SYSTEMS WITH RELIABILITY, LLP

BROADCAST ANTENNAS AND TRANSMISSION LINE

PATTERN CERTIFICATION

DIRECTIONAL FM ANTENNA
WGXM
January 12, 2013

Call Sign	:	WGXM
Location	:	Calypso, NC
Frequency	:	91.1 MHz
Channel	:	216A
Antenna Model	:	FMEC/2-PLUS-DA
Maximum Antenna Gain		
Horizontal	:	**1.683 / 2.261 dB**
Vertical	**:**	**1.683 / 2.261 dB**

ANTENNA DESCRIPTION

A custom designed FMEC/2-PLUS-DA antenna was fabricated to conform to the prescribed directional azimuth pattern. Each antenna bay consists of a circularly polarized, cross-V dipole radiating element, with 3 horizontal parasitics each. The bays are spaced one wavelength apart, mounted to a 2" (inch) schedule 40 support pole. The support pole is mounted to a 42" (inch) face tower. The antenna array points 270 degrees true north.

DESCRIPTION OF TEST PROCEDURE

The test antenna consisted of a single third-scale bay and parasitic system. The antenna was mounted to a third-scale pipe, which was mounted to a third-scale tower by use of third-scale brackets identical to those shipped with the final, full-scale antenna. For testing, the entire third-scale model was then mounted atop a 20' (foot) high platform, and all feed cables were properly grounded. Horizontal and vertical readings were taken. The desired directional pattern was obtained by adjusting the distance between the tower and the antenna, and implementing the use of horizontal parasitic elements.

DESCRIPTION OF TEST PERAMETERS AND EQUIPMENT

Horizontal and vertical pattern readings were taken by mounting a source antenna - a vertical/horizontal dipole, Cavity Back Resonator (CBR) antenna bay - approximately 100' (feet) from the third-scale antenna model. The source antenna's height was adjusted to achieve a uniform field at the third-scale test antenna location. The CBR antenna was operated in transmit mode, at frequency 273.3 MHz. The third-scale test antenna was then rotated clockwise in order to achieve 360° (degree) pattern readings at 5°(degree) increments. A gain reference was taken using a dipole tuned to 273.3 MHz. Nowhere did the received signal, or resultant documentation, exceed a maximum to minimum ratio of 15dB (decibels).

TEST RESULTS

The attached calculations verify that the **RMS** value of this antenna is ***98.9%*** of the **RMS** value of the pattern authorized in the related construction permit **BMPED-20121015AAV.** The vertical component **RMS** value is **0.782**. The horizontal component **RMS** value is **0.727**. The circular polarized component **RMS** value is **0.812**.

Azimuth and elevation plots and associated tabulations of this antenna are included with this package.

Measured vertical polarized directivity:	**1.635 / 2.134 dB**
Measured horizontal polarized directivity:	**1.895 / 2.775 dB**
Measured circular polarized pattern directivity:	**1.515 / 1.805 dB**

Gain in each polarization was calculated using the following relation:

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

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

V-Pol. Gain = (1.635)(.537)(1.918) **= 1.683 / 2.261 dB**
H-Pol. Gain = (1.895)(.463)(1.918) **= 1.683 / 2.261 dB**

INSTALLATION AND MOUNTING

The antenna is to be mounted in accordance with the supplied drawings. The antenna center of radiation is to be **45 *meters (147.65 ft.)*** above ground level. The antenna aperture is **10.8 feet**. 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 ***270 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**
1762D00	ELEVATION
1762D01	ANTENNA ORENTATION WITH PARASITICS
1762D02	BAY 1 & 2 PARASITIC PLACEMENT AND ASSEMBLY
2105A10	TEST RANGE SCHEMATIC

The array shall be mounted according to **DWG. 1762D00**. The antenna elements shall be aligned at the same heading as in **DWG. 1762D01**. This will ensure that the antenna is oriented properly at 270 degrees true north. Each bay's parasitic assembly is shown in **DWG. 1762D02.**. The test range schematic **DWG. 2105A10** shows the mounting configuration of the antenna setup on our range.

DOCUMENT EXHIBITS

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

Exhibit 1	Circular Polarized Azimuth Pattern Field Strength Tabulations (Composite)
Exhibit 2	Measured Horizontal Polarized Azimuth Pattern Measured Field Strength Tabulations (Horizontal)
Exhibit 3	Measured Vertical Polarized Azimuth Pattern Measured Field Strength Tabulations (Vertical)
Exhibit 4	Elevation Pattern Elevation Tabulations
Exhibit 5	Antenna Data Sheet
Exhibit 6	RMS Calculations
Exhibit 7	Drawings

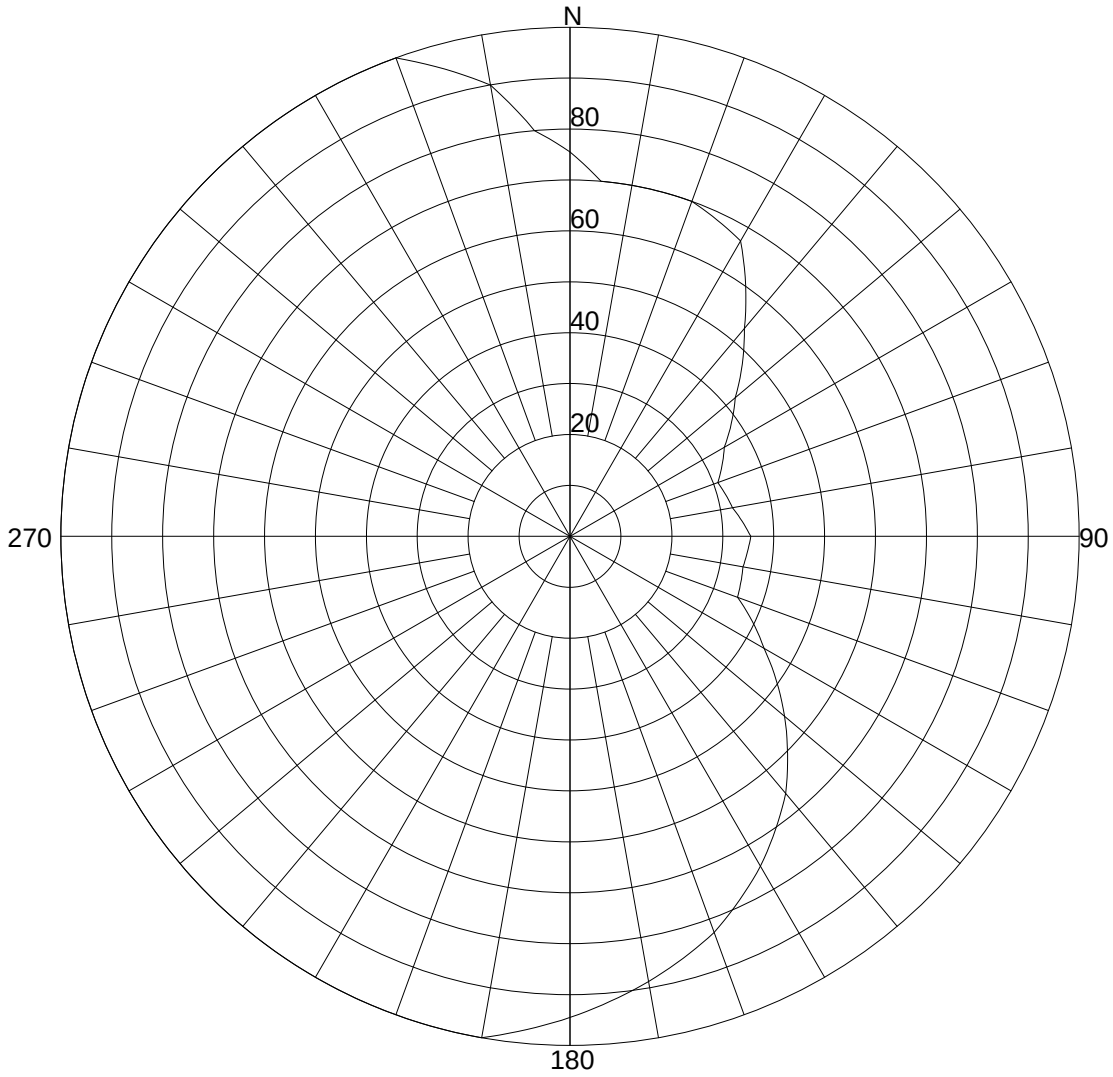
TEST EQUIPMENT

Network Analyzer	:	Hewlett Packard Model # 8753C Serial Number: 08753 – 69138
Computer	:	Pentium 3, 450 MHz, SAMS Range Program
Printer	:	Hewlett-Packard Laser Jet 6L
Positioner	:	Orbit Positioner
		All equipment is calibrated to ANSI/NCSL Z540-1-1994 specs

Prepared by:

Mark A. Gergely
Electrical Engineer
Systems With Reliability LLP

Exhibit 1: Circular Polarized Azimuth Pattern (Composite)



Azimuth Pattern

Scale: Linear

Unit: Relative Field

Systems With Reliability

CLIENT: *WGXM / Composite*

Date: 1/12/2013

ANTENNA TYPE: FMEC/2-PLUS-DA

FREQUENCY: 91.1 MHz

PATTERN POL.: Circular

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.51537 / 1.81dB

PATTERN RMS: *0.812*

Micro-Tek Eng. ver 2.5

Exhibit 1(cont'd): Circular Polarized Azimuth Pattern Tabulations(Composite)

Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	.7550 (-2.44)	180	.9450 (-0.49)
5	.7000 (-3.1)	185	.9725 (-0.24)
10	.7000 (-3.1)	190	1.0000 (0)
15	.7000 (-3.1)	195	1.0000 (0)
20	.7000 (-3.1)	200	1.0000 (0)
25	.6850 (-3.29)	205	1.0000 (0)
30	.6700 (-3.48)	210	1.0000 (0)
35	.6015 (-4.42)	215	1.0000 (0)
40	.5330 (-5.47)	220	1.0000 (0)
45	.4785 (-6.4)	225	1.0000 (0)
50	.4240 (-7.45)	230	1.0000 (0)
55	.3870 (-8.25)	235	1.0000 (0)
60	.3500 (-9.12)	240	1.0000 (0)
65	.3295 (-9.64)	245	1.0000 (0)
70	.3090 (-10.2)	250	1.0000 (0)
75	.3165 (-9.99)	255	1.0000 (0)
80	.3240 (-9.79)	260	1.0000 (0)
85	.3395 (-9.38)	265	1.0000 (0)
90	.3550 (-9)	270	1.0000 (0)
95	.3500 (-9.12)	275	1.0000 (0)
100	.3450 (-9.24)	280	1.0000 (0)
105	.3475 (-9.18)	285	1.0000 (0)
110	.3500 (-9.12)	290	1.0000 (0)
115	.3950 (-8.07)	295	1.0000 (0)
120	.4400 (-7.13)	300	1.0000 (0)
125	.4950 (-6.11)	305	1.0000 (0)
130	.5500 (-5.19)	310	1.0000 (0)
135	.6045 (-4.37)	315	1.0000 (0)
140	.6590 (-3.62)	320	1.0000 (0)
145	.7035 (-3.05)	325	1.0000 (0)
150	.7480 (-2.52)	330	1.0000 (0)
155	.7880 (-2.07)	335	1.0000 (0)
160	.8280 (-1.64)	340	1.0000 (0)
165	.8580 (-1.33)	345	.9500 (-0.45)
170	.8880 (-1.03)	350	.9000 (-0.92)
175	.9165 (-0.76)	355	.8000 (-1.94)

Systems With Reliability

CLIENT: *WGXM / Composite*

Date: 1/12/2013

ANTENNA TYPE: FMEC/2-PLUS-DA

FREQUENCY: 91.1 MHz

PATTERN POL.: Circular

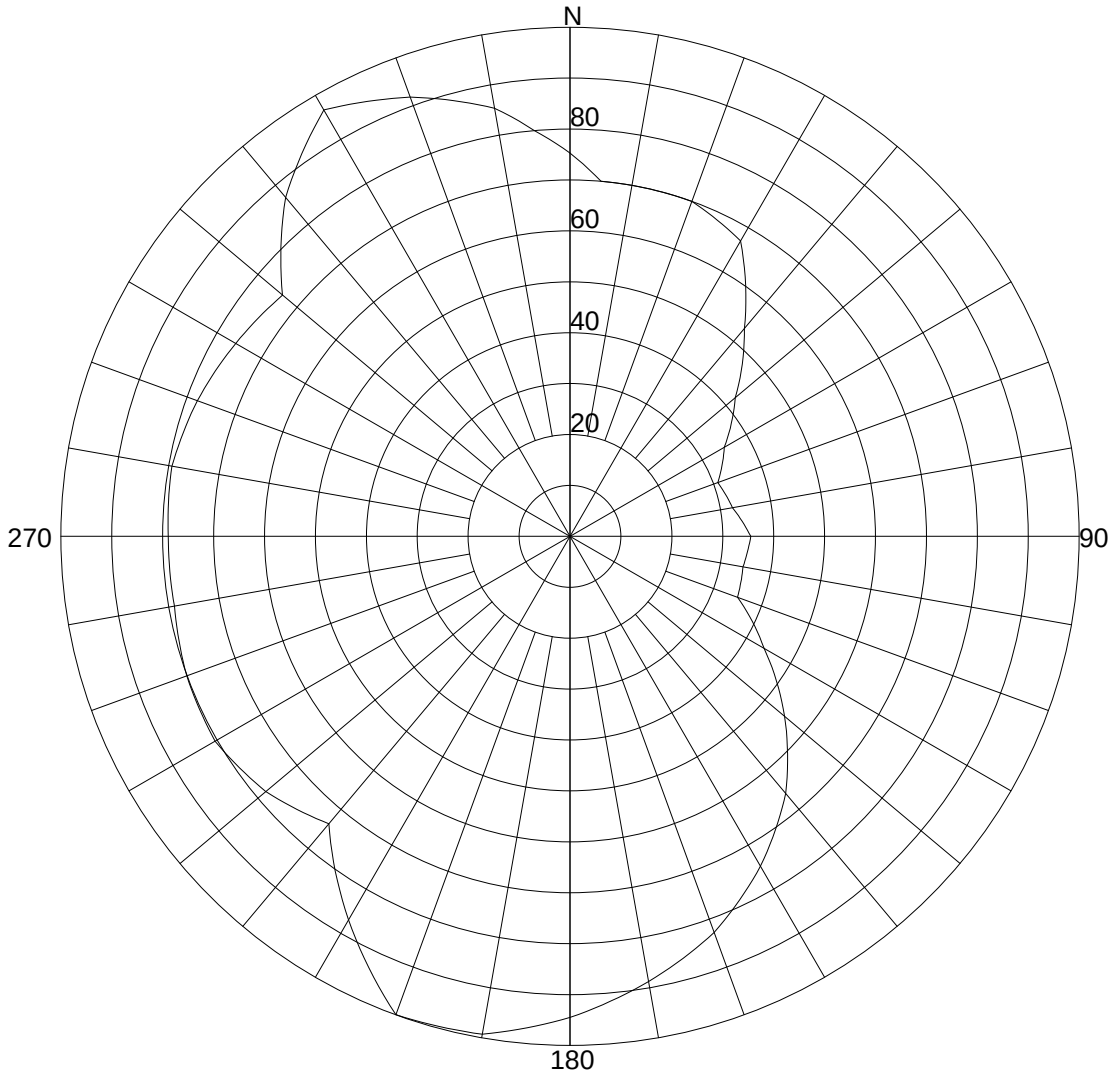
CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.51537 / 1.81dB

PATTERN RMS: *0.812*

Micro-Tek Eng. ver 2.5

Exhibit 2: Measured Horizontally Polarized Azimuth Pattern



Azimuth Pattern

Scale: Linear

Unit: Relative Field

Systems With Reliability

CLIENT: *WGXM*

Date: 1/12/2013

ANTENNA TYPE: FMEC/2-PLUS-DA

FREQUENCY: 91.1 MHz

PATTERN POL.: Horizontal

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.89452 / 2.77dB

PATTERN RMS: *0.727*

Micro-Tek Eng. ver 2.5

Exhibit 2(cont'd): Measured Horizontally Polarized Azimuth Pattern Tabulations

Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	.7530 (-2.46)	180	.9450 (-0.49)
5	.7000 (-3.1)	185	.9690 (-0.27)
10	.7000 (-3.1)	190	.9930 (-0.06)
15	.7000 (-3.1)	195	.9965 (-0.03)
20	.7000 (-3.1)	200	1.0000 (0)
25	.6850 (-3.29)	205	.9350 (-0.58)
30	.6700 (-3.48)	210	.8700 (-1.21)
35	.6015 (-4.42)	215	.8035 (-1.9)
40	.5330 (-5.47)	220	.7370 (-2.65)
45	.4785 (-6.4)	225	.7585 (-2.4)
50	.4240 (-7.45)	230	.7800 (-2.16)
55	.3870 (-8.25)	235	.7925 (-2.02)
60	.3500 (-9.12)	240	.8050 (-1.88)
65	.3295 (-9.64)	245	.8030 (-1.91)
70	.3090 (-10.2)	250	.8010 (-1.93)
75	.3165 (-9.99)	255	.7950 (-1.99)
80	.3240 (-9.79)	260	.7890 (-2.06)
85	.3395 (-9.38)	265	.7890 (-2.06)
90	.3550 (-9)	270	.7890 (-2.06)
95	.3500 (-9.12)	275	.7915 (-2.03)
100	.3450 (-9.24)	280	.7940 (-2)
105	.3475 (-9.18)	285	.7865 (-2.09)
110	.3500 (-9.12)	290	.7790 (-2.17)
115	.3950 (-8.07)	295	.7685 (-2.29)
120	.4400 (-7.13)	300	.7580 (-2.41)
125	.4950 (-6.11)	305	.7475 (-2.53)
130	.5500 (-5.19)	310	.7370 (-2.65)
135	.6045 (-4.37)	315	.8030 (-1.91)
140	.6590 (-3.62)	320	.8690 (-1.22)
145	.7035 (-3.05)	325	.9180 (-0.74)
150	.7480 (-2.52)	330	.9670 (-0.29)
155	.7880 (-2.07)	335	.9425 (-0.51)
160	.8280 (-1.64)	340	.9180 (-0.74)
165	.8580 (-1.33)	345	.8860 (-1.05)
170	.8880 (-1.03)	350	.8540 (-1.37)
175	.9165 (-0.76)	355	.8000 (-1.94)

Systems With Reliability

CLIENT: *WGXM*

Date: 1/12/2013

ANTENNA TYPE: FMEC/2-PLUS-DA

FREQUENCY: 91.1 MHz

PATTERN POL.: Horizontal

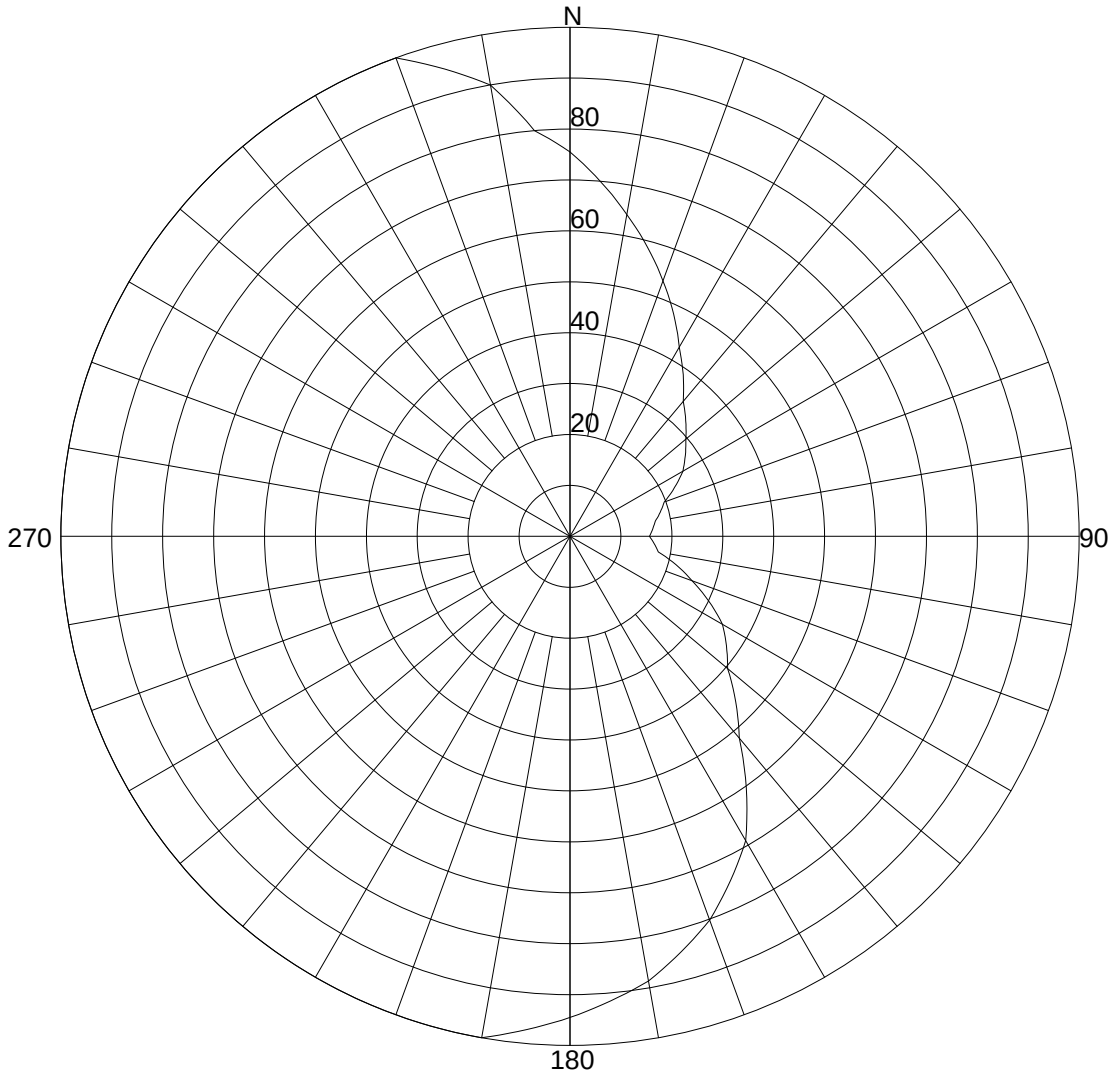
CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.89452 / 2.77dB

PATTERN RMS: *0.727*

Micro-Tek Eng. ver 2.5

Exhibit 3: Measured Vertically Polarized Azimuth Pattern



Azimuth Pattern

Scale: Linear

Unit: Relative Field

Systems With Reliability

CLIENT: *WGXM*

Date: 1/12/2013

ANTENNA TYPE: FMEC/2-PLUS-DA

FREQUENCY: 91.1 MHz

PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.63474 / 2.13dB

PATTERN RMS: *0.782*

Micro-Tek Eng. ver 2.5

Exhibit 3 (cont'd): Measured Vertically Polarized Azimuth Pattern Tabulations

Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	.7550 (-2.44)	180	.9450 (-0.49)
5	.6985 (-3.12)	185	.9725 (-0.24)
10	.6420 (-3.85)	190	1.0000 (0)
15	.5880 (-4.61)	195	1.0000 (0)
20	.5340 (-5.45)	200	1.0000 (0)
25	.4815 (-6.35)	205	1.0000 (0)
30	.4290 (-7.35)	210	1.0000 (0)
35	.3875 (-8.23)	215	1.0000 (0)
40	.3460 (-9.22)	220	1.0000 (0)
45	.3215 (-9.86)	225	1.0000 (0)
50	.2970 (-10.54)	230	1.0000 (0)
55	.2765 (-11.17)	235	1.0000 (0)
60	.2560 (-11.84)	240	1.0000 (0)
65	.2265 (-12.9)	245	1.0000 (0)
70	.1970 (-14.11)	250	1.0000 (0)
75	.1835 (-14.73)	255	1.0000 (0)
80	.1700 (-15.39)	260	1.0000 (0)
85	.1630 (-15.76)	265	1.0000 (0)
90	.1560 (-16.14)	270	1.0000 (0)
95	.1660 (-15.6)	275	1.0000 (0)
100	.1760 (-15.09)	280	1.0000 (0)
105	.2155 (-13.33)	285	1.0000 (0)
110	.2550 (-11.87)	290	1.0000 (0)
115	.3005 (-10.44)	295	1.0000 (0)
120	.3460 (-9.22)	300	1.0000 (0)
125	.3750 (-8.52)	305	1.0000 (0)
130	.4040 (-7.87)	310	1.0000 (0)
135	.4605 (-6.74)	315	1.0000 (0)
140	.5170 (-5.73)	320	1.0000 (0)
145	.6035 (-4.39)	325	1.0000 (0)
150	.6900 (-3.22)	330	1.0000 (0)
155	.7460 (-2.55)	335	1.0000 (0)
160	.8020 (-1.92)	340	1.0000 (0)
165	.8445 (-1.47)	345	.9500 (-0.45)
170	.8870 (-1.04)	350	.9000 (-0.92)
175	.9160 (-0.76)	355	.8000 (-1.94)

Systems With Reliability

CLIENT: *WGXM* Date: 1/12/2013

ANTENNA TYPE: FMEC/2-PLUS-DA

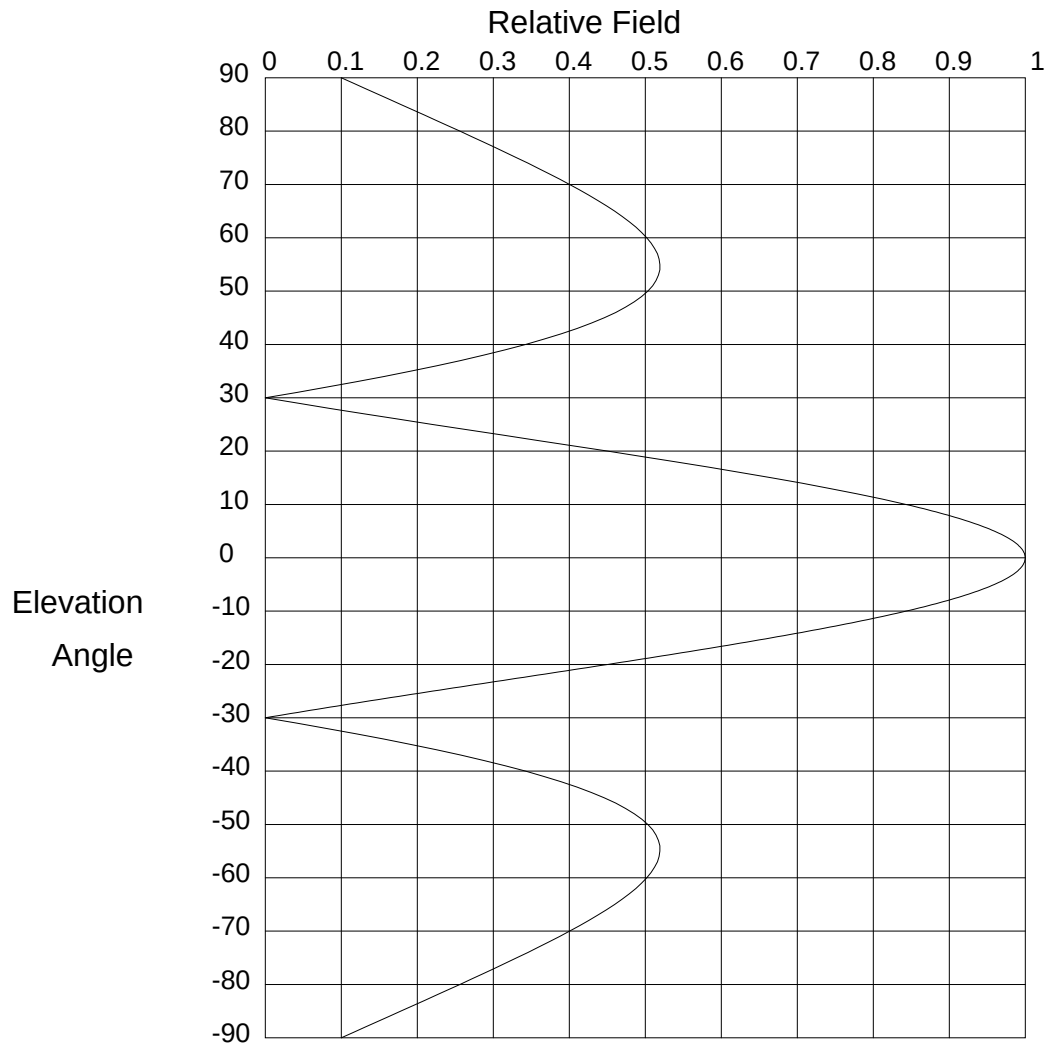
FREQUENCY: 91.1 MHz

PATTERN POL.: Vertical CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.63474 / 2.13dB PATTERN RMS: *0.782*

Micro-Tek Eng. ver 2.5

Exhibit 4: Elevation Pattern



Elevation Pattern

Scale: Linear

Units: Field, Relative

Systems With Reliability

CLIENT: *WGXM*

Date: 1/12/2013

ANTENNA TYPE: FMEC/2-PLUS-DA

FREQUENCY: 91.1 MHz

PATTERN POL.: Circular

DIRECTIVITY(Peak): 1.918/2.828 dBd

Beam Tilt (Deg.) : *0*

DIRECTIVITY(Horiz): 1.918/2.828 dBd

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

Micro-Tek Eng. ver 2.5

Relative Field Tabulation

Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)
90.0	.10 (-20)	52.0	.514 (-5.775)	14.0	.705 (-3.031)
89.0	.116 (-18.733)	51.0	.51 (-5.855)	13.0	.743 (-2.581)
88.0	.131 (-17.627)	50.0	.503 (-5.963)	12.0	.779 (-2.174)
87.0	.147 (-16.648)	49.0	.495 (-6.101)	11.0	.812 (-1.809)
86.0	.163 (-15.768)	48.0	.486 (-6.272)	10.0	.843 (-1.482)
85.0	.178 (-14.971)	47.0	.474 (-6.479)	9.8	.849 (-1.421)
84.0	.194 (-14.242)	46.0	.461 (-6.724)	9.6	.855 (-1.361)
83.0	.21 (-13.571)	45.0	.446 (-7.013)	9.4	.861 (-1.303)
82.0	.225 (-12.951)	44.0	.429 (-7.349)	9.2	.866 (-1.246)
81.0	.241 (-12.374)	43.0	.41 (-7.738)	9.0	.872 (-1.191)
80.0	.256 (-11.835)	42.0	.39 (-8.189)	8.8	.877 (-1.137)
79.0	.271 (-11.332)	41.0	.367 (-8.709)	8.6	.883 (-1.084)
78.0	.286 (-10.859)	40.0	.342 (-9.31)	8.4	.888 (-1.033)
77.0	.301 (-10.415)	39.0	.316 (-10.008)	8.2	.893 (-0.983)
76.0	.316 (-9.997)	38.0	.288 (-10.824)	8.0	.898 (-0.935)
75.0	.331 (-9.603)	37.0	.257 (-11.786)	7.8	.903 (-0.887)
74.0	.345 (-9.231)	36.0	.225 (-12.937)	7.6	.908 (-0.841)
73.0	.36 (-8.881)	35.0	.192 (-14.343)	7.4	.912 (-0.797)
72.0	.374 (-8.551)	34.0	.156 (-16.113)	7.2	.917 (-0.753)
71.0	.387 (-8.24)	33.0	.119 (-18.454)	7.0	.921 (-0.711)
70.0	.401 (-7.948)	32.0	.081 (-21.828)	6.8	.926 (-0.67)
69.0	.413 (-7.673)	31.0	.041 (-27.712)	6.6	.93 (-0.631)
68.0	.426 (-7.417)	30.0	.00 (-50)	6.4	.934 (-0.593)
67.0	.438 (-7.178)	29.0	.042 (-27.469)	6.2	.938 (-0.556)
66.0	.449 (-6.956)	28.0	.086 (-21.343)	6.0	.942 (-0.52)
65.0	.46 (-6.751)	27.0	.13 (-17.727)	5.8	.946 (-0.485)
64.0	.47 (-6.563)	26.0	.175 (-15.145)	5.6	.949 (-0.452)
63.0	.479 (-6.392)	25.0	.22 (-13.135)	5.4	.953 (-0.42)
62.0	.488 (-6.239)	24.0	.266 (-11.491)	5.2	.956 (-0.389)
61.0	.495 (-6.103)	23.0	.312 (-10.103)	5.0	.959 (-0.36)
60.0	.502 (-5.986)	22.0	.359 (-8.906)	4.8	.963 (-0.331)
59.0	.508 (-5.887)	21.0	.405 (-7.858)	4.6	.966 (-0.304)
58.0	.512 (-5.807)	20.0	.45 (-6.929)	4.4	.969 (-0.278)
57.0	.516 (-5.747)	19.0	.495 (-6.1)	4.2	.971 (-0.253)
56.0	.518 (-5.708)	18.0	.54 (-5.356)	4.0	.974 (-0.229)
55.0	.519 (-5.69)	17.0	.583 (-4.685)	3.8	.976 (-0.207)
54.0	.519 (-5.694)	16.0	.625 (-4.078)	3.6	.979 (-0.186)
53.0	.517 (-5.722)	15.0	.666 (-3.528)	3.4	.981 (-0.165)

Systems With Reliability

CLIENT: *WGXM*

Date: 1/12/2013

ANTENNA TYPE: FMEC/2-PLUS-DA

FREQUENCY: 91.1 MHz

PATTERN POL.: Circular

DIRECTIVITY(Peak): 1.918/2.828 dBd

Beam Tilt (Deg.) : *0*

DIRECTIVITY(Horiz): 1.918/2.828 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	.983 (-0.146)	-4.4	.969 (-0.278)	-12.0	.779 (-2.174)
3.0	.985 (-0.129)	-4.6	.966 (-0.304)	-12.2	.772 (-2.252)
2.8	.987 (-0.112)	-4.8	.963 (-0.331)	-12.4	.765 (-2.332)
2.6	.989 (-0.097)	-5.0	.959 (-0.36)	-12.6	.757 (-2.413)
2.4	.991 (-0.082)	-5.2	.956 (-0.389)	-12.8	.75 (-2.496)
2.2	.992 (-0.069)	-5.4	.953 (-0.42)	-13.0	.743 (-2.581)
2.0	.993 (-0.057)	-5.6	.949 (-0.452)	-13.2	.736 (-2.667)
1.8	.995 (-0.046)	-5.8	.946 (-0.485)	-13.4	.728 (-2.755)
1.6	.996 (-0.037)	-6.0	.942 (-0.52)	-13.6	.721 (-2.845)
1.4	.997 (-0.028)	-6.2	.938 (-0.556)	-13.8	.713 (-2.937)
1.2	.998 (-0.021)	-6.4	.934 (-0.593)	-14.0	.705 (-3.031)
1.0	.998 (-0.014)	-6.6	.93 (-0.631)	-14.2	.698 (-3.126)
.8	.999 (-0.009)	-6.8	.926 (-0.67)	-14.4	.69 (-3.224)
.6	.999 (-0.005)	-7.0	.921 (-0.711)	-14.6	.682 (-3.323)
.4	1.00 (-0.002)	-7.2	.917 (-0.753)	-14.8	.674 (-3.425)
.2	1.00 (-0.001)	-7.4	.912 (-0.797)	-15.0	.666 (-3.528)
.0	1.00 (0)	-7.6	.908 (-0.841)	-15.2	.658 (-3.634)
-.2	1.00 (-0.001)	-7.8	.903 (-0.887)	-15.4	.65 (-3.742)
-.4	1.00 (-0.002)	-8.0	.898 (-0.935)	-15.6	.642 (-3.851)
-.6	.999 (-0.005)	-8.2	.893 (-0.983)	-15.8	.634 (-3.963)
-.8	.999 (-0.009)	-8.4	.888 (-1.033)	-16.0	.625 (-4.078)
-1.0	.998 (-0.014)	-8.6	.883 (-1.084)	-16.2	.617 (-4.194)
-1.2	.998 (-0.021)	-8.8	.877 (-1.137)	-16.4	.609 (-4.313)
-1.4	.997 (-0.028)	-9.0	.872 (-1.191)	-16.6	.60 (-4.435)
-1.6	.996 (-0.037)	-9.2	.866 (-1.246)	-16.8	.592 (-4.558)
-1.8	.995 (-0.046)	-9.4	.861 (-1.303)	-17.0	.583 (-4.685)
-2.0	.993 (-0.057)	-9.6	.855 (-1.361)	-17.2	.575 (-4.814)
-2.2	.992 (-0.069)	-9.8	.849 (-1.421)	-17.4	.566 (-4.945)
-2.4	.991 (-0.082)	-10.0	.843 (-1.482)	-17.6	.557 (-5.079)
-2.6	.989 (-0.097)	-10.2	.837 (-1.544)	-17.8	.549 (-5.216)
-2.8	.987 (-0.112)	-10.4	.831 (-1.608)	-18.0	.54 (-5.356)
-3.0	.985 (-0.129)	-10.6	.825 (-1.674)	-18.2	.531 (-5.499)
-3.2	.983 (-0.146)	-10.8	.818 (-1.74)	-18.4	.522 (-5.644)
-3.4	.981 (-0.165)	-11.0	.812 (-1.809)	-18.6	.513 (-5.793)
-3.6	.979 (-0.186)	-11.2	.805 (-1.879)	-18.8	.504 (-5.945)
-3.8	.976 (-0.207)	-11.4	.799 (-1.95)	-19.0	.495 (-6.1)
-4.0	.974 (-0.229)	-11.6	.792 (-2.023)	-19.2	.486 (-6.259)
-4.2	.971 (-0.253)	-11.8	.785 (-2.098)	-19.4	.477 (-6.421)

Systems With Reliability

CLIENT: *WGXM*

Date: 1/12/2013

ANTENNA TYPE: FMEC/2-PLUS-DA

FREQUENCY: 91.1 MHz

PATTERN POL.: Circular

DIRECTIVITY(Peak): 1.918/2.828 dBd

Beam Tilt (Deg.) : *0*

DIRECTIVITY(Horiz): 1.918/2.828 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	.468 (-6.587)	-27.2	.121 (-18.344)	-54.0	.519 (-5.694)
-19.8	.459 (-6.756)	-27.4	.112 (-19.006)	-55.0	.519 (-5.69)
-20.0	.45 (-6.929)	-27.6	.103 (-19.721)	-56.0	.518 (-5.708)
-20.2	.441 (-7.106)	-27.8	.094 (-20.496)	-57.0	.516 (-5.747)
-20.4	.432 (-7.288)	-28.0	.086 (-21.343)	-58.0	.512 (-5.807)
-20.6	.423 (-7.473)	-28.2	.077 (-22.278)	-59.0	.508 (-5.887)
-20.8	.414 (-7.663)	-28.4	.068 (-23.322)	-60.0	.502 (-5.986)
-21.0	.405 (-7.858)	-28.6	.06 (-24.503)	-61.0	.495 (-6.103)
-21.2	.396 (-8.057)	-28.8	.051 (-25.863)	-62.0	.488 (-6.239)
-21.4	.386 (-8.261)	-29.0	.042 (-27.469)	-63.0	.479 (-6.392)
-21.6	.377 (-8.471)	-29.2	.034 (-29.429)	-64.0	.47 (-6.563)
-21.8	.368 (-8.686)	-29.4	.025 (-31.951)	-65.0	.46 (-6.751)
-22.0	.359 (-8.906)	-29.6	.017 (-35.496)	-66.0	.449 (-6.956)
-22.2	.349 (-9.132)	-29.8	.008 (-41.54)	-67.0	.438 (-7.178)
-22.4	.34 (-9.365)	-30.0	.00 (-50)	-68.0	.426 (-7.417)
-22.6	.331 (-9.604)	-31.0	.041 (-27.712)	-69.0	.413 (-7.673)
-22.8	.322 (-9.85)	-32.0	.081 (-21.828)	-70.0	.401 (-7.948)
-23.0	.312 (-10.103)	-33.0	.119 (-18.454)	-71.0	.387 (-8.24)
-23.2	.303 (-10.364)	-34.0	.156 (-16.113)	-72.0	.374 (-8.551)
-23.4	.294 (-10.632)	-35.0	.192 (-14.343)	-73.0	.36 (-8.881)
-23.6	.285 (-10.909)	-36.0	.225 (-12.937)	-74.0	.345 (-9.231)
-23.8	.276 (-11.195)	-37.0	.257 (-11.786)	-75.0	.331 (-9.603)
-24.0	.266 (-11.491)	-38.0	.288 (-10.824)	-76.0	.316 (-9.997)
-24.2	.257 (-11.797)	-39.0	.316 (-10.008)	-77.0	.301 (-10.415)
-24.4	.248 (-12.113)	-40.0	.342 (-9.31)	-78.0	.286 (-10.859)
-24.6	.239 (-12.441)	-41.0	.367 (-8.709)	-79.0	.271 (-11.332)
-24.8	.23 (-12.781)	-42.0	.39 (-8.189)	-80.0	.256 (-11.835)
-25.0	.22 (-13.135)	-43.0	.41 (-7.738)	-81.0	.241 (-12.374)
-25.2	.211 (-13.503)	-44.0	.429 (-7.349)	-82.0	.225 (-12.951)
-25.4	.202 (-13.887)	-45.0	.446 (-7.013)	-83.0	.21 (-13.571)
-25.6	.193 (-14.287)	-46.0	.461 (-6.724)	-84.0	.194 (-14.242)
-25.8	.184 (-14.706)	-47.0	.474 (-6.479)	-85.0	.178 (-14.971)
-26.0	.175 (-15.145)	-48.0	.486 (-6.272)	-86.0	.163 (-15.768)
-26.2	.166 (-15.606)	-49.0	.495 (-6.101)	-87.0	.147 (-16.648)
-26.4	.157 (-16.092)	-50.0	.503 (-5.963)	-88.0	.131 (-17.627)
-26.6	.148 (-16.605)	-51.0	.51 (-5.855)	-89.0	.116 (-18.733)
-26.8	.139 (-17.149)	-52.0	.514 (-5.775)	-90.0	.10 (-20)
-27.0	.13 (-17.727)	-53.0	.517 (-5.722)	90.0	.00 (-50)

Systems With Reliability

CLIENT: *WGXM*
Date: 1/12/2013

ANTENNA TYPE: FMEC/2-PLUS-DA
FREQUENCY: 91.1 MHz
PATTERN POL.: Circular
DIRECTIVITY(Peak): 1.918/2.828 dBd
Beam Tilt (Deg.) : *0*
DIRECTIVITY(Horiz): 1.918/2.828 dBd
Null Fill(s)(%) : *0, 0, 0*

Exhibit 5: Antenna Data Sheet

SYSTEMS WITH RELIABILITY, LLP

BROADCAST ANTENNAS AND TRANSMISSION LINE

SYSTEM DATA SHEET

Customer	WGXM
Contact	Tim Warner
Location	Calypso, NC
Antenna Model	FMEC/2-PLUS-DA
Channel / Frequency	216A/ 91.1 MHz

ELECTRICAL SPECIFICATIONS

Antenna Specifications:

		H-POL	dB		V. Pol.	dB	
License ERP (KW)		2.200	3.424	**dB**	2.200	3.424	**dB**
FCC Limit Pattern Directivity		1.479	1.700	**dB**	1.479	1.700	**dB**
Elevation Directivity		1.918	2.828	**dB**	1.918	2.828	**dB**
Azimuth Directivity		1.895	2.775	**dB**	1.635	2.134	**dB**
Composite Pattern		1.515	1.805	**dB**	1.515	1.805	**dB**
Polarization Ratio		0.463	-3.342	**dB**	0.537	-2.702	**dB**
RMS Comp./RMS Limit	98.9 **%**						
Antenna Efficiency %		100	0		100	0	
Power Ratio (Pol. Ratio X Efficiency)		0.4632	0		0.5368	0	
Antenna Gain		1.683	2.261	**dB**	1.683	2.261	**dB**

Antenna Input Power (KW)	1.307 **kW**	1.163 **(dBK)**	

Feed Line Specifications:

Line Type: Andrew	7/8" foam **50 Ω**	**LDF5-50A**	
Attenuation Per 100 ft (dB)	0.346 **dB**		
Line Length (ft) AGL + Horizontal Run	147.65 **ft.**		
Total Line Attenuation (dB)	0.5109 **dB**		
Line Efficiency	88.90 **%**		
Power Input to the Line (KW)	1.470 **kW**	1.674 **(dBK)**	

MECHANICAL SPECIFICATIONS

No. Of Bays	2					
Antenna Aperture	10.80	**ft.**			3.29	**meter**
Center of Radiation AGL	147.65	**ft.**			45.00	**meter**
Antenna Weight	140.00	**lbs.**			63.64	**kg**
Windload (50/33)	270.00	**lbs.**	**Windload CaAc**		8.00	**ft^2**

Prepared by: David K. Edmiston

David K. Edmiston Jr.
SWR, LLP

Exhibit 6: RMS Calculations

SYSTEMS WITH RELIABILITY, INC.
Broadcast Antennas and Transmission Systems

WGXM Antenna RMS Comparison

PROPOSED ANTENNA		DESIGNED ANTENNA	
Azimuth Heading	Relative Field	Azimuth Heading	Relative Field
0	0.790	0	0.755
10	0.700	10	0.700
20	0.700	20	0.700
30	0.670	30	0.670
40	0.533	40	0.533
50	0.424	50	0.424
60	0.350	60	0.350
70	0.350	70	0.309
80	0.368	80	0.324
90	0.355	90	0.355
100	0.345	100	0.345
110	0.350	110	0.350
120	0.440	120	0.440
130	0.550	130	0.550
140	0.690	140	0.659
150	0.860	150	0.748
160	0.910	160	0.828
170	0.925	170	0.888
180	0.945	180	0.945
190	1.000	190	1.000
200	1.000	200	1.000
210	1.000	210	1.000
220	1.000	220	1.000
230	1.000	230	1.000
240	1.000	240	1.000
250	1.000	250	1.000
260	1.000	260	1.000
270	1.000	270	1.000
280	1.000	280	1.000
290	1.000	290	1.000
300	1.000	300	1.000
310	1.000	310	1.000
320	1.000	320	1.000
330	1.000	330	1.000
340	1.000	340	1.000
350	0.900	350	0.900

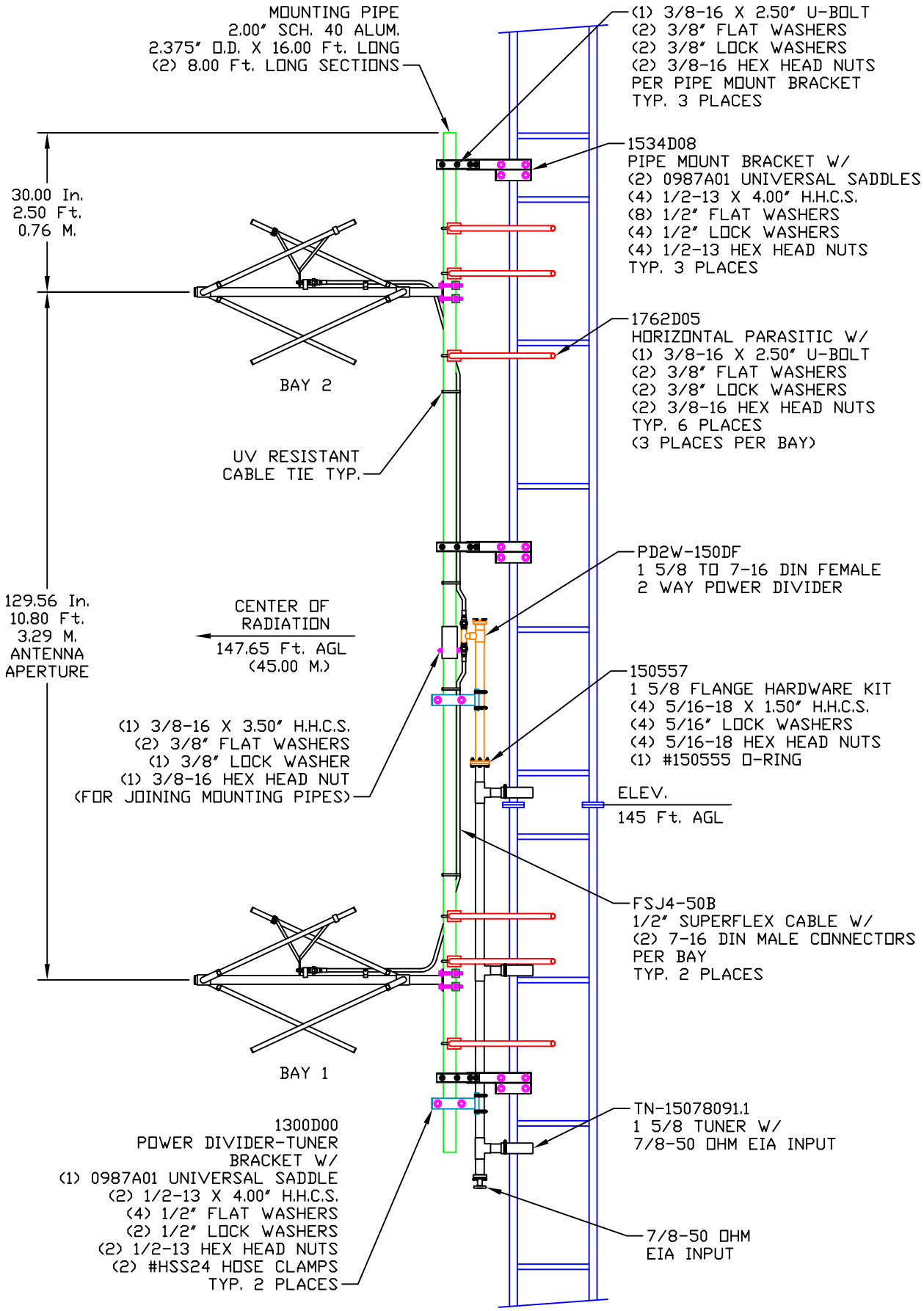
Sum of Relative Field Squared :	**24.363**	**Sum of Relative Field Squared :**	**23.820**
Sum Divided by 36 (Readings) :	**0.677**	**Sum Divided by 36 (Readings) :**	**0.662**
Square Root :	**0.823**	**Square Root :**	**0.813**

Percentage of Construction Permit Antenna Filled : **98.9%**

NOTES:
1. REFERENCE DWG. 1762D01 FOR ANTENNA ORIENTATION.
2. REFERENCE DWG. 1762D02 FOR PARASITIC PLACEMENT.

DRAWING NUMBER: 1762D00

Exhibit 7: Drawings

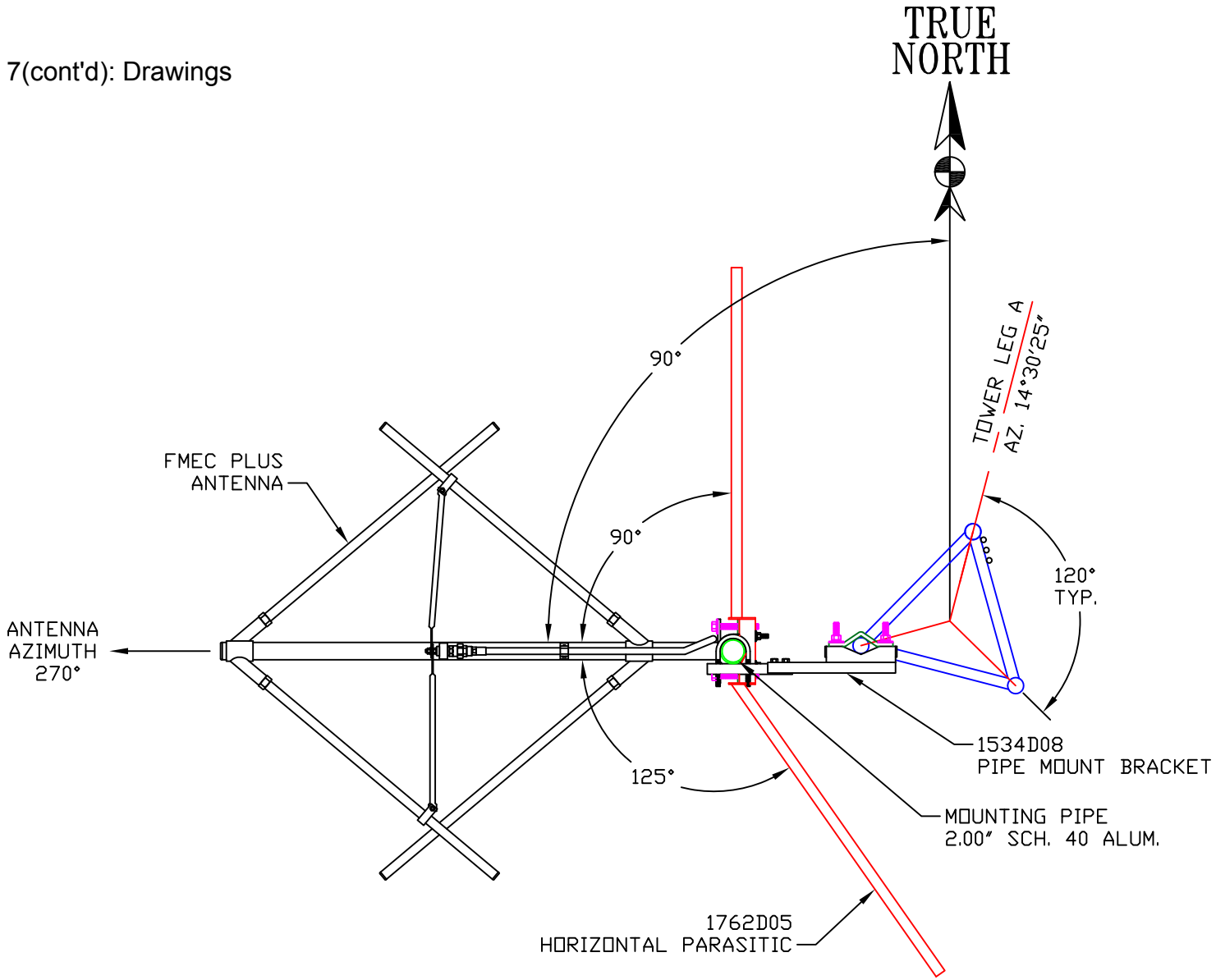


SYSTEMS WITH RELIABILITY, LP 619 INDUSTRIAL PARK ROAD EBENSBURG, PENNSYLVANIA 15931	TITLE: FMEC/2-PLUS-DA, FREQ. 91.1 WGXM, CALYPSO, NC MATERIAL:	SIZE C	REV 1 2 3	APPR.	DATE	ENGINEER:	DRAWING NUMBER: 1762D00
						SCALE: NTS NAME: RAC DATE: 1/9/13	SHEET 1 OF 1

NOTE:

Exhibit 7(cont'd): Drawings

DRAWING NUMBER: 1762D01



TOP VIEW

TOLERANCES	
.X	± .015
.XX	± .005
.XXX	± .002
X/X	± 1/32
DEG.	± 1/2

UNLESS OTHERWISE SPECIFIED

REVISION RECORD		
REV	APPROVAL	DATE

SYSTEMS WITH RELIABILITY, LP
619 INDUSTRIAL PARK ROAD
EBENSBURG, PENNSYLVANIA 15931

TITLE: FMEC/2-PLUS-DA, FREQ. 91.1 WGXM, CALYPSO, NC

MATERIAL: ANTENNA ORIENTATION FROM TRUE NORTH

SIZE A

PARTS MADE BY THIS DRAWING

DRAWING NUMBER: 1762D01

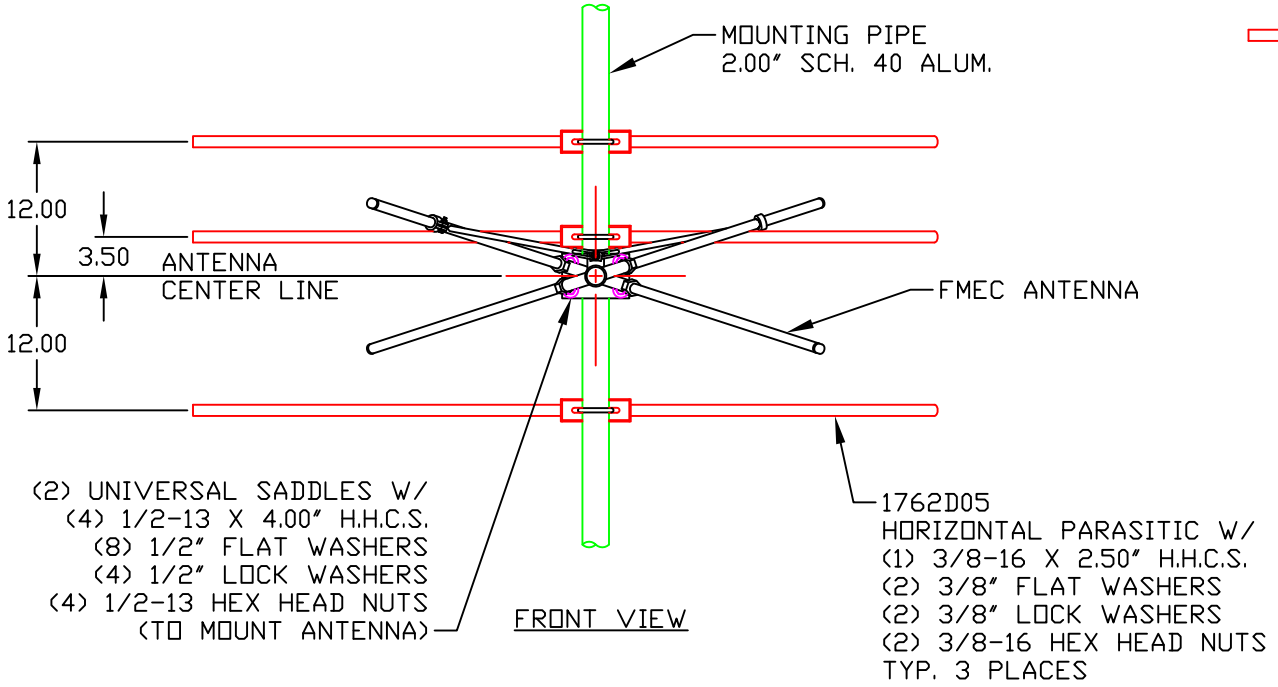
SCALE: NTS | NAME: RAC | DATE: 1/9/13 | SHEET 1 OF 1

NOTE:

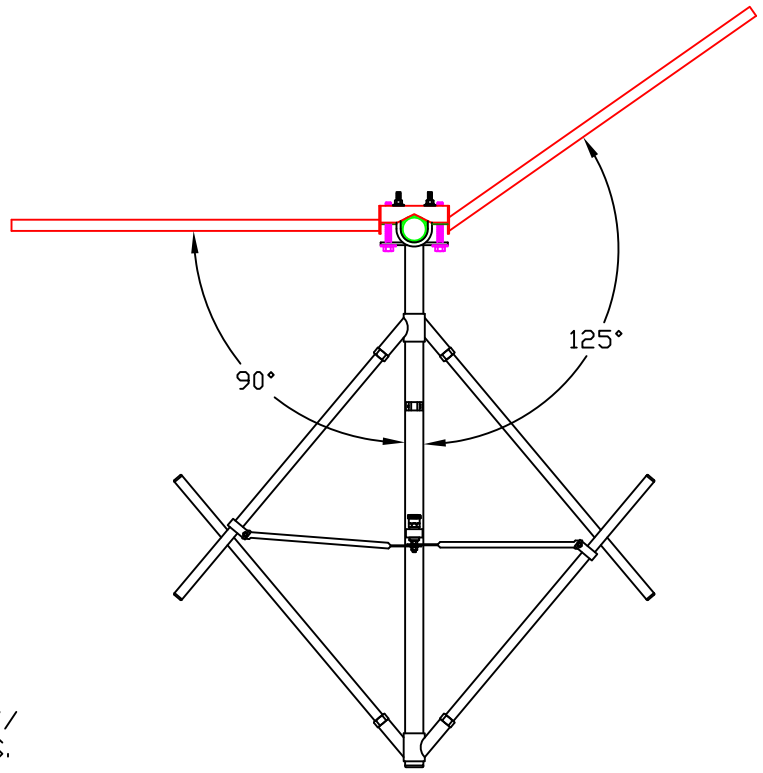
THIS ASSEMBLY IS TYPICAL FOR BOTH BAYS.

DRAWING NUMBER: 1762D02

Exhibit 7(cont'd): Drawings



FRONT VIEW



TOP VIEW

TOLERANCES	
.X	± .015
.XX	± .005
.XXX	± .002
X/X	± 1/32
DEG.	± 1/2

UNLESS OTHERWISE SPECIFIED

REVISION RECORD

REV	APPROVAL	DATE

SYSTEMS WITH RELIABILITY, LP
619 INDUSTRIAL PARK ROAD
EBENSBURG, PENNSYLVANIA 15931

TITLE: FMEC/2-PLUS-DA, FREQ. 91.1
WGXM, CALYPSO, NC

MATERIAL: PARASITIC
PLACEMENT

SIZE A

PARTS MADE BY THIS DRAWING

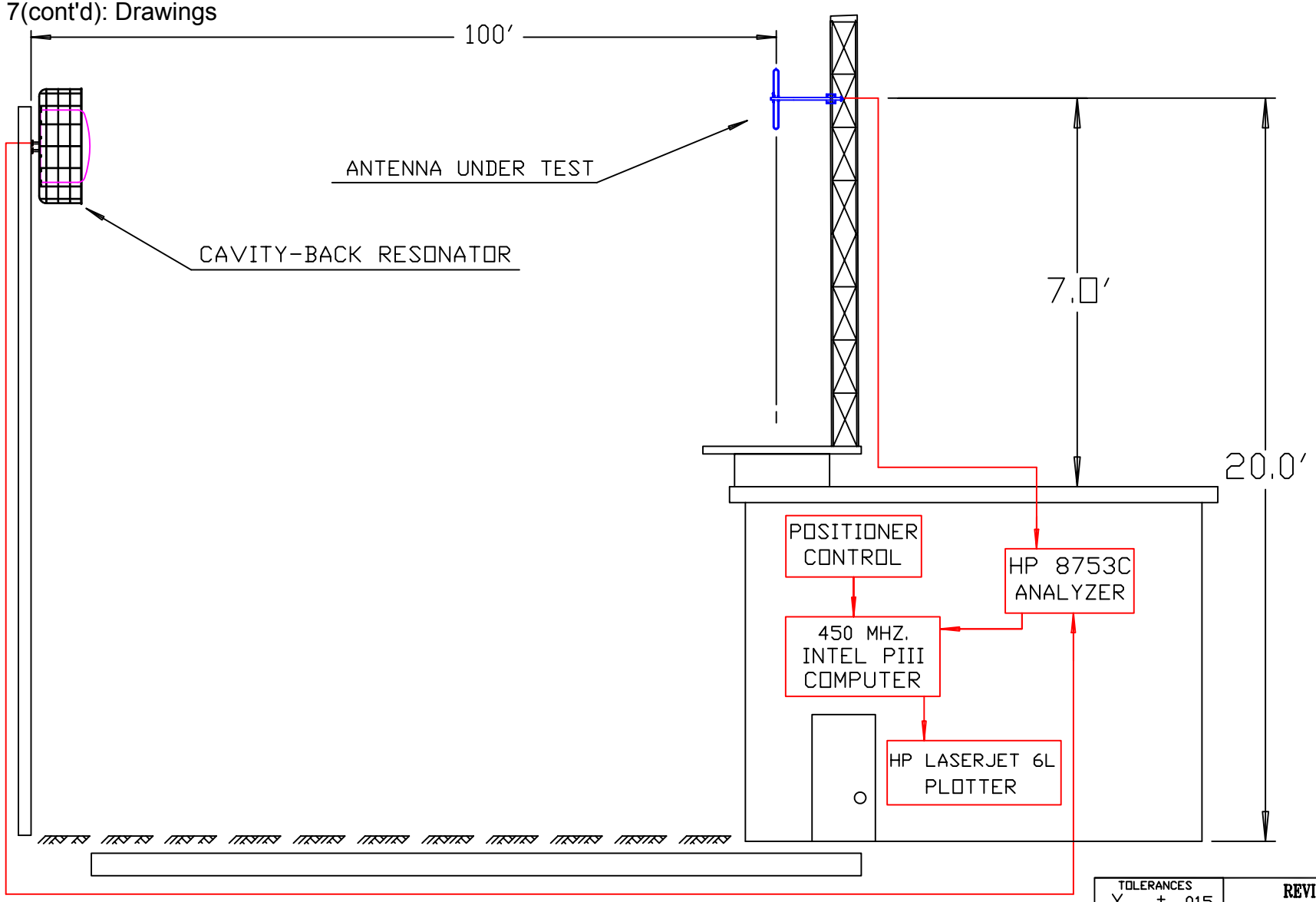
DRAWING NUMBER: 1762D02

SCALE: NTS | NAME: RAC | DATE: 1/9/13 | SHEET 1 OF 1

NOTE:

Exhibit 7(cont'd): Drawings

DRAWING NUMBER: 2105A10



TOLERANCES	
.X	± .015
.XX	± .005
.XXX	± .002
X/X	± 1/32
DEG.	± 1/2

UNLESS OTHERWISE SPECIFIED

REVISION RECORD

REV	APPROVAL	DATE
2		10/7/05
1		4/30/02

SYSTEMS WITH RELIABILITY, INC
619 INDUSTRIAL PARK ROAD
EBENSBURG, PENNSYLVANIA 15931

TITLE: TEST RANGE SCHEMATIC

MATERIAL:

SIZE A

PARTS MADE BY THIS DRAWING

DRAWING NUMBER: 2105A10

SCALE: NTS | NAME: JRM | DATE: 11/1/98 | SHEET 1 OF 1