



**SYSTEMS WITH RELIABILITY, LTD.**  
**Broadcast Antenna and Transmission Systems**

## **PATTERN CERTIFICATION**

**DIRECTIONAL FM ANTENNA**  
**WYFZ**  
**May 18, 2006**

<b>Call Sign</b>	:	WYFZ
<b>Location</b>	:	Bellevue, FL
<b>Frequency</b>	:	91.3 MHz
<b>Channel</b>	:	217
<b>Antenna Model</b>	:	FM3/1 DA
<b>Maximum Antenna Gain</b>	:	
<b>Horizontal</b>	:	1.559/ 1.930 dB
<b>Vertical</b>	:	1.559/ 1.930 dB

### **ANTENNA DESCRIPTION**

A custom designed **FM3/1 DA** antenna was used to produce the required directional azimuth pattern. The antenna consists of a single circular polarized radiating element with parasitic resonators, as required, to produce the pattern. The antenna is comprised of single element mounted to a tower pointing **180** degrees true north.

### **DESCRIPTION OF TEST PROCEDURE**

The test antenna consists of a third-scale single bay antenna element and resonators. This antenna was mounted to a third-scale tower with appropriately scaled mounting brackets replicated to the ones supplied with the finalized antenna. The tower was placed on a 20 ft. wooden platform. All feed cables were properly grounded during pattern testing. Appropriate parasitic resonators were used to obtain desired directional pattern.

The source antenna, a switchable (vertical/horizontal polarized) Cavity Back Resonator was mounted approximately 100 feet from the test antenna. The height and orientation was adjusted to provide a uniform field at the location of the single bay under test. The source antenna was operated at a frequency of 273.9 MHz. The antenna under test was rotated in a clockwise direction in transmit mode. A gain reference was taken using a dipole tuned to 273.9 MHz. Nowhere does the received signal exceed a maximum to minimum ratio of 15 dB.

## DOCUMENT EXHIBITS

The following exhibits are included as part of this Certificate of Compliance:

<b>Exhibit 1</b>	Circular Polarized Azimuth Pattern Field Strength Tabulations (Composite)
<b>Exhibit 2</b>	Measured Horizontal Polarized Azimuth Pattern Measured Field Strength Tabulations (Horizontal)
<b>Exhibit 3</b>	Measured Vertical Polarized Azimuth Pattern Measured Field Strength Tabulations (Vertical)
<b>Exhibit 4</b>	Elevation Pattern Elevation Tabulations
<b>Exhibit 5</b>	Antenna Data Sheet

## TEST EQUIPMENT

<b>Network Analyzer</b>	:	Hewlett Packard Model # 8753C Serial Number: 08753 – 69138
<b>Computer</b>	:	450 MHz Intel PIII
<b>Plotter</b>	:	Hewlett-Packard Laser Jet 6L
<b>Positioner</b>	:	Antenna Positioner Orbit AL-860-1 Position Controller Orbit AL-4901-3A.

The test equipment is calibrated in accordance to ANSI / NCSL Z540 -1-1994

*Prepared by:*



---

Jagannath G. Shanbhag  
Electrical Engineer  
Department of Engineering  
SWR Inc

## TEST RESULTS

The attached calculations verify that the root mean square (RMS) of the measured composite antenna pattern is **92.59 %** of the RMS of the authorized composite directional antenna pattern of the related construction permit **BLED-20001130AAT**.

The following are the values of the measured antenna patterns

RMS value of circular polarized (Composite) pattern :	0.576
Directivity of horizontal polarized pattern :	3.24215 / 5.108dB
Directivity of vertical polarized pattern :	3.87911 / 5.887dB
Directivity of circular polarized (Composite) pattern :	3.01591 / 4.794dB

Gain in each polarization was calculated using the following relation:

**GAIN = Azimuth Directivity x Elevation Directivity x Power Ratio between Polarizations**

Using this relationship along with ratio measured at our testing facilities:

$$\text{H-Pol. Gain} = (3.24215)(0.883)(0.544722) = 1.559/ 1.930 \text{ dB}$$

$$\text{V-Pol. Gain} = (3.87911)(0.883)(0.455278) = 1.559/ 1.930 \text{ dB}$$

## INSTALLATION AND MOUNTING

The antenna is to be mounted in accordance with the supplied drawings. The antenna center of radiation is to be **102 meters** above ground level. No other antennas are to be mounted within **10 feet** of the antenna. No other obstructions other than those specified by original drawings supplied are to be mounted at the same level as the antenna. The antenna is to be oriented at **180 degrees** true North.

The parasitic system is custom designed to shape and direct the antenna pattern as required. The systems orientation and the mounting details are described in the following drawings:

DRAWING NO.	TITLE
0708D00	ANTENNA ASSEMBLY
0708D01	ANTENNA ORIENTATION
0708D02	PARASITIC PLACEMENT
2105A10	TEST RANGE SCHEMATIC

The array shall be mounted according to **DWG. 0708D00**. The antenna elements shall be aligned at the same heading as in **DWG. 0708D01**. The Parasitic Assembly is shown in **DWG. 0708D02**. This will ensure that the antenna is oriented properly at **180 degrees** true north.



**SYSTEMS WITH RELIABILITY, INC.**  
**Broadcast Antennas and Transmission Systems**

## WYFZ Antenna RMS Comparison

### PROPOSED ANTENNA

Azimuth Heading	Relative Field
0	0.2450
10	0.2200
20	0.2020
30	0.1780
40	0.1780
50	0.1780
60	0.1780
70	0.1780
80	0.2230
90	0.2810
100	0.3510
110	0.4410
120	0.5530
130	0.6920
140	0.8510
150	1.0000
160	1.0000
170	1.0000
180	1.0000
190	1.0000
200	1.0000
210	1.0000
220	1.0000
230	1.0000
240	0.9220
250	0.7340
260	0.5840

### DESIGNED ANTENNA

Azimuth Heading	Relative Field
0	0.1800
10	0.1600
20	0.1580
30	0.1560
40	0.1700
50	0.1720
60	0.1720
70	0.1720
80	0.1800
90	0.2240
100	0.2810
110	0.3500
120	0.4380
130	0.5500
140	0.6500
150	0.7980
160	0.9000
170	1.0000
180	1.0000
190	1.0000
200	1.0000
210	0.9930
220	0.9670
230	0.9140
240	0.8490
250	0.7200
260	0.5800

**PROPOSED ANTENNA**

Azimuth Heading	Relative Field
270	0.4650
280	0.3700
290	0.3270
300	0.2880
310	0.2880
320	0.2880
330	0.2880
340	0.2880
350	0.2880

Sum of Relative Field Squared : 13.951  
Sum Divided by 36 (Readings) : 0.388  
Square Root : 0.623

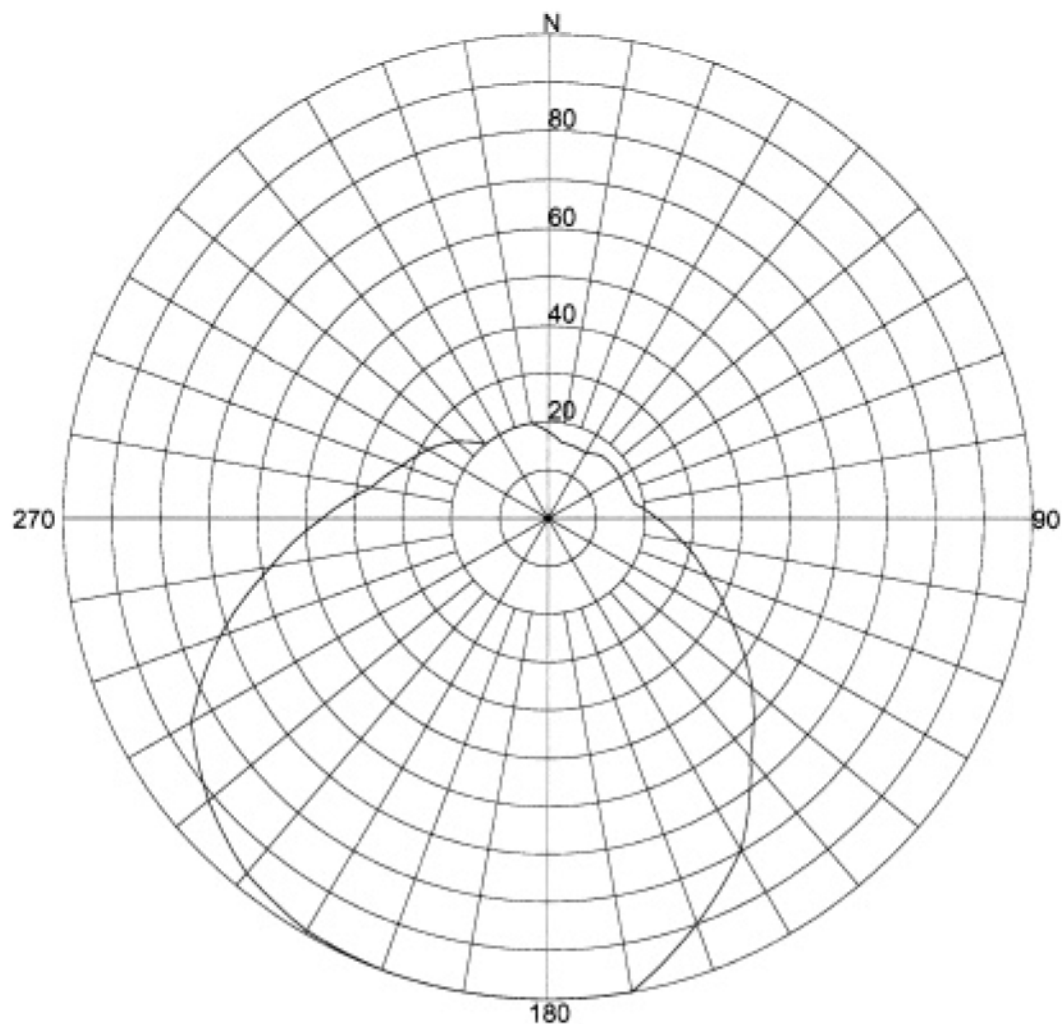
**Percentage of Construction Permit Antenna Filled :**

**DESIGNED ANTENNA**

Azimuth Heading	Relative Field
270	0.4650
280	0.3695
290	0.3200
300	0.2850
310	0.2480
320	0.2000
330	0.2000
340	0.2000
350	0.1900

Sum of Relative Field Squared : 11.959  
Sum Divided by 36 (Readings) : 0.332  
Square Root : 0.576

**92.59%**



**Azimuth Pattern**

**Systems With Reliability L.L.P.**

Scale: Linear

Unit: Relative Field

CLIENT: *Bible Broadcasting Network*

Date: 4/27/2006

ANTENNA TYPE: FM3/1 DA

FREQUENCY: 91.3

PATTERN POL.: Circular

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.01591 / 4.794dB

PATTERN RMS: 0.576

## Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	.1800 (-14.895 )	180	1.0000 ( 0 )
5	.1700 (-15.391 )	185	1.0000 ( 0 )
10	.1600 (-15.918 )	190	1.0000 ( 0 )
15	.1590 (-15.972 )	195	1.0000 ( 0 )
20	.1580 (-16.027 )	200	1.0000 ( 0 )
25	.1570 (-16.082 )	205	.9965 (-0.03 )
30	.1560 (-16.138 )	210	.9930 (-0.061 )
35	.1630 (-15.756 )	215	.9800 (-0.175 )
40	.1700 (-15.391 )	220	.9670 (-0.291 )
45	.1710 (-15.34 )	225	.9405 (-0.533 )
50	.1720 (-15.289 )	230	.9140 (-0.781 )
55	.1720 (-15.289 )	235	.8815 (-1.096 )
60	.1720 (-15.289 )	240	.8490 (-1.422 )
65	.1720 (-15.289 )	245	.7845 (-2.108 )
70	.1720 (-15.289 )	250	.7200 (-2.853 )
75	.1760 (-15.09 )	255	.6500 (-3.742 )
80	.1800 (-14.895 )	260	.5800 (-4.731 )
85	.2020 (-13.893 )	265	.5225 (-5.638 )
90	.2240 (-12.995 )	270	.4650 (-6.651 )
95	.2525 (-11.955 )	275	.4173 (-7.592 )
100	.2810 (-11.026 )	280	.3695 (-8.648 )
105	.3155 (-10.02 )	285	.3448 (-9.25 )
110	.3500 (-9.119 )	290	.3200 (-9.897 )
115	.3940 (-8.09 )	295	.3025 (-10.385 )
120	.4380 (-7.171 )	300	.2850 (-10.903 )
125	.4940 (-6.125 )	305	.2665 (-11.486 )
130	.5500 (-5.193 )	310	.2480 (-12.111 )
135	.6000 (-4.437 )	315	.2240 (-12.995 )
140	.6500 (-3.742 )	320	.2000 (-13.979 )
145	.7240 (-2.805 )	325	.2000 (-13.979 )
150	.7980 (-1.96 )	330	.2000 (-13.979 )
155	.8490 (-1.422 )	335	.2000 (-13.979 )
160	.9000 (-0.915 )	340	.2000 (-13.979 )
165	.9500 (-0.446 )	345	.2000 (-13.979 )
170	1.0000 ( 0 )	350	.2000 (-13.979 )
175	1.0000 ( 0 )	355	.1900 (-14.425 )

## Systems With Reliability L.L.P.

CLIENT: *Bible Broadcasting Network*

Date: 4/27/2006

ANTENNA TYPE: FM3/1 DA

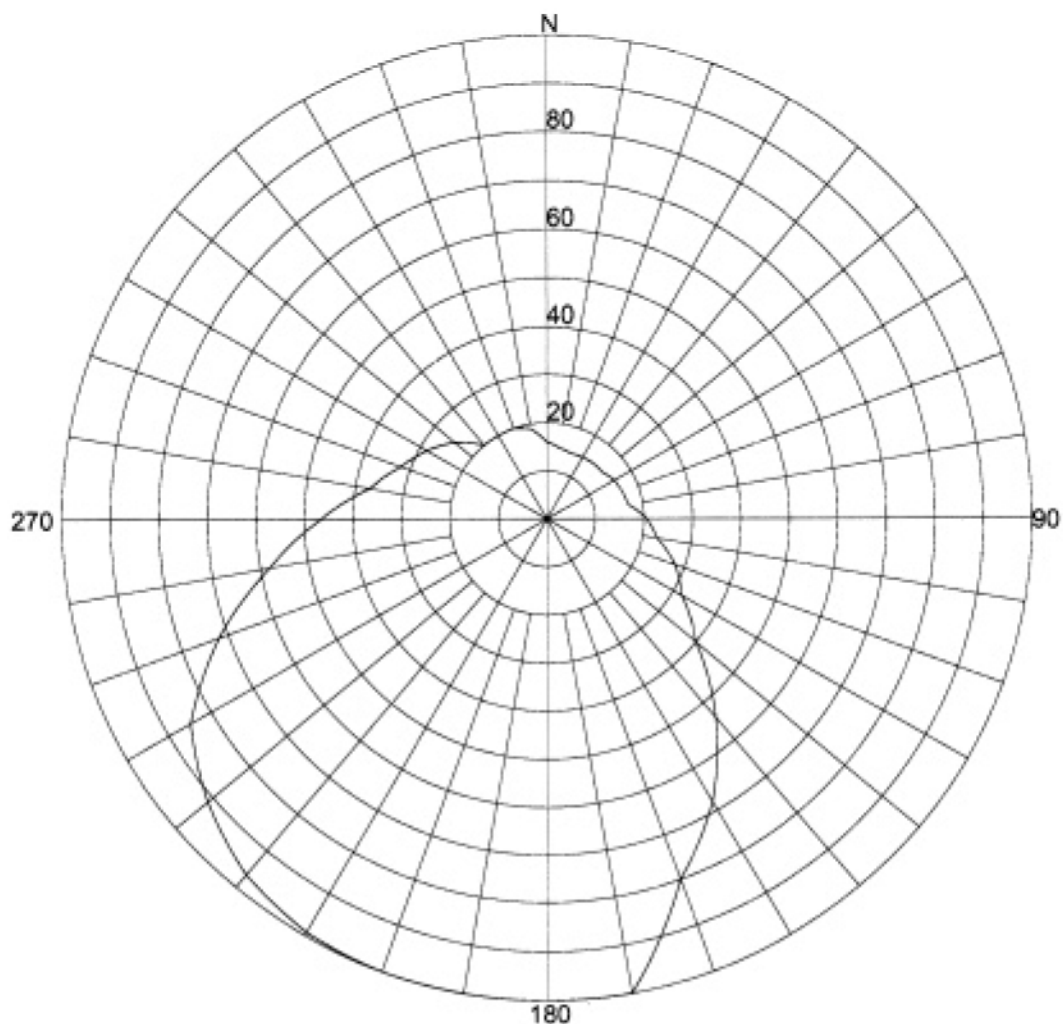
FREQUENCY: 91.3

PATTERN POL.: Circular

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.01591 / 4.794dB

PATTERN RMS: 0.576



**Azimuth Pattern**

Scale: Linear

Unit: Relative Field

## Systems With Reliability L.L.P.

CLIENT: *Bible Broadcasting Network*

Date: 4/27/2006

ANTENNA TYPE: FM3/1 DA

FREQUENCY: 91.3

PATTERN POL.: Horizontal

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.24215 / 5.108dB

PATTERN RMS: 0.555



## Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	.1600 (-15.918)	180	1.0000 ( 0 )
5	.1550 (-16.193)	185	1.0000 ( 0 )
10	.1500 (-16.478)	190	1.0000 ( 0 )
15	.1475 (-16.624)	195	1.0000 ( 0 )
20	.1450 (-16.773)	200	1.0000 ( 0 )
25	.1465 (-16.683)	205	.9965 (-0.03 )
30	.1480 (-16.595)	210	.9930 (-0.061)
35	.1490 (-16.536)	215	.9800 (-0.175)
40	.1500 (-16.478)	220	.9670 (-0.291)
45	.1500 (-16.478)	225	.9405 (-0.533)
50	.1500 (-16.478)	230	.9140 (-0.781)
55	.1550 (-16.193)	235	.8815 (-1.096)
60	.1600 (-15.918)	240	.8490 (-1.422)
65	.1625 (-15.783)	245	.7845 (-2.108)
70	.1650 (-15.65 )	250	.7200 (-2.853)
75	.1675 (-15.52 )	255	.6500 (-3.742)
80	.1700 (-15.391)	260	.5800 (-4.731)
85	.1875 (-14.54 )	265	.5225 (-5.638)
90	.2050 (-13.765)	270	.4650 (-6.651)
95	.2175 (-13.251)	275	.4173 (-7.592)
100	.2300 (-12.765)	280	.3695 (-8.648)
105	.2550 (-11.869)	285	.3448 (-9.25 )
110	.2800 (-11.057)	290	.3200 (-9.897)
115	.3000 (-10.458)	295	.3025 (-10.385)
120	.3200 (-9.897)	300	.2850 (-10.903)
125	.3600 (-8.874)	305	.2665 (-11.486)
130	.4000 (-7.959)	310	.2480 (-12.111)
135	.4700 (-6.558)	315	.2240 (-12.995)
140	.5400 (-5.352)	320	.2000 (-13.979)
145	.6100 (-4.293)	325	.2000 (-13.979)
150	.6800 (-3.35 )	330	.2000 (-13.979)
155	.7400 (-2.615)	335	.2000 (-13.979)
160	.8000 (-1.938)	340	.2000 (-13.979)
165	.9000 (-0.915)	345	.1950 (-14.199)
170	1.0000 ( 0 )	350	.1900 (-14.425)
175	1.0000 ( 0 )	355	.1750 (-15.139)

## Systems With Reliability L.L.P.

CLIENT: *Bible Broadcasting Network*

Date: 4/27/2006

ANTENNA TYPE: FM3/1 DA

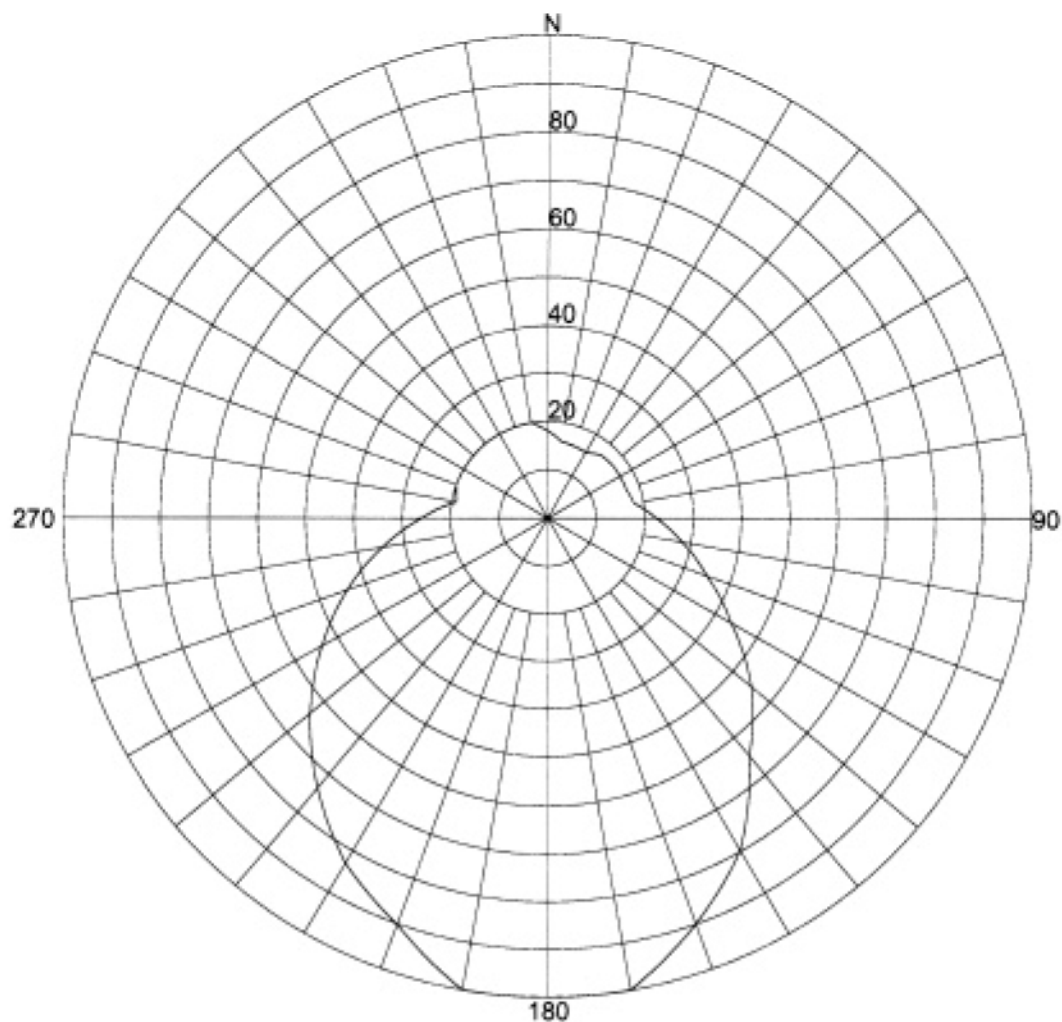
FREQUENCY: 91.3

PATTERN POL.: Horizontal

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.24215 / 5.108dB

PATTERN RMS: 0.555



Azimuth Pattern

## Systems With Reliability L.L.P.

Scale: Linear

Unit: Relative Field

CLIENT: *Bible Broadcasting Network*

Date: 4/27/2006

ANTENNA TYPE: FM3/1 DA

FREQUENCY: 91.3

PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.87911 / 5.887dB

PATTERN RMS: 0.508

## Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	.1800 (-14.895 )	180	1.0000 ( 0 )
5	.1700 (-15.391 )	185	1.0000 ( 0 )
10	.1600 (-15.918 )	190	1.0000 ( 0 )
15	.1590 (-15.972 )	195	.9510 (-0.436 )
20	.1580 (-16.027 )	200	.9020 (-0.896 )
25	.1570 (-16.082 )	205	.8660 (-1.25 )
30	.1560 (-16.138 )	210	.8300 (-1.618 )
35	.1630 (-15.756 )	215	.7830 (-2.125 )
40	.1700 (-15.391 )	220	.7360 (-2.662 )
45	.1710 (-15.34 )	225	.6870 (-3.261 )
50	.1720 (-15.289 )	230	.6380 (-3.904 )
55	.1720 (-15.289 )	235	.5870 (-4.627 )
60	.1720 (-15.289 )	240	.5360 (-5.417 )
65	.1720 (-15.289 )	245	.4875 (-6.241 )
70	.1720 (-15.289 )	250	.4390 (-7.151 )
75	.1760 (-15.09 )	255	.3920 (-8.134 )
80	.1800 (-14.895 )	260	.3450 (-9.244 )
85	.2020 (-13.893 )	265	.3020 (-10.4 )
90	.2240 (-12.995 )	270	.2590 (-11.734 )
95	.2525 (-11.955 )	275	.2250 (-12.956 )
100	.2810 (-11.026 )	280	.1910 (-14.379 )
105	.3155 (-10.02 )	285	.1955 (-14.177 )
110	.3500 (-9.119 )	290	.2000 (-13.979 )
115	.3940 (-8.09 )	295	.2000 (-13.979 )
120	.4380 (-7.171 )	300	.2000 (-13.979 )
125	.4940 (-6.125 )	305	.2000 (-13.979 )
130	.5500 (-5.193 )	310	.2000 (-13.979 )
135	.6000 (-4.437 )	315	.2000 (-13.979 )
140	.6500 (-3.742 )	320	.2000 (-13.979 )
145	.7240 (-2.805 )	325	.2000 (-13.979 )
150	.7980 (-1.96 )	330	.2000 (-13.979 )
155	.8490 (-1.422 )	335	.2000 (-13.979 )
160	.9000 (-0.915 )	340	.2000 (-13.979 )
165	.9500 (-0.446 )	345	.2000 (-13.979 )
170	1.0000 ( 0 )	350	.2000 (-13.979 )
175	1.0000 ( 0 )	355	.1900 (-14.425 )

## Systems With Reliability L.L.P.

CLIENT: *Bible Broadcasting Network*

Date: 4/27/2006

ANTENNA TYPE: FM3/1 DA

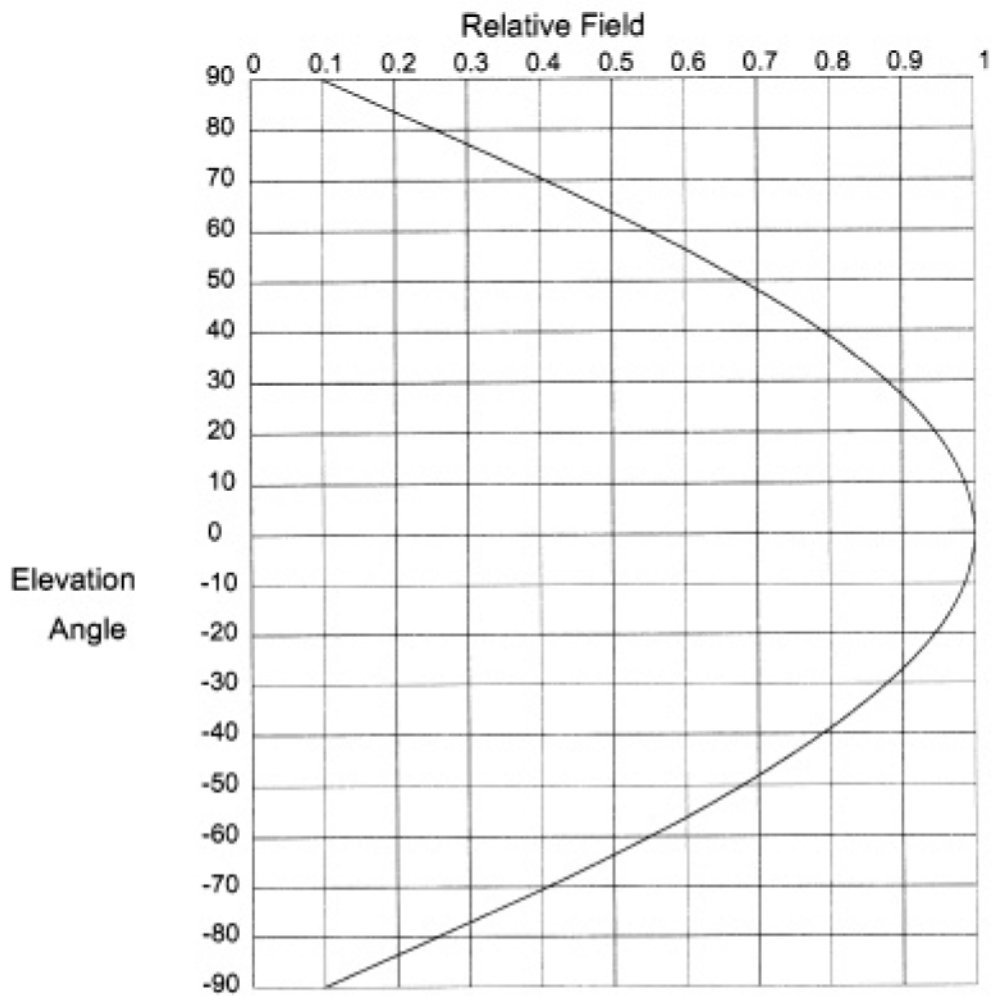
FREQUENCY: 91.3

PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.87911 / 5.887dB

PATTERN RMS: 0.508



## Elevation Pattern

Scale: Linear

Units: Field, Relative

## Systems With Reliability L.L.P.

Date: 2/13/2006

CLIENT: *Bible Broadcasting Network*  
 ANTENNA TYPE: FM3/1 DA  
 FREQUENCY: 91.3  
 PATTERN POL.: Circular  
 DIRECTIVITY(Peak): 0.883/-0.539 dBd  
 DIRECTIVITY(Horiz): 0.883/-0.539 dBd

Beam Tilt (Deg.): 0  
 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 (-20)	52.0	.654 (-3.687)	14.0	.973 (-0.235)
89.0	.116 (-18.733)	51.0	.666 (-3.525)	13.0	.977 (-0.203)
88.0	.131 (-17.627)	50.0	.679 (-3.369)	12.0	.98 (-0.173)
87.0	.147 (-16.648)	49.0	.69 (-3.217)	11.0	.983 (-0.145)
86.0	.163 (-15.768)	48.0	.702 (-3.071)	10.0	.986 (-0.12)
85.0	.178 (-14.97)	47.0	.714 (-2.928)	9.8	.987 (-0.115)
84.0	.194 (-14.241)	46.0	.725 (-2.791)	9.6	.987 (-0.11)
83.0	.21 (-13.569)	45.0	.736 (-2.658)	9.4	.988 (-0.106)
82.0	.225 (-12.946)	44.0	.747 (-2.529)	9.2	.988 (-0.101)
81.0	.241 (-12.367)	43.0	.758 (-2.404)	9.0	.989 (-0.097)
80.0	.256 (-11.826)	42.0	.769 (-2.283)	8.8	.989 (-0.093)
79.0	.272 (-11.317)	41.0	.779 (-2.167)	8.6	.99 (-0.088)
78.0	.287 (-10.839)	40.0	.789 (-2.054)	8.4	.99 (-0.084)
77.0	.302 (-10.387)	39.0	.799 (-1.944)	8.2	.991 (-0.08)
76.0	.318 (-9.959)	38.0	.809 (-1.839)	8.0	.991 (-0.076)
75.0	.333 (-9.553)	37.0	.819 (-1.737)	7.8	.992 (-0.073)
74.0	.348 (-9.167)	36.0	.828 (-1.638)	7.6	.992 (-0.069)
73.0	.363 (-8.799)	35.0	.837 (-1.543)	7.4	.993 (-0.065)
72.0	.378 (-8.448)	34.0	.846 (-1.451)	7.2	.993 (-0.062)
71.0	.393 (-8.112)	33.0	.855 (-1.363)	7.0	.993 (-0.058)
70.0	.408 (-7.791)	32.0	.863 (-1.277)	6.8	.994 (-0.055)
69.0	.423 (-7.483)	31.0	.871 (-1.195)	6.6	.994 (-0.052)
68.0	.437 (-7.187)	30.0	.879 (-1.116)	6.4	.994 (-0.049)
67.0	.452 (-6.904)	29.0	.887 (-1.04)	6.2	.995 (-0.046)
66.0	.466 (-6.631)	28.0	.895 (-0.967)	6.0	.995 (-0.043)
65.0	.48 (-6.369)	27.0	.902 (-0.897)	5.8	.995 (-0.04)
64.0	.495 (-6.116)	26.0	.909 (-0.83)	5.6	.996 (-0.037)
63.0	.509 (-5.873)	25.0	.916 (-0.765)	5.4	.996 (-0.035)
62.0	.523 (-5.638)	24.0	.922 (-0.704)	5.2	.996 (-0.032)
61.0	.536 (-5.411)	23.0	.928 (-0.645)	5.0	.997 (-0.03)
60.0	.55 (-5.193)	22.0	.934 (-0.589)	4.8	.997 (-0.027)
59.0	.564 (-4.982)	21.0	.94 (-0.535)	4.6	.997 (-0.025)
58.0	.577 (-4.778)	20.0	.946 (-0.485)	4.4	.997 (-0.023)
57.0	.59 (-4.58)	19.0	.951 (-0.437)	4.2	.998 (-0.021)
56.0	.603 (-4.39)	18.0	.956 (-0.391)	4.0	.998 (-0.019)
55.0	.616 (-4.205)	17.0	.961 (-0.348)	3.8	.998 (-0.017)
54.0	.629 (-4.027)	16.0	.965 (-0.308)	3.6	.998 (-0.015)
53.0	.642 (-3.854)	15.0	.969 (-0.271)	3.4	.998 (-0.014)

### Systems With Reliability L.L.P.

Page 1 of 3

CLIENT: *Bible Broadcasting Network*

Date: 2/13/2006

ANTENNA TYPE: FM3/1 DA

FREQUENCY: 91.3

PATTERN POL.: Circular

DIRECTIVITY(Peak): 0.883/-0.539 dBd

Beam Tilt (Deg.) : 0

DIRECTIVITY(Horiz): 0.883/-0.539 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	.999 (-0.012)	-4.4	.997 (-0.023)	-12.0	.98 (-0.173 )
3.0	.999 (-0.011)	-4.6	.997 (-0.025)	-12.2	.98 (-0.178 )
2.8	.999 (-0.009)	-4.8	.997 (-0.027)	-12.4	.979 (-0.184 )
2.6	.999 (-0.008)	-5.0	.997 (-0.03)	-12.6	.978 (-0.19 )
2.4	.999 (-0.007)	-5.2	.996 (-0.032)	-12.8	.978 (-0.196 )
2.2	.999 (-0.006)	-5.4	.996 (-0.035)	-13.0	.977 (-0.203 )
2.0	.999 (-0.005)	-5.6	.996 (-0.037)	-13.2	.976 (-0.209 )
1.8	1.00 (-0.004)	-5.8	.995 (-0.04)	-13.4	.975 (-0.215 )
1.6	1.00 (-0.003)	-6.0	.995 (-0.043)	-13.6	.975 (-0.222 )
1.4	1.00 (-0.002)	-6.2	.995 (-0.046)	-13.8	.974 (-0.229 )
1.2	1.00 (-0.002)	-6.4	.994 (-0.049)	-14.0	.973 (-0.235 )
1.0	1.00 (-0.001)	-6.6	.994 (-0.052)	-14.2	.973 (-0.242 )
.8	1.00 (-0.001)	-6.8	.994 (-0.055)	-14.4	.972 (-0.249 )
.6	1.00 (0)	-7.0	.993 (-0.058)	-14.6	.971 (-0.256 )
.4	1.00 (0)	-7.2	.993 (-0.062)	-14.8	.97 (-0.263 )
.2	1.00 (0)	-7.4	.993 (-0.065)	-15.0	.969 (-0.271 )
.0	1.00 (0)	-7.6	.992 (-0.069)	-15.2	.969 (-0.278 )
-.2	1.00 (0)	-7.8	.992 (-0.073)	-15.4	.968 (-0.285 )
-.4	1.00 (0)	-8.0	.991 (-0.076)	-15.6	.967 (-0.293 )
-.6	1.00 (0)	-8.2	.991 (-0.08)	-15.8	.966 (-0.3 )
-.8	1.00 (-0.001)	-8.4	.99 (-0.084)	-16.0	.965 (-0.308 )
-1.0	1.00 (-0.001)	-8.6	.99 (-0.088)	-16.2	.964 (-0.316 )
-1.2	1.00 (-0.002)	-8.8	.989 (-0.093)	-16.4	.963 (-0.324 )
-1.4	1.00 (-0.002)	-9.0	.989 (-0.097)	-16.6	.962 (-0.332 )
-1.6	1.00 (-0.003)	-9.2	.988 (-0.101)	-16.8	.962 (-0.34 )
-1.8	1.00 (-0.004)	-9.4	.988 (-0.106)	-17.0	.961 (-0.348 )
-2.0	.999 (-0.005)	-9.6	.987 (-0.11)	-17.2	.96 (-0.357 )
-2.2	.999 (-0.006)	-9.8	.987 (-0.115)	-17.4	.959 (-0.365 )
-2.4	.999 (-0.007)	-10.0	.986 (-0.12)	-17.6	.958 (-0.374 )
-2.6	.999 (-0.008)	-10.2	.986 (-0.124)	-17.8	.957 (-0.383 )
-2.8	.999 (-0.009)	-10.4	.985 (-0.129)	-18.0	.956 (-0.391 )
-3.0	.999 (-0.011)	-10.6	.985 (-0.134)	-18.2	.955 (-0.4 )
-3.2	.999 (-0.012)	-10.8	.984 (-0.14)	-18.4	.954 (-0.409 )
-3.4	.998 (-0.014)	-11.0	.983 (-0.145)	-18.6	.953 (-0.418 )
-3.6	.998 (-0.015)	-11.2	.983 (-0.15)	-18.8	.952 (-0.427 )
-3.8	.998 (-0.017)	-11.4	.982 (-0.156)	-19.0	.951 (-0.437 )
-4.0	.998 (-0.019)	-11.6	.982 (-0.161)	-19.2	.95 (-0.446 )
-4.2	.998 (-0.021)	-11.8	.981 (-0.167)	-19.4	.949 (-0.456 )

## Systems With Reliability L.L.P.

Page 2 of 3

CLIENT: *Bible Broadcasting Network*

Date: 2/13/2006

ANTENNA TYPE: FM3/1 DA

FREQUENCY: 91.3

PATTERN POL.: Circular

DIRECTIVITY(Peak): 0.883/-0.539 dBd

Beam Tilt (Deg.) : 0

DIRECTIVITY(Horiz): 0.883/-0.539 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	.948 (-0.465)	-27.2	.90 (-0.911)	-54.0	.629 (-4.027)
-19.8	.947 (-0.475)	-27.4	.899 (-0.924)	-55.0	.616 (-4.205)
-20.0	.946 (-0.485)	-27.6	.898 (-0.939)	-56.0	.603 (-4.39)
-20.2	.945 (-0.495)	-27.8	.896 (-0.953)	-57.0	.59 (-4.58)
-20.4	.944 (-0.505)	-28.0	.895 (-0.967)	-58.0	.577 (-4.778)
-20.6	.942 (-0.515)	-28.2	.893 (-0.981)	-59.0	.564 (-4.982)
-20.8	.941 (-0.525)	-28.4	.892 (-0.996)	-60.0	.55 (-5.193)
-21.0	.94 (-0.535)	-28.6	.89 (-1.01)	-61.0	.536 (-5.411)
-21.2	.939 (-0.546)	-28.8	.889 (-1.025)	-62.0	.523 (-5.638)
-21.4	.938 (-0.556)	-29.0	.887 (-1.04)	-63.0	.509 (-5.873)
-21.6	.937 (-0.567)	-29.2	.886 (-1.055)	-64.0	.495 (-6.116)
-21.8	.936 (-0.578)	-29.4	.884 (-1.07)	-65.0	.48 (-6.369)
-22.0	.934 (-0.589)	-29.6	.883 (-1.085)	-66.0	.466 (-6.631)
-22.2	.933 (-0.6)	-29.8	.881 (-1.101)	-67.0	.452 (-6.904)
-22.4	.932 (-0.611)	-30.0	.879 (-1.116)	-68.0	.437 (-7.187)
-22.6	.931 (-0.622)	-31.0	.871 (-1.195)	-69.0	.423 (-7.483)
-22.8	.93 (-0.633)	-32.0	.863 (-1.277)	-70.0	.408 (-7.791)
-23.0	.928 (-0.645)	-33.0	.855 (-1.363)	-71.0	.393 (-8.112)
-23.2	.927 (-0.656)	-34.0	.846 (-1.451)	-72.0	.378 (-8.448)
-23.4	.926 (-0.668)	-35.0	.837 (-1.543)	-73.0	.363 (-8.799)
-23.6	.925 (-0.68)	-36.0	.828 (-1.638)	-74.0	.348 (-9.167)
-23.8	.923 (-0.692)	-37.0	.819 (-1.737)	-75.0	.333 (-9.553)
-24.0	.922 (-0.704)	-38.0	.809 (-1.839)	-76.0	.318 (-9.959)
-24.2	.921 (-0.716)	-39.0	.799 (-1.944)	-77.0	.302 (-10.387)
-24.4	.92 (-0.728)	-40.0	.789 (-2.054)	-78.0	.287 (-10.839)
-24.6	.918 (-0.74)	-41.0	.779 (-2.167)	-79.0	.272 (-11.317)
-24.8	.917 (-0.753)	-42.0	.769 (-2.283)	-80.0	.256 (-11.826)
-25.0	.916 (-0.765)	-43.0	.758 (-2.404)	-81.0	.241 (-12.367)
-25.2	.914 (-0.778)	-44.0	.747 (-2.529)	-82.0	.225 (-12.946)
-25.4	.913 (-0.791)	-45.0	.736 (-2.658)	-83.0	.21 (-13.569)
-25.6	.912 (-0.803)	-46.0	.725 (-2.791)	-84.0	.194 (-14.241)
-25.8	.91 (-0.816)	-47.0	.714 (-2.928)	-85.0	.178 (-14.97)
-26.0	.909 (-0.83)	-48.0	.702 (-3.071)	-86.0	.163 (-15.768)
-26.2	.908 (-0.843)	-49.0	.69 (-3.217)	-87.0	.147 (-16.648)
-26.4	.906 (-0.856)	-50.0	.679 (-3.369)	-88.0	.131 (-17.627)
-26.6	.905 (-0.87)	-51.0	.666 (-3.525)	-89.0	.116 (-18.733)
-26.8	.903 (-0.883)	-52.0	.654 (-3.687)	-90.0	.10 (-20)
-27.0	.902 (-0.897)	-53.0	.642 (-3.854)	90.0	.00 (-50)

**Systems With Reliability L.L.P.**

Page 3 of 3

CLIENT: *Bible Broadcasting Network*

Date: 2/13/2006

ANTENNA TYPE: FM3/1 DA

FREQUENCY: 91.3

PATTERN POL.: Circular

DIRECTIVITY(Peak): 0.883/-0.539 dBd

Beam Tilt (Deg.) : 0

DIRECTIVITY(Horiz): 0.883/-0.539 dBd

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



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

## SYSTEM DATA SHEET

Customer	Bible Broadcasting Network
Contact	Mike Raley
Location	WYFZ, Bellview, FL
Antenna Model	FM3/1 DA
Channel / Frequency	91.3 MHz

### ELECTRICAL SPECIFICATION

Polarization Type	Circular	
Polarization Ratio		
H-Pol. (PRH)	54.4722	%
V-Pol. (PRV)	45.5278	%
Elevation Directivity (ED)	0.883	
Azimuth Directivity (AD) H-Pol.	3.242	
Azimuth Directivity (AD) V-Pol.	3.879	
Antenna Gain (GH)		
H-Pol. (GH)	1.559	
V-Pol. (GV)	1.559	
dB Gain (AG)		
H-Pol. (AGH)	1.930	
V-Pol. (AGV)	1.930	
ERP		
H-Pol. (ERPH)	0.900	kW
V-Pol. (ERPV)	0.900	kW
Line Type	7/8" Foam	LDF5-50A
Attenuation per 100 ft.	0.347	dB/100ft
Line Length (LL)	360.00	ft.
Total Line Attenuation	1.25	dB
Line Efficiency (LE)	75.00	%
Line Loss (LPL)	0.19	kW
Antenna Input Power (AIP)	0.58	kW
Req'd. Transmitter Output Power	0.77	kW

### MECHANICAL SPECIFICATION

Height Above Ground Level (AGL)	334.56	ft.	102	m
Antenna Weight	33.00	lbs.	15.00	kg
Windload (50/33)	54.00	lbs.	24.55	kg

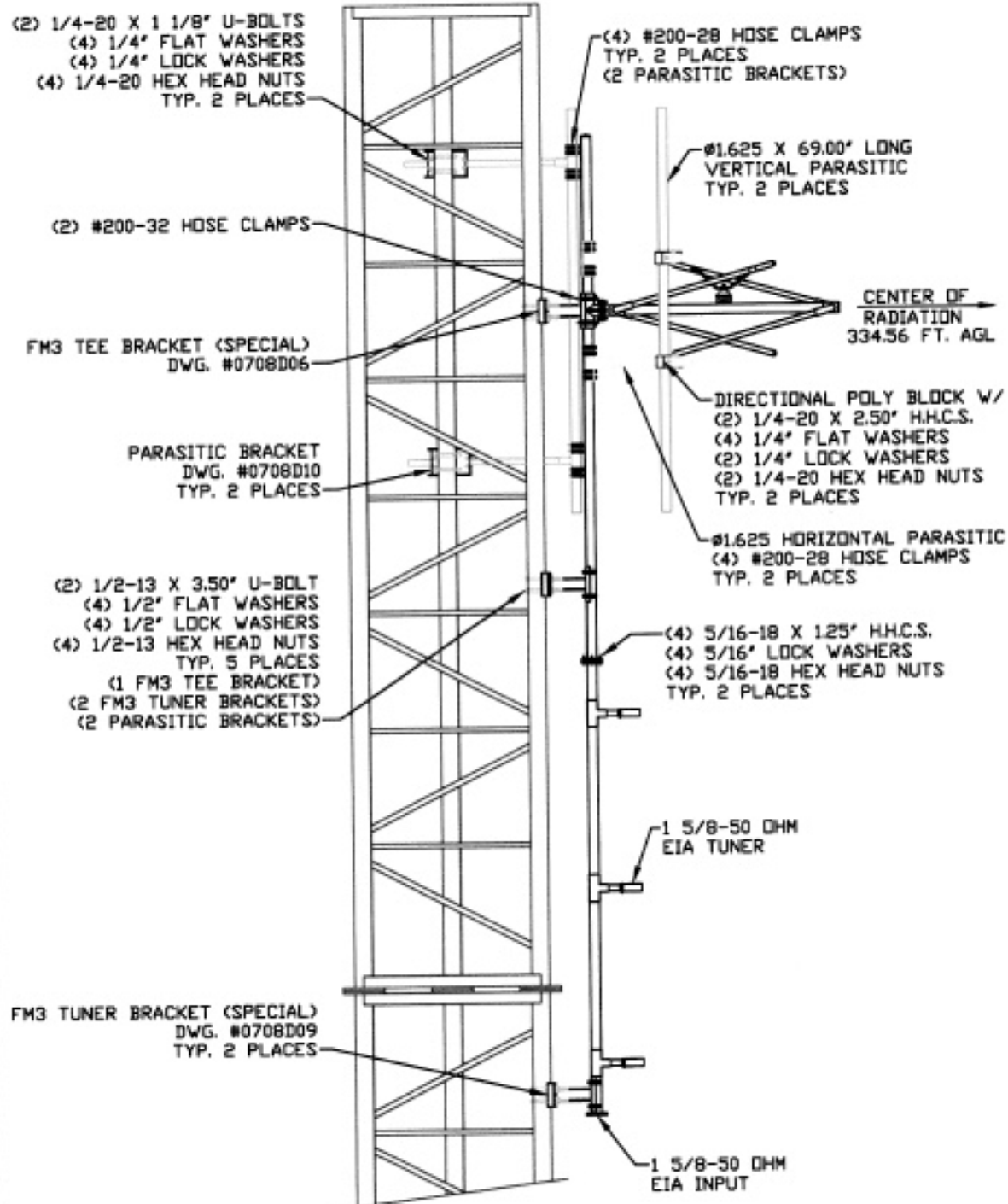
Prepared by:

Jagannath G. Shanbhag  
 Electrical Engineer  
 Department of Engineering  
 SWR, Inc.



## NOTES:

1. REFERENCE DWG. #0780D01  
FOR ANTENNA ORIENTATION.
2. REFERENCE DWG. #0780D02  
FOR PARASITIC PLACEMENT.



SYSTEMS WITH RELIABILITY, INC.  
819 INDUSTRIAL PARK ROAD  
GREENSBORO, PENNSYLVANIA 15831

FILE: FM3/1-DA, FREQ. 91.3  
BY: WYEZ, OCALA, FL

SIZE: B MAPPR. DATE: ENGINEER:  
C 2 3

DATE: NTS

RAC

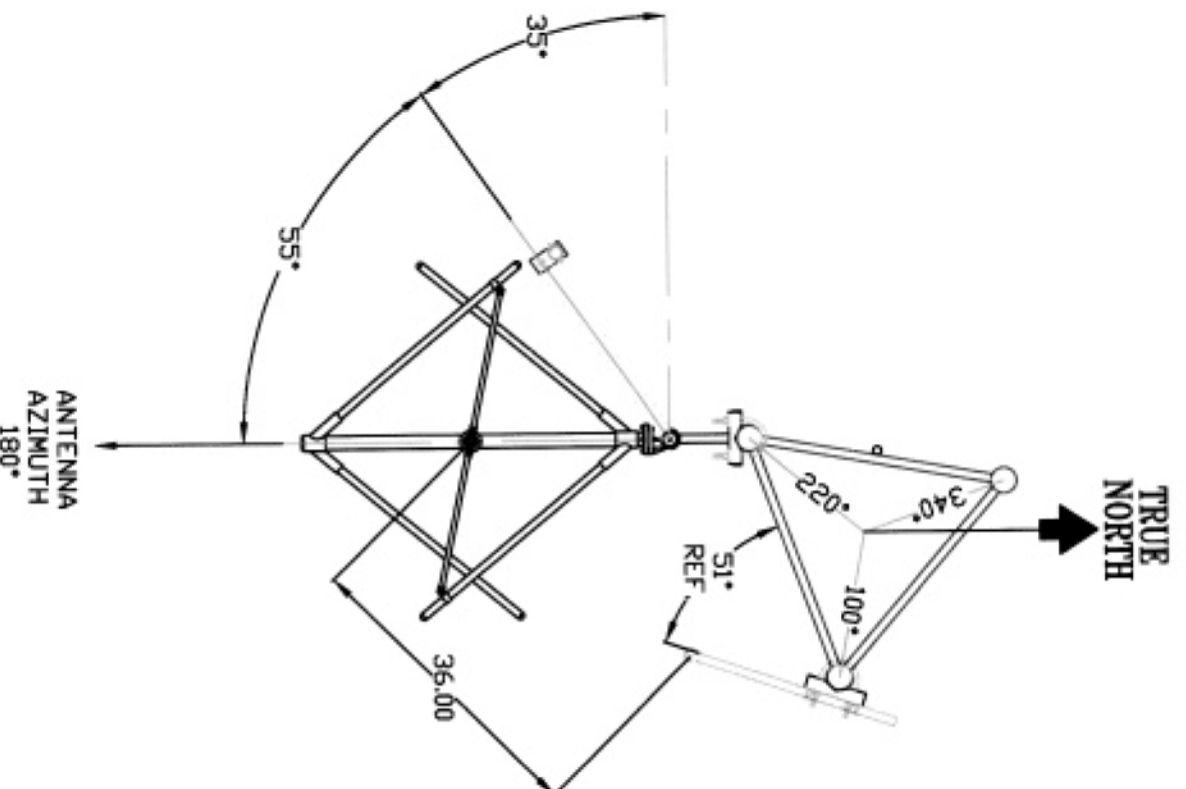
DATE: 5/15/06

1 OF 1

DRAWING NUMBER: 0708D00

NOTE:

DRAWING NUMBER  
**0708D01**



TOLERANCES		REVISION RECORD	
		REV	DATE
X	± .015		
XX	± .005		
XXX	± .002		
X/X	± 1/32		
DEG.	± 1/2		
UNLESS OTHERWISE SPECIFIED			

TITLE:

**FM3/1-DA, FREQ. 91.3**

MATERIAL:

**WYFZ, OCALA, FL**

**ANTENNA ORIENTATION**

**TOP VIEW**

SIZE:

**A**

PARTS MADE BY THIS DRAWING

SCALE: **NTS**

DATE: **RAC**

DATE: **5/15/06**

SHEET: **1**

OF **1**

DRAWING NUMBER  
**0708D01**

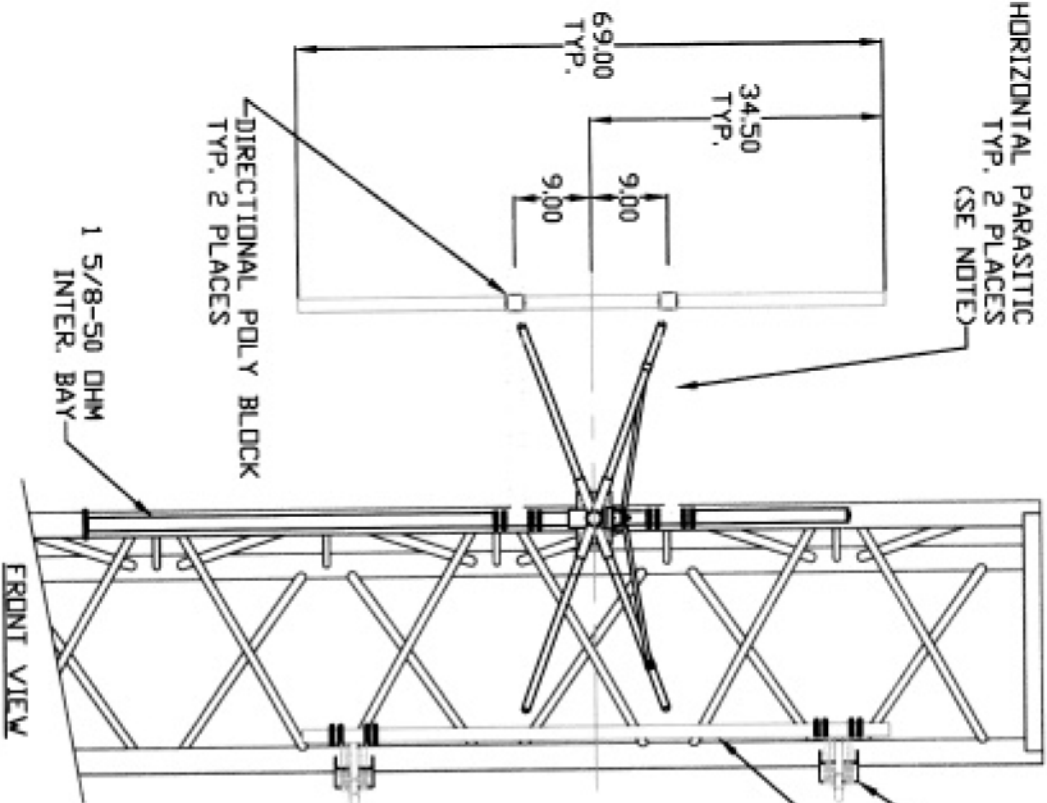


SYSTEMS WITH RELIABILITY, INC  
619 INDUSTRIAL PARK ROAD  
EBERSBURG, PENNSYLVANIA 15831

NOTE:

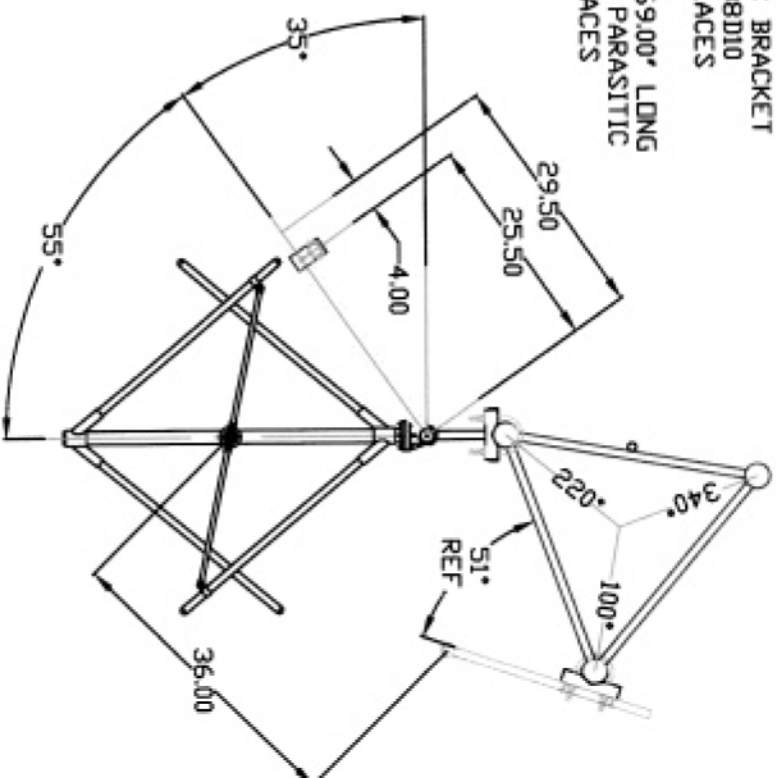
HORIZONTAL PARASITIC LOCATIONS ARE OUTLINED ON THE  
1 5/8 INTER. BAY PER TUNING AT THE FACTORY. PLACE THE  
HORIZONTAL PARASITICS AT THE OUTLINED LOCATIONS

Ø1.625 HORIZONTAL PARASITIC  
TYP. 2 PLACES  
(SEE NOTE)



PARASITIC BRACKET  
DWG. #0708D10  
TYP. 2 PLACES

Ø1.625 X 69.00" LONG  
VERTICAL PARASITIC  
TYP. 2 PLACES



TOP VIEW

FRONT VIEW

TOLERANCES	REV	REVISION RECORD	DATE
.X ± .015			
.XX ± .005			
.XXX ± .002			
X/X ± 1/32			
DEG. ± 1/2			
UNLESS OTHERWISE SPECIFIED			



SYSTEMS WITH RELIABILITY, INC  
619 INDUSTRIAL PARK ROAD  
GREENSBURG, PENNSYLVANIA 15631

TITLE:

FM3/1-DA, FREQ. 91.3

MATERIAL:

WYFZ, OCALA, FL  
PARASITIC PLACEMENT

SIZE:

A

PARTS MADE BY THIS DRAWING

SCALE: NTS

DATE: RAC

5/15/06

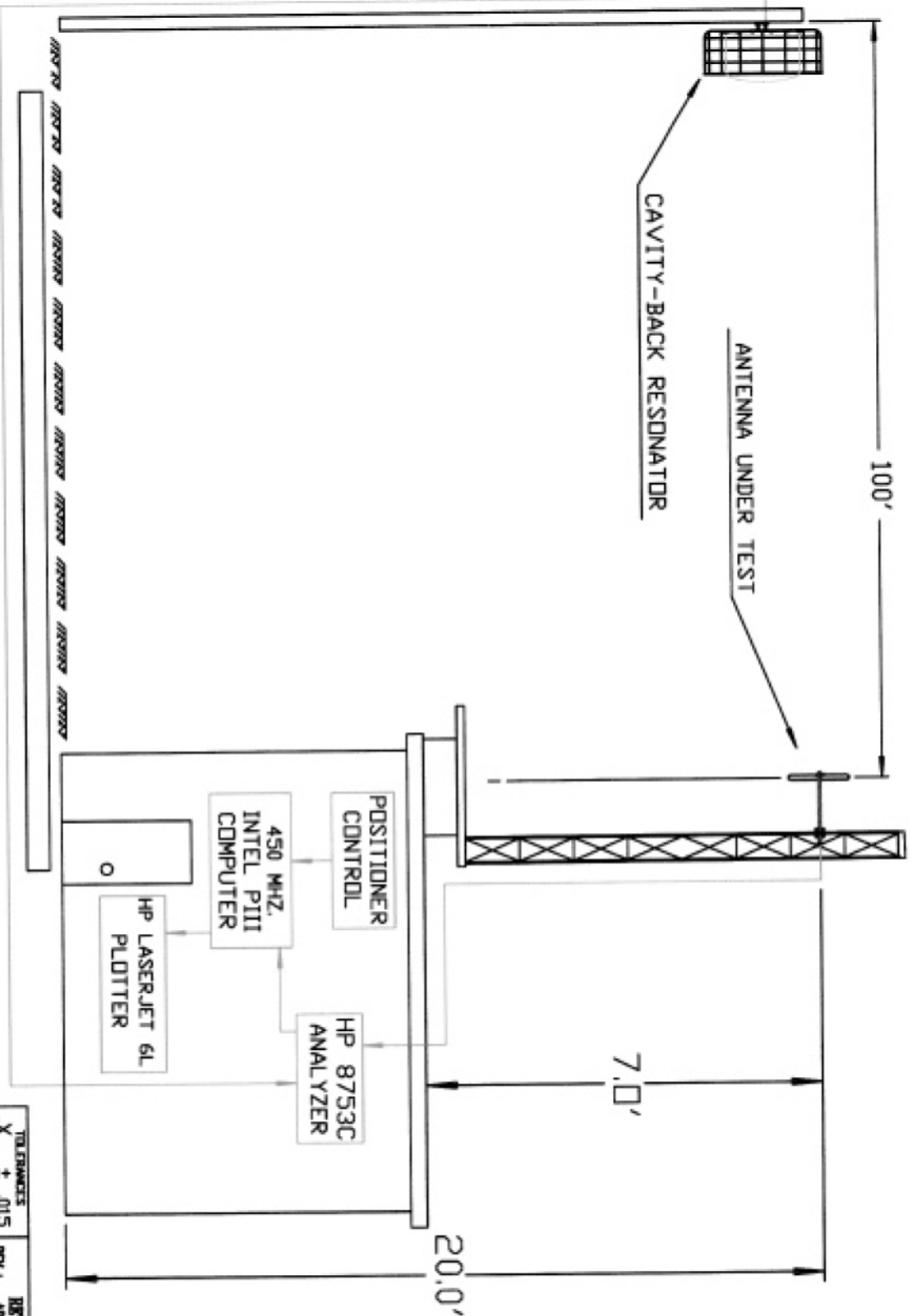
SHEET 1 OF 1

DRAWING NUMBER: 0708D02

DRAWING NUMBER: 0708D02

NOTE:

DRAWING  
NUMBER: 2105A10



# TEST RANGE SCHEMATIC

TITLE:

MATERIAL:



SYSTEMS WITH RELIABILITY, INC.  
619 INDUSTRIAL PARK ROAD  
Ebensburg, Pennsylvania 16831

SIZE: A

SCALE: NTS  
PARTS MADE BY THIS DRAWING  
JRM

DATE: 11/1/98

OF 1

TOLERANCES		REVISION RECORD	
		REV	DATE
.X	± .015		
.XX	± .005		
.XXX	± .002		
X/X	± 1/32		
DELS.	± 1/2		
UNLESS OTHERWISE SPECIFIED			
		2	10/7/05
		1	4/30/02

DRAWING NUMBER: 2105A10