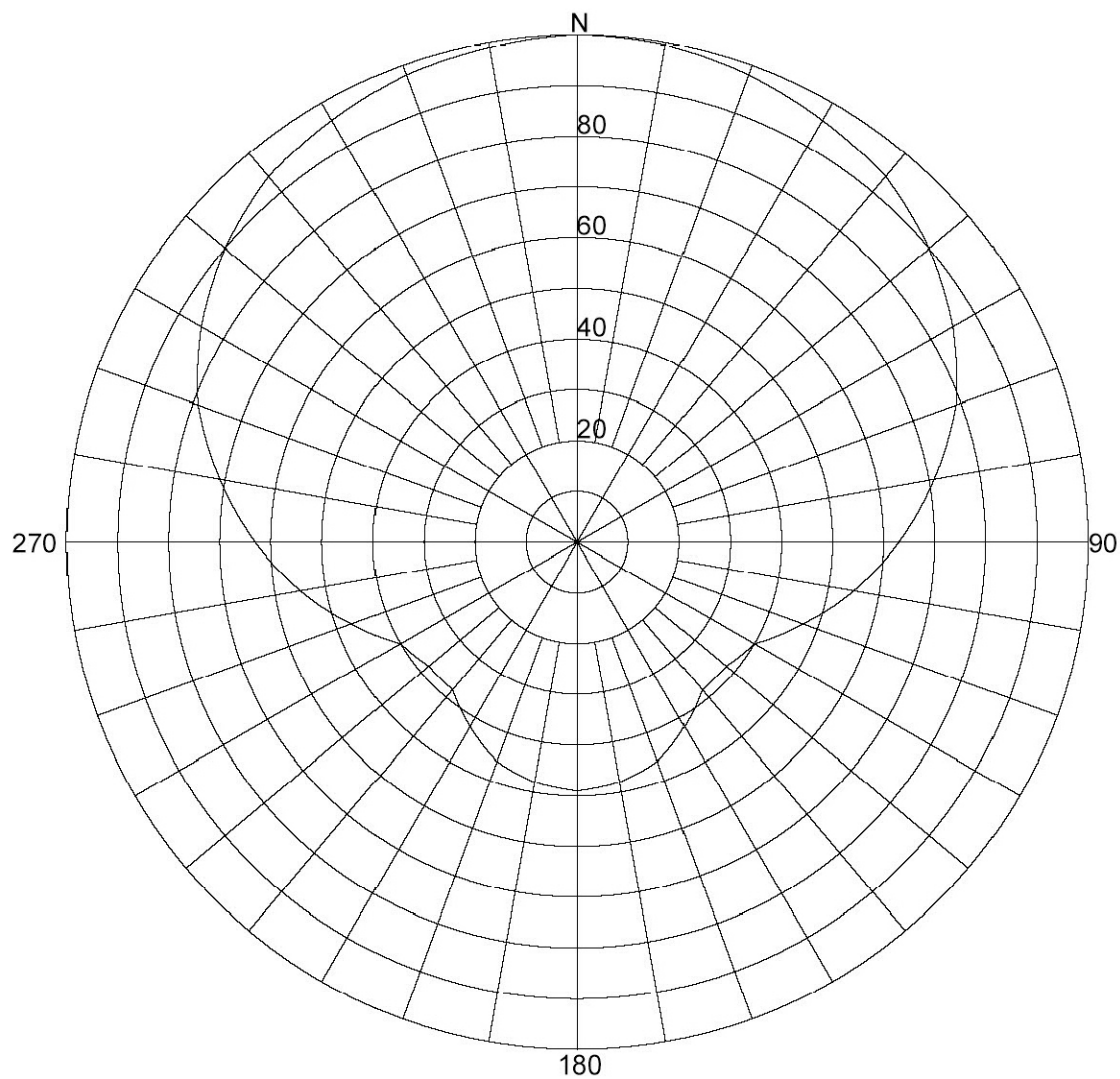
No. Of Bays	32	#		
Antenna Aperture	57.54	ft.	17.54	m
Antenna Total Length	63.04	ft.	19.22	m
Antenna Weight	875.00	lbs.	397.73	kg
Windload (50/33)	1970.00	lbs.	56.80	ft.^2

Mechanical Specifications will be certified upon final construction and testing.

Note: Given values can be used for planning system.

Prepared by:

Mark A. Gergely  
 SWR, LP, Engineering



## Azimuth Pattern

Scale: Linear

Unit: Relative Field

### Systems With Reliability Inc

CLIENT: *WBMM*

Date: 6/17/2008

ANTENNA TYPE: SWFP32MLS / 22

FREQUENCY: 521 MHz

PATTERN POL.: Horizontal

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.99739 / 3.005dB

PATTERN RMS: 0.708

## Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	1.0000 ( 0 )	180	.4900 (-6.196 )
5	.9975 (-0.022 )	185	.4850 (-6.285 )
10	.9950 (-0.044 )	190	.4800 (-6.375 )
15	.9875 (-0.109 )	195	.4700 (-6.558 )
20	.9800 (-0.175 )	200	.4600 (-6.745 )
25	.9700 (-0.265 )	205	.4400 (-7.131 )
30	.9600 (-0.355 )	210	.4200 (-7.535 )
35	.9500 (-0.446 )	215	.4000 (-7.959 )
40	.9400 (-0.537 )	220	.3800 (-8.404 )
45	.9200 (-0.724 )	225	.3800 (-8.404 )
50	.9000 (-0.915 )	230	.3800 (-8.404 )
55	.8750 (-1.16 )	235	.3900 (-8.179 )
60	.8500 (-1.412 )	240	.4000 (-7.959 )
65	.8200 (-1.724 )	245	.4350 (-7.23 )
70	.7900 (-2.047 )	250	.4700 (-6.558 )
75	.7500 (-2.499 )	255	.5100 (-5.849 )
80	.7100 (-2.975 )	260	.5500 (-5.193 )
85	.6700 (-3.479 )	265	.5900 (-4.583 )
90	.6300 (-4.013 )	270	.6300 (-4.013 )
95	.5900 (-4.583 )	275	.6700 (-3.479 )
100	.5500 (-5.193 )	280	.7100 (-2.975 )
105	.5100 (-5.849 )	285	.7500 (-2.499 )
110	.4700 (-6.558 )	290	.7900 (-2.047 )
115	.4350 (-7.23 )	295	.8200 (-1.724 )
120	.4000 (-7.959 )	300	.8500 (-1.412 )
125	.3900 (-8.179 )	305	.8750 (-1.16 )
130	.3800 (-8.404 )	310	.9000 (-0.915 )
135	.3800 (-8.404 )	315	.9200 (-0.724 )
140	.3800 (-8.404 )	320	.9400 (-0.537 )
145	.4000 (-7.959 )	325	.9500 (-0.446 )
150	.4200 (-7.535 )	330	.9600 (-0.355 )
155	.4400 (-7.131 )	335	.9700 (-0.265 )
160	.4600 (-6.745 )	340	.9800 (-0.175 )
165	.4700 (-6.558 )	345	.9850 (-0.131 )
170	.4800 (-6.375 )	350	.9900 (-0.087 )
175	.4850 (-6.285 )	355	.9950 (-0.044 )

## Systems With Reliability Inc

CLIENT: *WBMM*

Date: 6/17/2008

ANTENNA TYPE: SWFP32MLS / 22

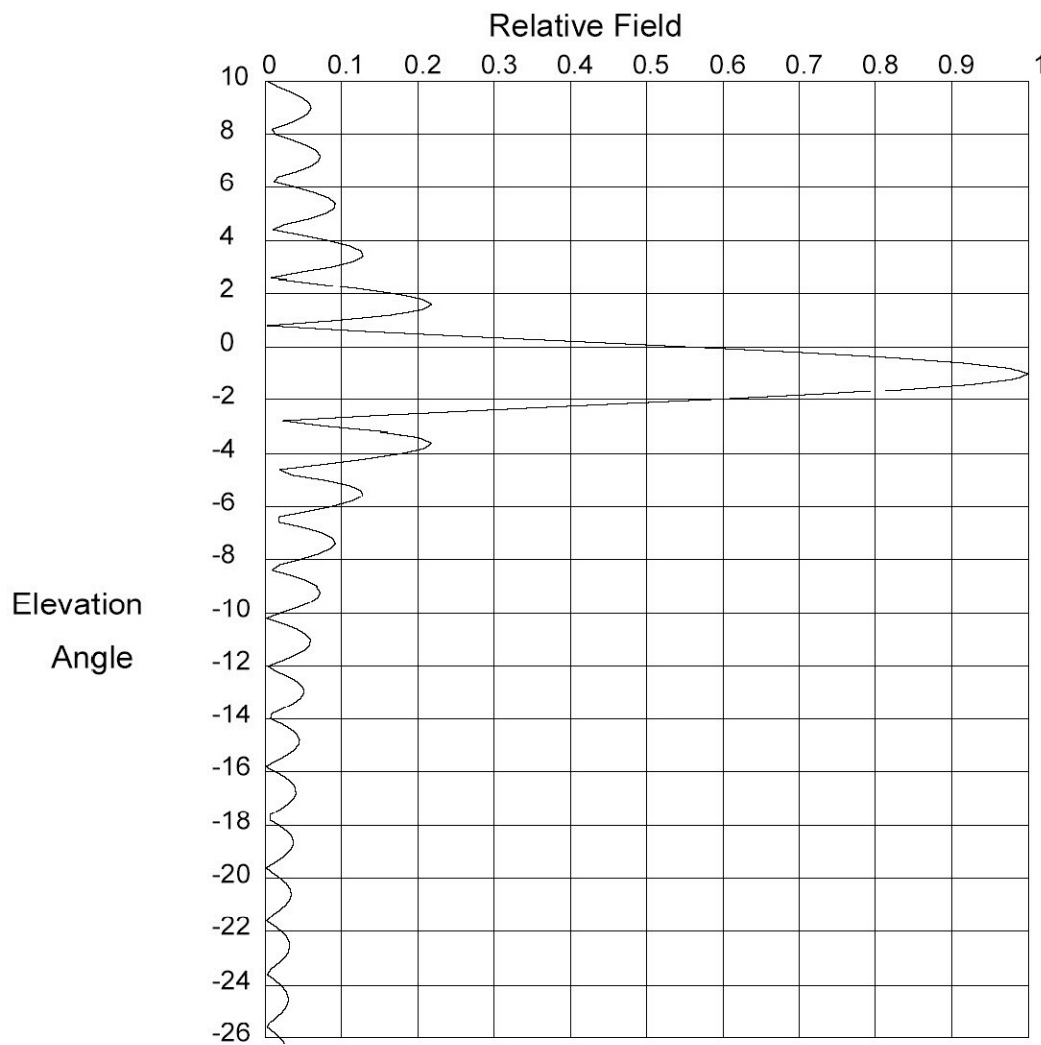
FREQUENCY: 521 MHz

PATTERN POL.: Horizontal

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.99739 / 3.005dB

PATTERN RMS: 0.708



## Elevation Pattern

Scale: Linear

Units: Field, Relative

## Systems With Reliability Inc

CLIENT: *WBMM*

Date: 6/17/2008

ANTENNA TYPE: SWFP32MLS / 22

FREQUENCY: 521 MHz

PATTERN POL.: Horizontal

DIRECTIVITY(Peak): 36.901/15.67 dBd

Beam Tilt (Deg.) : -1

DIRECTIVITY(Horiz): 11.606/10.647 dBd

Null Fill(s)(%) : 0, 0, 0

## Relative Field Tabulation

Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)
90.0	.10 (-19.997)	52.0	.029 (-30.702)	14.0	.021 (-33.57 )
89.0	.116 (-18.731)	51.0	.001 (-62.998)	13.0	.041 (-27.727 )
88.0	.131 (-17.63)	50.0	.029 (-30.795)	12.0	.014 (-37.003 )
87.0	.147 (-16.672)	49.0	.025 (-32.15)	11.0	.05 (-25.956 )
86.0	.161 (-15.849)	48.0	.007 (-42.758)	10.0	.003 (-49.979 )
85.0	.174 (-15.173)	47.0	.03 (-30.506)	9.8	.016 (-36.094 )
84.0	.185 (-14.666)	46.0	.016 (-36.141)	9.6	.033 (-29.536 )
83.0	.191 (-14.365)	45.0	.018 (-34.952)	9.4	.048 (-26.415 )
82.0	.192 (-14.324)	44.0	.027 (-31.228)	9.2	.057 (-24.859 )
81.0	.186 (-14.62)	43.0	.00 (-77.184)	9.0	.06 (-24.408 )
80.0	.17 (-15.367)	42.0	.027 (-31.41)	8.8	.056 (-24.987 )
79.0	.145 (-16.748)	41.0	.015 (-36.257)	8.6	.046 (-26.802 )
78.0	.111 (-19.108)	40.0	.018 (-34.717)	8.4	.029 (-30.667 )
77.0	.069 (-23.283)	39.0	.024 (-32.299)	8.2	.009 (-41.141 )
76.0	.022 (-33.015)	38.0	.007 (-42.934)	8.0	.014 (-37.305 )
75.0	.022 (-33.138)	37.0	.027 (-31.336)	7.8	.035 (-29.021 )
74.0	.058 (-24.777)	36.0	.003 (-49.528)	7.6	.054 (-25.363 )
73.0	.078 (-22.172)	35.0	.026 (-31.732)	7.4	.067 (-23.488 )
72.0	.078 (-22.164)	34.0	.012 (-38.754)	7.2	.073 (-22.781 )
71.0	.058 (-24.796)	33.0	.023 (-32.862)	7.0	.07 (-23.105 )
70.0	.022 (-33.122)	32.0	.017 (-35.229)	6.8	.059 (-24.605 )
69.0	.018 (-35.005)	31.0	.019 (-34.339)	6.6	.04 (-27.916 )
68.0	.048 (-26.307)	30.0	.021 (-33.495)	6.4	.016 (-36.031 )
67.0	.058 (-24.714)	29.0	.016 (-35.816)	6.2	.012 (-38.567 )
66.0	.043 (-27.379)	28.0	.024 (-32.529)	6.0	.039 (-28.071 )
65.0	.009 (-40.995)	27.0	.014 (-36.927)	5.8	.064 (-23.873 )
64.0	.027 (-31.3)	26.0	.025 (-31.938)	5.6	.082 (-21.69 )
63.0	.047 (-26.578)	25.0	.014 (-37.331)	5.4	.092 (-20.739 )
62.0	.039 (-28.181)	24.0	.026 (-31.552)	5.2	.091 (-20.827 )
61.0	.008 (-41.907)	23.0	.014 (-36.849)	5.0	.079 (-22.05 )
60.0	.026 (-31.544)	22.0	.027 (-31.312)	4.8	.057 (-24.926 )
59.0	.041 (-27.689)	21.0	.017 (-35.573)	4.6	.026 (-31.685 )
58.0	.026 (-31.814)	20.0	.027 (-31.241)	4.4	.01 (-40.011 )
57.0	.009 (-41.195)	19.0	.02 (-33.775)	4.2	.048 (-26.464 )
56.0	.035 (-29.215)	18.0	.027 (-31.433)	4.0	.082 (-21.703 )
55.0	.03 (-30.364)	17.0	.026 (-31.74)	3.8	.11 (-19.197 )
54.0	.001 (-65.467)	16.0	.025 (-32.077)	3.6	.126 (-17.984 )
53.0	.03 (-30.541)	15.0	.033 (-29.681)	3.4	.129 (-17.815 )

## Systems With Reliability Inc

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CLIENT: *WBMM*

Date: 6/17/2008

ANTENNA TYPE: SWFP32MLS / 22

FREQUENCY: 521 MHz

PATTERN POL.: Horizontal

DIRECTIVITY(Peak): 36.901/15.67 dBd

Beam Tilt (Deg.) : -1

DIRECTIVITY(Horiz): 11.606/10.647 dBd

Null Fill(s)(%) : 0, 0, 0

## Relative Field Tabulation

Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)
3.2	.116 (-18.747)	-4.4	.076 (-22.336)	-12.0	.004 (-48.589)
3.0	.087 (-21.215)	-4.6	.019 (-34.506)	-12.2	.015 (-36.765)
2.8	.045 (-26.996)	-4.8	.035 (-29.165)	-12.4	.031 (-30.301)
2.6	.008 (-42.247)	-5.0	.079 (-22.021)	-12.6	.043 (-27.392)
2.4	.065 (-23.709)	-5.2	.111 (-19.122)	-12.8	.05 (-26.063)
2.2	.122 (-18.293)	-5.4	.127 (-17.933)	-13.0	.051 (-25.829)
2.0	.17 (-15.371)	-5.6	.128 (-17.886)	-13.2	.047 (-26.593)
1.8	.204 (-13.787)	-5.8	.114 (-18.867)	-13.4	.037 (-28.523)
1.6	.218 (-13.235)	-6.0	.089 (-21.047)	-13.6	.024 (-32.283)
1.4	.206 (-13.73)	-6.2	.055 (-25.137)	-13.8	.009 (-41.06)
1.2	.165 (-15.64)	-6.4	.018 (-34.748)	-14.0	.007 (-42.913)
1.0	.095 (-20.426)	-6.6	.018 (-34.806)	-14.2	.022 (-33.177)
.8	.003 (-51.897)	-6.8	.05 (-25.993)	-14.4	.034 (-29.388)
.6	.124 (-18.128)	-7.0	.074 (-22.568)	-14.6	.042 (-27.553)
.4	.263 (-11.597)	-7.2	.089 (-21.035)	-14.8	.045 (-26.911)
.2	.412 (-7.707)	-7.4	.092 (-20.698)	-15.0	.043 (-27.258)
.0	.561 (-5.024)	-7.6	.085 (-21.388)	-15.2	.037 (-28.652)
-.2	.701 (-3.09)	-7.8	.069 (-23.221)	-15.4	.027 (-31.481)
-.4	.822 (-1.705)	-8.0	.046 (-26.754)	-15.6	.014 (-37.228)
-.6	.916 (-0.761)	-8.2	.019 (-34.434)	-15.8	.00 (-69.743)
-.8	.977 (-0.203)	-8.4	.009 (-41.206)	-16.0	.014 (-37.047)
-1.0	1.00 (0)	-8.6	.034 (-29.371)	-16.2	.026 (-31.717)
-1.2	.984 (-0.142)	-8.8	.054 (-25.316)	-16.4	.035 (-29.169)
-1.4	.929 (-0.637)	-9.0	.067 (-23.428)	-16.6	.04 (-28.019)
-1.6	.841 (-1.509)	-9.2	.072 (-22.807)	-16.8	.04 (-27.895)
-1.8	.724 (-2.811)	-9.4	.069 (-23.218)	-17.0	.037 (-28.742)
-2.0	.586 (-4.635)	-9.6	.058 (-24.714)	-17.2	.029 (-30.755)
-2.2	.439 (-7.16)	-9.8	.041 (-27.71)	-17.4	.019 (-34.654)
-2.4	.289 (-10.773)	-10.0	.02 (-33.838)	-17.6	.006 (-44.059)
-2.6	.148 (-16.59)	-10.2	.002 (-54.362)	-17.8	.006 (-43.887)
-2.8	.023 (-32.733)	-10.4	.023 (-32.749)	-18.0	.018 (-34.833)
-3.0	.079 (-22.03)	-10.6	.041 (-27.794)	-18.2	.028 (-31.143)
-3.2	.154 (-16.235)	-10.8	.053 (-25.472)	-18.4	.034 (-29.314)
-3.4	.20 (-13.971)	-11.0	.059 (-24.532)	-18.6	.037 (-28.635)
-3.6	.217 (-13.255)	-11.2	.059 (-24.642)	-18.8	.036 (-28.908)
-3.8	.208 (-13.62)	-11.4	.051 (-25.786)	-19.0	.031 (-30.178)
-4.0	.178 (-14.994)	-11.6	.039 (-28.248)	-19.2	.023 (-32.78)
-4.2	.132 (-17.607)	-11.8	.022 (-33.092)	-19.4	.013 (-37.932)

## Systems With Reliability Inc

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CLIENT: *WBMM*

Date: 6/17/2008

ANTENNA TYPE: SWFP32MLS / 22

FREQUENCY: 521 MHz

PATTERN POL.: Horizontal

DIRECTIVITY(Peak): 36.901/15.67 dBd

Beam Tilt (Deg.) : -1

DIRECTIVITY(Horiz): 11.606/10.647 dBd

Null Fill(s)(%) : 0, 0, 0

## Relative Field Tabulation

Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)
-19.6	.001 (-57.901)	-27.2	.016 (-35.951)	-54.0	.011 (-38.86 )
-19.8	.01 (-39.93)	-27.4	.008 (-42.015)	-55.0	.018 (-34.877 )
-20.0	.02 (-33.891)	-27.6	.001 (-62.594)	-56.0	.032 (-29.984 )
-20.2	.028 (-31.033)	-27.8	.009 (-40.659)	-57.0	.018 (-34.841 )
-20.4	.033 (-29.647)	-28.0	.017 (-35.457)	-58.0	.011 (-39.393 )
-20.6	.034 (-29.285)	-28.2	.023 (-32.816)	-59.0	.032 (-29.963 )
-20.8	.032 (-29.843)	-28.4	.027 (-31.461)	-60.0	.03 (-30.58 )
-21.0	.027 (-31.435)	-28.6	.028 (-31.018)	-61.0	.006 (-43.748 )
-21.2	.019 (-34.534)	-28.8	.027 (-31.383)	-62.0	.021 (-33.388 )
-21.4	.009 (-40.98)	-29.0	.023 (-32.62)	-63.0	.036 (-28.754 )
-21.6	.002 (-55.605)	-29.2	.018 (-35.023)	-64.0	.03 (-30.325 )
-21.8	.012 (-38.467)	-29.4	.011 (-39.546)	-65.0	.008 (-42.411 )
-22.0	.021 (-33.616)	-29.6	.002 (-52.207)	-66.0	.02 (-34.151 )
-22.2	.028 (-31.195)	-29.8	.006 (-44.746)	-67.0	.038 (-28.421 )
-22.4	.031 (-30.06)	-30.0	.013 (-37.418)	-68.0	.04 (-27.992 )
-22.6	.032 (-29.881)	-31.0	.025 (-32.097)	-69.0	.026 (-31.817 )
-22.8	.03 (-30.601)	-32.0	.009 (-41.33)	-70.0	.002 (-54.892 )
-23.0	.024 (-32.376)	-33.0	.026 (-31.637)	-71.0	.023 (-32.838 )
-23.2	.016 (-35.764)	-34.0	.002 (-54.188)	-72.0	.04 (-27.858 )
-23.4	.007 (-43.094)	-35.0	.026 (-31.577)	-73.0	.047 (-26.583 )
-23.6	.003 (-50.892)	-36.0	.006 (-43.928)	-74.0	.042 (-27.62 )
-23.8	.012 (-38.195)	-37.0	.024 (-32.426)	-75.0	.027 (-31.301 )
-24.0	.02 (-33.789)	-38.0	.016 (-36.18)	-76.0	.008 (-42.039 )
-24.2	.026 (-31.54)	-39.0	.017 (-35.245)	-77.0	.012 (-38.344 )
-24.4	.03 (-30.494)	-40.0	.023 (-32.61)	-78.0	.029 (-30.627 )
-24.6	.03 (-30.365)	-41.0	.006 (-44.901)	-79.0	.042 (-27.535 )
-24.8	.028 (-31.111)	-42.0	.027 (-31.532)	-80.0	.049 (-26.173 )
-25.0	.023 (-32.89)	-43.0	.009 (-40.468)	-81.0	.051 (-25.822 )
-25.2	.015 (-36.254)	-44.0	.021 (-33.61)	-82.0	.049 (-26.179 )
-25.4	.007 (-43.462)	-45.0	.023 (-32.703)	-83.0	.044 (-27.083 )
-25.6	.003 (-51.982)	-46.0	.005 (-45.994)	-84.0	.038 (-28.427 )
-25.8	.011 (-38.854)	-47.0	.027 (-31.34)	-85.0	.031 (-30.126 )
-26.0	.019 (-34.366)	-48.0	.016 (-35.957)	-86.0	.025 (-32.089 )
-26.2	.025 (-32.056)	-49.0	.014 (-36.791)	-87.0	.019 (-34.2 )
-26.4	.028 (-30.942)	-50.0	.029 (-30.876)	-88.0	.015 (-36.304 )
-26.6	.029 (-30.727)	-51.0	.011 (-39.141)	-89.0	.012 (-38.214 )
-26.8	.027 (-31.353)	-52.0	.019 (-34.573)	-90.0	.01 (-39.777 )
-27.0	.023 (-32.945)	-53.0	.03 (-30.563)	90.0	.00 (-50 )

## Systems With Reliability Inc

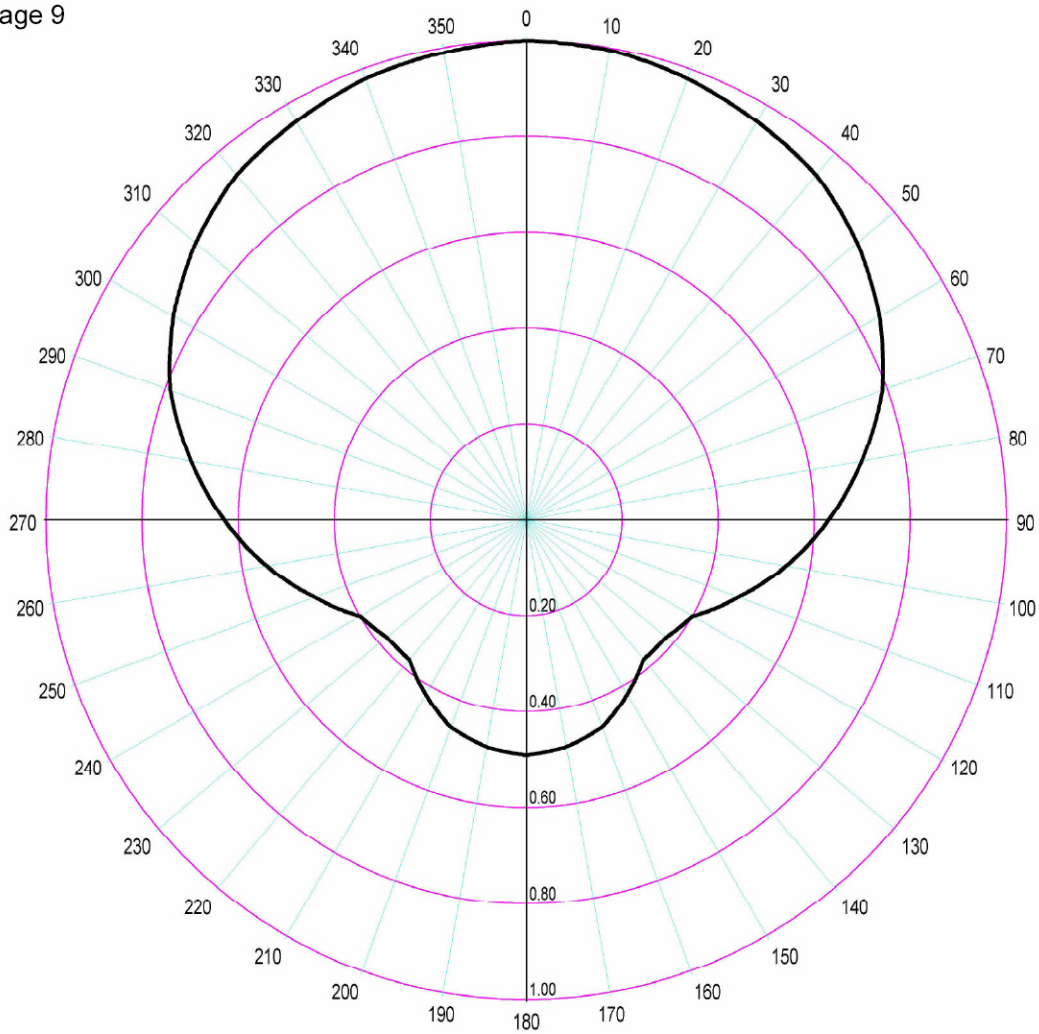
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CLIENT: *WBMM*

Date: 6/17/2008

ANTENNA TYPE: *SWFP32MLS / 22*FREQUENCY: *521 MHz*PATTERN POL.: *Horizontal*DIRECTIVITY(Peak): *36.901/15.67 dBd*Beam Tilt (Deg.) : *-1*DIRECTIVITY(Horiz): *11.606/10.647 dBd*Null Fill(s)(%) : *0, 0, 0*





Azim	Rel.FS ERP [kW]		dBk
0.0	1.000	60.000	17.782
5.0	0.997	59.641	17.755
10.0	0.994	59.282	17.729
15.0	0.987	58.450	17.668
20.0	0.979	57.506	17.597
25.0	0.969	56.338	17.508
30.0	0.959	55.181	17.418
35.0	0.949	54.036	17.327
40.0	0.939	52.903	17.235
45.0	0.919	50.674	17.048
50.0	0.899	48.492	16.857
55.0	0.874	45.833	16.612
60.0	0.849	43.248	16.360
65.0	0.819	40.246	16.047
70.0	0.789	37.351	15.723
75.0	0.749	33.660	15.271
80.0	0.709	30.161	14.794
85.0	0.669	26.854	14.290

Azim	Rel.FS ERP [kW]		dBk
90.0	0.629	23.738	13.755
95.0	0.589	20.815	13.184
100.0	0.549	18.084	12.573
105.0	0.509	15.545	11.916
110.0	0.469	13.198	11.205
115.0	0.434	11.301	10.531
120.0	0.399	9.552	9.801
125.0	0.389	9.079	9.581
130.0	0.379	8.618	9.354
135.0	0.379	8.618	9.354
140.0	0.379	8.618	9.354
145.0	0.399	9.552	9.801
150.0	0.419	10.534	10.226
155.0	0.439	11.563	10.631
160.0	0.459	12.641	11.018
165.0	0.469	13.198	11.205
170.0	0.479	13.766	11.388
175.0	0.484	14.055	11.478

Azim	Rel.FS ERP [kW]		dBk
180.0	0.489	14.347	11.568
185.0	0.484	14.055	11.478
190.0	0.479	13.766	11.388
195.0	0.469	13.198	11.205
200.0	0.459	12.641	11.018
205.0	0.439	11.563	10.631
210.0	0.419	10.534	10.226
215.0	0.399	9.552	9.801
220.0	0.379	8.618	9.354
225.0	0.379	8.618	9.354
230.0	0.379	8.618	9.354
235.0	0.389	9.079	9.581
240.0	0.399	9.552	9.801
245.0	0.434	11.301	10.531
250.0	0.469	13.198	11.205
255.0	0.509	15.545	11.916
260.0	0.549	18.084	12.573
265.0	0.589	20.815	13.184

Azim	Rel.FS ERP [kW]		dBk
270.0	0.629	23.738	13.755
275.0	0.669	26.854	14.290
280.0	0.709	30.161	14.794
285.0	0.749	33.660	15.271
290.0	0.789	37.351	15.723
295.0	0.819	40.246	16.047
300.0	0.849	43.248	16.360
305.0	0.874	45.833	16.612
310.0	0.899	48.492	16.857
315.0	0.919	50.674	17.048
320.0	0.939	52.903	17.235
325.0	0.949	54.036	17.327
330.0	0.959	55.181	17.418
335.0	0.969	56.338	17.508
340.0	0.979	57.506	17.597
345.0	0.984	58.095	17.641
350.0	0.989	58.687	17.685
355.0	0.994	59.282	17.729