SYSTEMS WITH RELIABILITY, LLP

BROADCAST ANTENNAS AND TRANSMISSION LINE

PATTERN CERTIFICATION

DIRECTIONAL FM ANTENNA
WYFU
January 13, 2012

Call Sign	:	WYFU
Location	:	Masontown, PA
Frequency	:	88.5 MHz
Channel	:	203B1
Antenna Model	:	FM10D/3-DA
Maximum Antenna Gain		
Horizontal	:	**3.301 / 5.186 dB**
Vertical	**:**	**3.301 / 5.186 dB**

ANTENNA DESCRIPTION

A custom designed **FM10D/3-DA** antenna was used to produce the required directional azimuth pattern. Each antenna bay consists of a circularly polarized cross-V dipole-radiating element with horizontal and vertical parasitics. The array is comprised of three bays, that are spaced a full wavelength apart, mounted to a support pipe and mounted to a Sabre 1800 Tower pointing 260 degrees true north.

DESCRIPTION OF TEST PROCEDURE

The test antenna consists of a single bay third-scale model antenna and parasitic system. This antenna was mounted to a pipe attached to a 6-inch third scale model tower (1800 Sabre) with the use of mounting brackets supplied with the finalized antenna. The tower was placed on a 20 ft. high platform. All feed cables are properly grounded during pattern testing. Horizontal and vertical parasitic elements were used to obtain the desired directional pattern.

The source antenna, a vertical/horizontal dipole Cavity Back Resonator antenna configuration was mounted approximately 100 feet from the test antenna. The source's height was adjusted to provide a uniform field at the test antenna location. The CBR antenna was operated in the transmit mode at a frequency of 265.5 MHz. The antenna under test was rotated in a clockwise direction. A gain reference was taken using a dipole tuned to 265.5 MHz. Nowhere, does the received signal exceed a maximum to minimum ratio of 15 dB.

TEST RESULTS

The attached calculations verify that the **RMS** value of this antenna is ***90.9 %*** of the **RMS** value of the pattern authorized in the related construction permit **BPED-20101001AAS**. The vertical component **RMS** value is **0.690**. The horizontal component **RMS** value is **0.655**. The circular polarized component **RMS** value is **0.730**.

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

Measured vertical polarized directivity:	**2.098 / 3.220 dB**
Measured horizontal polarized directivity:	**2.329 / 3.670 dB**
Measured circular polarized pattern directivity:	**1.878 / 2.740 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 = (2.098)(.526)(2.991) **= 3.301 / 5.186 dB**
H-Pol. Gain = (2.329)(.474)(2.991) **= 3.301 / 5.186 dB**

INSTALLATION AND MOUNTING

The antenna is to be mounted in accordance with the supplied drawings. The antenna center of radiation is to be **43 *meters (141.08 ft.)*** above ground level. The antenna aperture is **22.23 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 ***260 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**
1627D00	ELEVATION
1627D01	ANTENNA ORENTATION WITH PARASITICS
1627D02	BAY 1 PARASITIC PLACEMENT AND ASSEMBLY
1627D03	BAY 2 PARASITIC PLACEMENT AND ASSEMBLY
1627D04	BAY 3 PARASITIC PLACEMENT AND ASSEMBLY
2105A10	TEST RANGE SCHEMATIC

The array shall be mounted according to **DWG. 1627D00**. The antenna elements shall be aligned at the same heading as in **DWG. 1627D01**. This will ensure that the antenna is oriented properly at 260 degrees true north. Each bay's parasitic assembly is shown in **DWG. 1627D02 THRU 1627D04**.

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

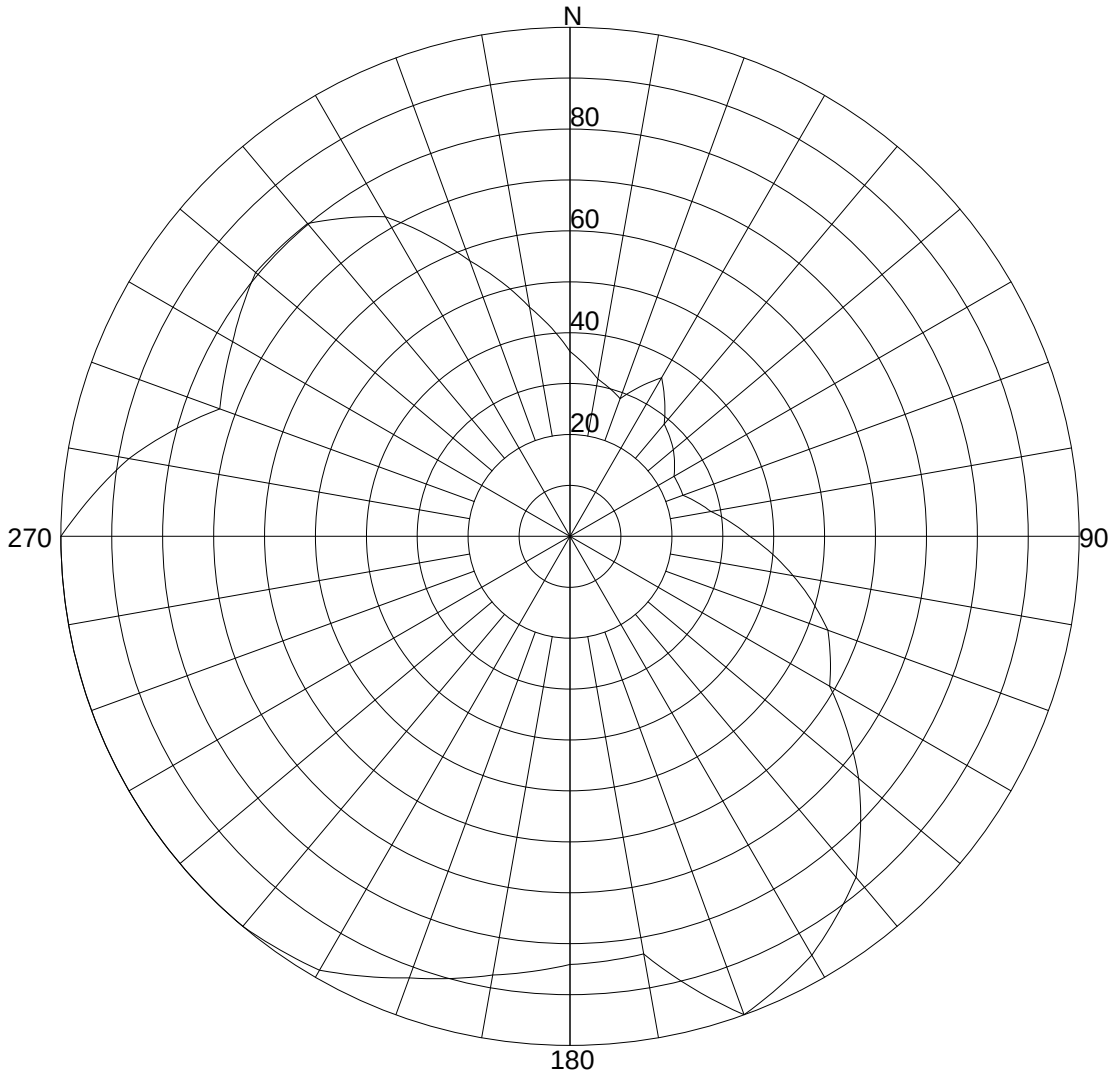
TEST EQUIPMENT

Network Analyzer	:	Hewlett Packard Model # 8753C Serial Number: 08753 – 69138
Computer	:	Pentium 3, 450 MHz, 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



Azimuth Pattern

Scale: Linear

Unit: Relative Field

Systems With Reliability

CLIENT: *WYFU / BBN Composite*

Date: 1/9/2012

ANTENNA TYPE: FM10D/3-DA

FREQUENCY: 88.5 MHz

PATTERN POL.: Circular

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.8783 / 2.74dB

PATTERN RMS: *0.730*

Micro-Tek Eng. ver 2.5

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

Relative Field Tabulation(Azimuth)

Azimuth Heading	Relative Field(dB)	Azimuth Heading	Relatve Field(dB)
0	.3630 (-8.78)	180	.8410 (-1.49)
5	.3385 (-9.38)	185	.8580 (-1.32)
10	.3140 (-10.03)	190	.8750 (-1.15)
15	.3010 (-10.4)	195	.8990 (-0.92)
20	.2880 (-10.78)	200	.9230 (-0.69)
25	.3240 (-9.76)	205	.9535 (-0.4)
30	.3600 (-8.85)	210	.9840 (-0.13)
35	.3240 (-9.76)	215	.9920 (-0.06)
40	.2880 (-10.78)	220	1.0000 (0.01)
45	.2765 (-11.13)	225	1.0000 (0.01)
50	.2650 (-11.5)	230	1.0000 (0.01)
55	.2505 (-11.99)	235	1.0000 (0.01)
60	.2360 (-12.51)	240	1.0000 (0.01)
65	.2360 (-12.51)	245	1.0000 (0.01)
70	.2360 (-12.51)	250	1.0000 (0.01)
75	.2585 (-11.72)	255	1.0000 (0.01)
80	.2810 (-11)	260	1.0000 (0.01)
85	.3170 (-9.95)	265	1.0000 (0.01)
90	.3530 (-9.02)	270	1.0000 (0.01)
95	.3990 (-7.96)	275	.9400 (-0.53)
100	.4450 (-7.01)	280	.8800 (-1.1)
105	.4920 (-6.14)	285	.8060 (-1.86)
110	.5390 (-5.35)	290	.7320 (-2.7)
115	.5640 (-4.96)	295	.7485 (-2.5)
120	.5890 (-4.58)	300	.7650 (-2.32)
125	.6645 (-3.54)	305	.7855 (-2.09)
130	.7400 (-2.6)	310	.8060 (-1.86)
135	.8070 (-1.85)	315	.8040 (-1.88)
140	.8740 (-1.16)	320	.8020 (-1.91)
145	.9120 (-0.79)	325	.7635 (-2.33)
150	.9500 (-0.44)	330	.7250 (-2.78)
155	.9750 (-0.21)	335	.6505 (-3.72)
160	1.0000 (0.01)	340	.5760 (-4.78)
165	.9165 (-0.75)	345	.5165 (-5.72)
170	.8330 (-1.58)	350	.4570 (-6.78)
175	.8370 (-1.54)	355	.4100 (-7.72)

Systems With Reliability

CLIENT: *WYFU / BBN Composite*

Date: 1/9/2012

ANTENNA TYPE: FM10D/3-DA

FREQUENCY: 88.5 MHz

PATTERN POL.: Circular

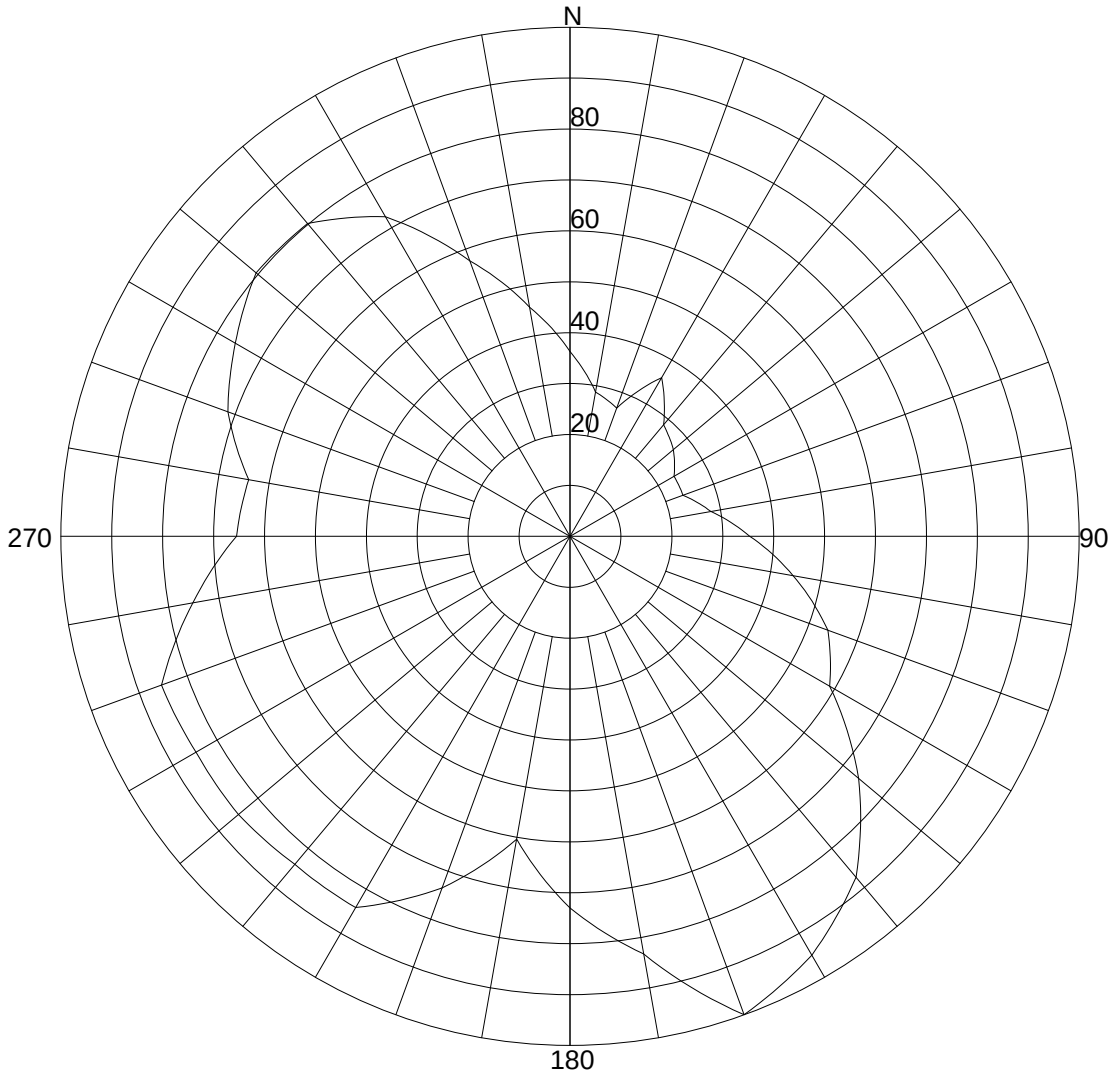
CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.8783 / 2.74dB

PATTERN RMS: *0.730*

Micro-Tek Eng. ver 2.5

Exhibit 2: Measured Horizontal Polarized Azimuth Pattern



Azimuth Pattern

Scale: Linear

Unit: Relative Field

Systems With Reliability

CLIENT: *WYFU / BBN Horizontal*

Date: 1/9/2012

ANTENNA TYPE: FM10D/3 DA

FREQUENCY: 88.5 MHz

PATTERN POL.: Horizontal

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 2.32879 / 3.67dB

PATTERN RMS: *0.655*

Micro-Tek Eng. ver 2.5

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

Relative Field Tabulation(Azimuth)

Azimuth Heading	Relative Field(dB)	Azimuth Heading	Relatve Field(dB)
0	.3630 (-8.78)	180	.7300 (-2.72)
5	.3255 (-9.72)	185	.6670 (-3.5)
10	.2880 (-10.78)	190	.6040 (-4.36)
15	.2780 (-11.09)	195	.6695 (-3.47)
20	.2680 (-11.4)	200	.7350 (-2.66)
25	.3140 (-10.03)	205	.7885 (-2.05)
30	.3600 (-8.85)	210	.8420 (-1.48)
35	.3230 (-9.79)	215	.8415 (-1.49)
40	.2860 (-10.84)	220	.8410 (-1.49)
45	.2755 (-11.17)	225	.8455 (-1.45)
50	.2650 (-11.5)	230	.8500 (-1.4)
55	.2505 (-11.99)	235	.8490 (-1.41)
60	.2360 (-12.51)	240	.8480 (-1.42)
65	.2360 (-12.51)	245	.8510 (-1.39)
70	.2360 (-12.51)	250	.8540 (-1.36)
75	.2585 (-11.72)	255	.8030 (-1.89)
80	.2810 (-11)	260	.7520 (-2.46)
85	.3170 (-9.95)	265	.7035 (-3.04)
90	.3530 (-9.02)	270	.6550 (-3.66)
95	.3990 (-7.96)	275	.6480 (-3.76)
100	.4450 (-7.01)	280	.6410 (-3.85)
105	.4920 (-6.14)	285	.6780 (-3.36)
110	.5390 (-5.35)	290	.7150 (-2.9)
115	.5640 (-4.96)	295	.7370 (-2.64)
120	.5890 (-4.58)	300	.7590 (-2.38)
125	.6645 (-3.54)	305	.7820 (-2.12)
130	.7400 (-2.6)	310	.8050 (-1.87)
135	.8070 (-1.85)	315	.8035 (-1.89)
140	.8740 (-1.16)	320	.8020 (-1.91)
145	.9120 (-0.79)	325	.7635 (-2.33)
150	.9500 (-0.44)	330	.7250 (-2.78)
155	.9750 (-0.21)	335	.6505 (-3.72)
160	1.0000 (0.01)	340	.5760 (-4.78)
165	.9165 (-0.75)	345	.5165 (-5.72)
170	.8330 (-1.58)	350	.4570 (-6.78)
175	.7815 (-2.13)	355	.4100 (-7.72)

Systems With Reliability

CLIENT: *WYFU / BBN Horizontal*

Date: 1/9/2012

ANTENNA TYPE: FM10D/3 DA

FREQUENCY: 88.5 MHz

PATTERN POL.: Horizontal

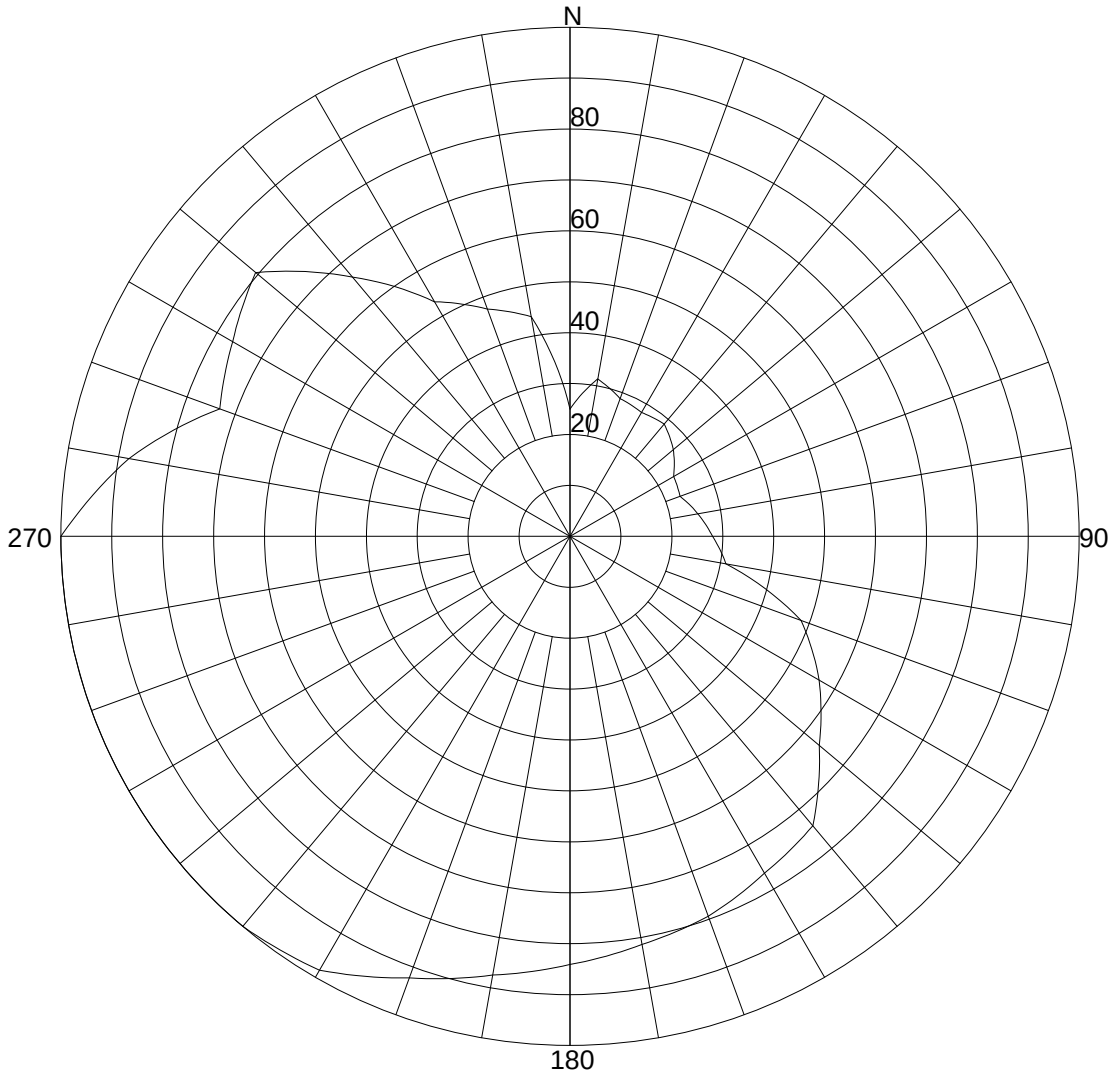
CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 2.32879 / 3.67dB

PATTERN RMS: *0.655*

Micro-Tek Eng. ver 2.5

Exhibit 3: Measured Vertical Polarized Azimuth Pattern



Azimuth Pattern

Scale: Linear

Unit: Relative Field

Systems With Reliability

CLIENT: *WYFU / BBN Vertical*

Date: 1/9/2012

ANTENNA TYPE: FM10D/3 DA

FREQUENCY: 88.5 MHz

PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 2.09759 / 3.22dB

PATTERN RMS: *0.690*

Micro-Tek Eng. ver 2.5

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

Relative Field Tabulation(Azimuth)

Azimuth Heading	Relative Field(dB)	Azimuth Heading	Relatve Field(dB)
0	.2500 (-12.01)	180	.8410 (-1.49)
5	.2820 (-10.96)	185	.8580 (-1.32)
10	.3140 (-10.03)	190	.8750 (-1.15)
15	.3010 (-10.4)	195	.8990 (-0.92)
20	.2880 (-10.78)	200	.9230 (-0.69)
25	.2845 (-10.89)	205	.9535 (-0.4)
30	.2810 (-11)	210	.9840 (-0.13)
35	.2845 (-10.89)	215	.9920 (-0.06)
40	.2880 (-10.78)	220	1.0000 (0.01)
45	.2765 (-11.13)	225	1.0000 (0.01)
50	.2650 (-11.5)	230	1.0000 (0.01)
55	.2500 (-12.01)	235	1.0000 (0.01)
60	.2350 (-12.54)	240	1.0000 (0.01)
65	.2325 (-12.63)	245	1.0000 (0.01)
70	.2300 (-12.73)	250	1.0000 (0.01)
75	.2425 (-12.27)	255	1.0000 (0.01)
80	.2550 (-11.84)	260	1.0000 (0.01)
85	.2675 (-11.42)	265	1.0000 (0.01)
90	.2800 (-11.03)	270	1.0000 (0.01)
95	.2955 (-10.56)	275	.9400 (-0.53)
100	.3110 (-10.12)	280	.8800 (-1.1)
105	.3970 (-8)	285	.8060 (-1.86)
110	.4830 (-6.3)	290	.7320 (-2.7)
115	.5240 (-5.6)	295	.7485 (-2.5)
120	.5650 (-4.94)	300	.7650 (-2.32)
125	.6020 (-4.39)	305	.7855 (-2.09)
130	.6390 (-3.88)	310	.8060 (-1.86)
135	.6905 (-3.2)	315	.7355 (-2.66)
140	.7420 (-2.58)	320	.6650 (-3.53)
145	.7530 (-2.45)	325	.5985 (-4.44)
150	.7640 (-2.33)	330	.5320 (-5.47)
155	.7790 (-2.16)	335	.5035 (-5.94)
160	.7940 (-1.99)	340	.4750 (-6.45)
165	.8040 (-1.88)	345	.4565 (-6.79)
170	.8140 (-1.78)	350	.4380 (-7.15)
175	.8275 (-1.63)	355	.3440 (-9.24)

Systems With Reliability

CLIENT: *WYFU / BBN Vertical*

Date: 1/9/2012

ANTENNA TYPE: FM10D/3 DA

FREQUENCY: 88.5 MHz

PATTERN POL.: Vertical

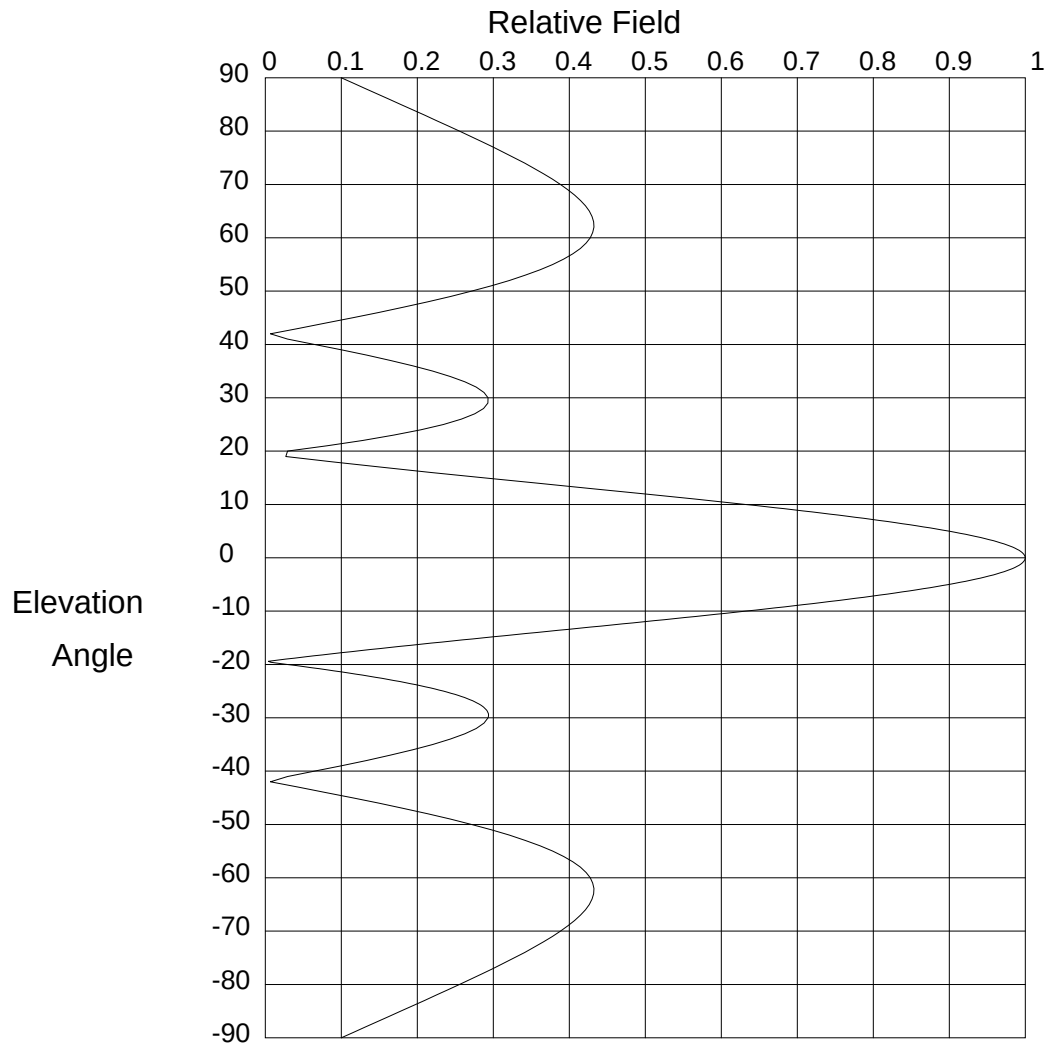
CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 2.09759 / 3.22dB

PATTERN RMS: *0.690*

Micro-Tek Eng. ver 2.5

Exhibit 4: Elevation Pattern



Elevation Pattern

Scale: Linear

Units: Field, Relative

Systems With Reliability

CLIENT: *WYFU / BBN Elevation Pattern*

Date: 1/9/2012

ANTENNA TYPE: FM10D/3-DA

FREQUENCY: 88.5 MHz

PATTERN POL.: Circular

DIRECTIVITY(Peak): 2.991/4.758 dBd

Beam Tilt (Deg.) : *0*

DIRECTIVITY(Horiz): 2.991/4.758 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	.321 (-9.865)	14.0	.357 (-8.938)
89.0	.116 (-18.733)	51.0	.298 (-10.529)	13.0	.428 (-7.377)
88.0	.131 (-17.628)	50.0	.272 (-11.318)	12.0	.498 (-6.062)
87.0	.147 (-16.648)	49.0	.244 (-12.26)	11.0	.566 (-4.942)
86.0	.163 (-15.769)	48.0	.214 (-13.395)	10.0	.632 (-3.982)
85.0	.178 (-14.972)	47.0	.182 (-14.784)	9.8	.645 (-3.807)
84.0	.194 (-14.244)	46.0	.149 (-16.526)	9.6	.658 (-3.637)
83.0	.21 (-13.575)	45.0	.115 (-18.805)	9.4	.671 (-3.472)
82.0	.225 (-12.957)	44.0	.079 (-22.01)	9.2	.683 (-3.312)
81.0	.24 (-12.385)	43.0	.043 (-27.275)	9.0	.695 (-3.157)
80.0	.256 (-11.852)	42.0	.007 (-43.22)	8.8	.707 (-3.006)
79.0	.271 (-11.356)	41.0	.029 (-30.637)	8.6	.719 (-2.86)
78.0	.285 (-10.893)	40.0	.065 (-23.719)	8.4	.731 (-2.719)
77.0	.30 (-10.462)	39.0	.10 (-19.999)	8.2	.743 (-2.582)
76.0	.314 (-10.06)	38.0	.133 (-17.494)	8.0	.754 (-2.449)
75.0	.328 (-9.686)	37.0	.165 (-15.651)	7.8	.766 (-2.321)
74.0	.341 (-9.339)	36.0	.194 (-14.237)	7.6	.777 (-2.196)
73.0	.354 (-9.018)	35.0	.22 (-13.132)	7.4	.787 (-2.076)
72.0	.366 (-8.724)	34.0	.243 (-12.271)	7.2	.798 (-1.959)
71.0	.378 (-8.455)	33.0	.263 (-11.612)	7.0	.808 (-1.847)
70.0	.389 (-8.211)	32.0	.278 (-11.131)	6.8	.819 (-1.738)
69.0	.398 (-7.995)	31.0	.288 (-10.815)	6.6	.829 (-1.633)
68.0	.407 (-7.804)	30.0	.293 (-10.658)	6.4	.838 (-1.532)
67.0	.415 (-7.642)	29.0	.293 (-10.662)	6.2	.848 (-1.434)
66.0	.421 (-7.507)	28.0	.287 (-10.834)	6.0	.857 (-1.34)
65.0	.426 (-7.403)	27.0	.276 (-11.192)	5.8	.866 (-1.249)
64.0	.43 (-7.329)	26.0	.258 (-11.764)	5.6	.875 (-1.162)
63.0	.432 (-7.287)	25.0	.234 (-12.598)	5.4	.883 (-1.078)
62.0	.432 (-7.281)	24.0	.205 (-13.772)	5.2	.891 (-0.998)
61.0	.431 (-7.31)	23.0	.169 (-15.43)	5.0	.899 (-0.921)
60.0	.428 (-7.38)	22.0	.128 (-17.86)	4.8	.907 (-0.847)
59.0	.422 (-7.491)	21.0	.081 (-21.813)	4.6	.914 (-0.777)
58.0	.415 (-7.648)	20.0	.029 (-30.657)	4.4	.922 (-0.709)
57.0	.405 (-7.856)	19.0	.027 (-31.323)	4.2	.928 (-0.645)
56.0	.393 (-8.119)	18.0	.088 (-21.139)	4.0	.935 (-0.584)
55.0	.378 (-8.442)	17.0	.152 (-16.379)	3.8	.941 (-0.527)
54.0	.362 (-8.835)	16.0	.219 (-13.21)	3.6	.947 (-0.472)
53.0	.343 (-9.305)	15.0	.287 (-10.833)	3.4	.953 (-0.421)

Systems With Reliability

CLIENT: *WYFU / BBN Elevation Pattern*
Date: 1/9/2012
ANTENNA TYPE: FM10D/3-DA
FREQUENCY: 88.5 MHz
PATTERN POL.: Circular
DIRECTIVITY(Peak): 2.991/4.758 dBd
Beam Tilt (Deg.) : *0*
DIRECTIVITY(Horiz): 2.991/4.758 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	.958 (-0.372)	-4.4	.922 (-0.709)	-12.0	.498 (-6.062)
3.0	.963 (-0.327)	-4.6	.914 (-0.777)	-12.2	.484 (-6.308)
2.8	.968 (-0.284)	-4.8	.907 (-0.847)	-12.4	.47 (-6.562)
2.6	.972 (-0.245)	-5.0	.899 (-0.921)	-12.6	.456 (-6.825)
2.4	.976 (-0.208)	-5.2	.891 (-0.998)	-12.8	.442 (-7.096)
2.2	.98 (-0.175)	-5.4	.883 (-1.078)	-13.0	.428 (-7.377)
2.0	.983 (-0.145)	-5.6	.875 (-1.162)	-13.2	.414 (-7.667)
1.8	.987 (-0.117)	-5.8	.866 (-1.249)	-13.4	.40 (-7.968)
1.6	.989 (-0.092)	-6.0	.857 (-1.34)	-13.6	.385 (-8.28)
1.4	.992 (-0.071)	-6.2	.848 (-1.434)	-13.8	.371 (-8.603)
1.2	.994 (-0.052)	-6.4	.838 (-1.532)	-14.0	.357 (-8.938)
1.0	.996 (-0.036)	-6.6	.829 (-1.633)	-14.2	.343 (-9.287)
.8	.997 (-0.023)	-6.8	.819 (-1.738)	-14.4	.329 (-9.65)
.6	.999 (-0.013)	-7.0	.808 (-1.847)	-14.6	.315 (-10.027)
.4	.999 (-0.006)	-7.2	.798 (-1.959)	-14.8	.301 (-10.421)
.2	1.00 (-0.001)	-7.4	.787 (-2.076)	-15.0	.287 (-10.833)
.0	1.00 (0)	-7.6	.777 (-2.196)	-15.2	.273 (-11.263)
-.2	1.00 (-0.001)	-7.8	.766 (-2.321)	-15.4	.26 (-11.714)
-.4	.999 (-0.006)	-8.0	.754 (-2.449)	-15.6	.246 (-12.187)
-.6	.999 (-0.013)	-8.2	.743 (-2.582)	-15.8	.232 (-12.685)
-.8	.997 (-0.023)	-8.4	.731 (-2.719)	-16.0	.219 (-13.21)
-1.0	.996 (-0.036)	-8.6	.719 (-2.86)	-16.2	.205 (-13.766)
-1.2	.994 (-0.052)	-8.8	.707 (-3.006)	-16.4	.192 (-14.356)
-1.4	.992 (-0.071)	-9.0	.695 (-3.157)	-16.6	.178 (-14.984)
-1.6	.989 (-0.092)	-9.2	.683 (-3.312)	-16.8	.165 (-15.656)
-1.8	.987 (-0.117)	-9.4	.671 (-3.472)	-17.0	.152 (-16.379)
-2.0	.983 (-0.145)	-9.6	.658 (-3.637)	-17.2	.139 (-17.16)
-2.2	.98 (-0.175)	-9.8	.645 (-3.807)	-17.4	.126 (-18.01)
-2.4	.976 (-0.208)	-10.0	.632 (-3.982)	-17.6	.113 (-18.943)
-2.6	.972 (-0.245)	-10.2	.619 (-4.163)	-17.8	.10 (-19.978)
-2.8	.968 (-0.284)	-10.4	.606 (-4.349)	-18.0	.088 (-21.139)
-3.0	.963 (-0.327)	-10.6	.593 (-4.541)	-18.2	.075 (-22.464)
-3.2	.958 (-0.372)	-10.8	.58 (-4.739)	-18.4	.063 (-24.008)
-3.4	.953 (-0.421)	-11.0	.566 (-4.942)	-18.6	.051 (-25.862)
-3.6	.947 (-0.472)	-11.2	.553 (-5.153)	-18.8	.039 (-28.188)
-3.8	.941 (-0.527)	-11.4	.539 (-5.37)	-19.0	.027 (-31.323)
-4.0	.935 (-0.584)	-11.6	.525 (-5.593)	-19.2	.016 (-36.185)
-4.2	.928 (-0.645)	-11.8	.511 (-5.824)	-19.4	.004 (-47.865)

Systems With Reliability

CLIENT: *WYFU / BBN Elevation Pattern*
Date: 1/9/2012
ANTENNA TYPE: FM10D/3-DA
FREQUENCY: 88.5 MHz
PATTERN POL.: Circular
DIRECTIVITY(Peak): 2.991/4.758 dBd
Beam Tilt (Deg.) : *0*
DIRECTIVITY(Horiz): 2.991/4.758 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	.007 (-42.787)	-27.2	.278 (-11.104)	-54.0	.362 (-8.835)
-19.8	.018 (-34.715)	-27.4	.281 (-11.025)	-55.0	.378 (-8.442)
-20.0	.029 (-30.657)	-27.6	.283 (-10.953)	-56.0	.393 (-8.119)
-20.2	.04 (-27.943)	-27.8	.285 (-10.89)	-57.0	.405 (-7.856)
-20.4	.051 (-25.91)	-28.0	.287 (-10.834)	-58.0	.415 (-7.648)
-20.6	.061 (-24.292)	-28.2	.289 (-10.785)	-59.0	.422 (-7.491)
-20.8	.071 (-22.952)	-28.4	.29 (-10.744)	-60.0	.428 (-7.38)
-21.0	.081 (-21.813)	-28.6	.291 (-10.71)	-61.0	.431 (-7.31)
-21.2	.091 (-20.825)	-28.8	.292 (-10.682)	-62.0	.432 (-7.281)
-21.4	.101 (-19.956)	-29.0	.293 (-10.662)	-63.0	.432 (-7.287)
-21.6	.11 (-19.183)	-29.2	.293 (-10.648)	-64.0	.43 (-7.329)
-21.8	.119 (-18.489)	-29.4	.294 (-10.641)	-65.0	.426 (-7.403)
-22.0	.128 (-17.86)	-29.6	.294 (-10.64)	-66.0	.421 (-7.507)
-22.2	.137 (-17.288)	-29.8	.294 (-10.646)	-67.0	.415 (-7.642)
-22.4	.145 (-16.765)	-30.0	.293 (-10.658)	-68.0	.407 (-7.804)
-22.6	.153 (-16.284)	-31.0	.288 (-10.815)	-69.0	.398 (-7.995)
-22.8	.161 (-15.84)	-32.0	.278 (-11.131)	-70.0	.389 (-8.211)
-23.0	.169 (-15.43)	-33.0	.263 (-11.612)	-71.0	.378 (-8.455)
-23.2	.177 (-15.049)	-34.0	.243 (-12.271)	-72.0	.366 (-8.724)
-23.4	.184 (-14.695)	-35.0	.22 (-13.132)	-73.0	.354 (-9.018)
-23.6	.191 (-14.366)	-36.0	.194 (-14.237)	-74.0	.341 (-9.339)
-23.8	.198 (-14.059)	-37.0	.165 (-15.651)	-75.0	.328 (-9.686)
-24.0	.205 (-13.772)	-38.0	.133 (-17.494)	-76.0	.314 (-10.06)
-24.2	.211 (-13.505)	-39.0	.10 (-19.999)	-77.0	.30 (-10.462)
-24.4	.217 (-13.254)	-40.0	.065 (-23.719)	-78.0	.285 (-10.893)
-24.6	.223 (-13.021)	-41.0	.029 (-30.637)	-79.0	.271 (-11.356)
-24.8	.229 (-12.802)	-42.0	.007 (-43.22)	-80.0	.256 (-11.852)
-25.0	.234 (-12.598)	-43.0	.043 (-27.275)	-81.0	.24 (-12.385)
-25.2	.24 (-12.407)	-44.0	.079 (-22.01)	-82.0	.225 (-12.957)
-25.4	.245 (-12.229)	-45.0	.115 (-18.805)	-83.0	.21 (-13.575)
-25.6	.249 (-12.063)	-46.0	.149 (-16.526)	-84.0	.194 (-14.244)
-25.8	.254 (-11.908)	-47.0	.182 (-14.784)	-85.0	.178 (-14.972)
-26.0	.258 (-11.764)	-48.0	.214 (-13.395)	-86.0	.163 (-15.769)
-26.2	.262 (-11.63)	-49.0	.244 (-12.26)	-87.0	.147 (-16.648)
-26.4	.266 (-11.507)	-50.0	.272 (-11.318)	-88.0	.131 (-17.628)
-26.6	.269 (-11.393)	-51.0	.298 (-10.529)	-89.0	.116 (-18.733)
-26.8	.273 (-11.288)	-52.0	.321 (-9.865)	-90.0	.10 (-20)
-27.0	.276 (-11.192)	-53.0	.343 (-9.305)	90.0	.00 (-50)

Systems With Reliability

CLIENT: *WYFU / BBN Elevation Pattern*
Date: 1/9/2012
ANTENNA TYPE: FM10D/3-DA
FREQUENCY: 88.5 MHz
PATTERN POL.: Circular
DIRECTIVITY(Peak): 2.991/4.758 dBd
Beam Tilt (Deg.) : *0*
DIRECTIVITY(Horiz): 2.991/4.758 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	WYFU
Contact	Mike Raley
Location	Masontown, PA
Antenna Model	FM10D/3-DA
Channel / Frequency	203B1 / 88.5 MHz

ELECTRICAL SPECIFICATIONS

Antenna Specifications:

		H-POL	dB		V. Pol.	dB	
License ERP (KW)		16.000	12.041	**dB**	16.000	12.041	**dB**
FCC Limit Pattern Directivity		1.551	1.906	**dB**	1.551	1.906	**dB**
Elevation Directivity		2.991	4.758	**dB**	2.991	4.758	**dB**
Azimuth Directivity		2.329	3.671	**dB**	2.098	3.217	**dB**
Composite Pattern		1.878	2.738	**dB**	1.878	2.738	**dB**
Polarization Ratio		0.474	-3.243	**dB**	0.526	-2.789	**dB**
RMS Comp./RMS Limit	90.9 **%**						
Antenna Efficiency %		100	0		100	0	
Power Ratio (Pol. Ratio X Efficiency)		0.4739	0		0.5261	0	
Antenna Gain		3.301	5.186	**dB**	3.301	5.186	**dB**

Antenna Input Power (KW)	4.847 **kW**	6.855 **(dBK)**	

Feed Line Specifications:

Line Type- ANDREW	1 5/8" Air **50 Ω**	**HJ7-50A**	
Attenuation Per 100 ft (dB)	0.196 **dB**		
Total Line Length (ft)	140.00 **ft.**		
Total Line Attenuation (dB)	0.2744 **dB**		
Line Efficiency	93.88 **%**		
Power Input to the Line (KW)	5.163 **kW**	7.129 **(dBK)**	

MECHANICAL SPECIFICATIONS

No. Of Bays	3				
Antenna Aperture	22.23 **ft.**			6.78	**meter**
Center of Radiation AGL	141.08 **ft.**			43.00	**meter**
Antenna Weight with Pole	585.00 **lbs.**			265.91	**kg**
Windload (50/33)	1288.00 **lbs.**	**Windload CaAc**		37.30	**ft^2**

Prepared by: David K Edmiston Jr.

David K. Edmiston Jr.
SWR, LLP

Exhibit 6: RMS Calculations

SYSTEMS WITH RELIABILITY, INC.
Broadcast Antennas and Transmission Systems

WYFU Antenna RMS Comparison

PROPOSED ANTENNA		DESIGNED ANTENNA	
Azimuth Heading	**Relative Field**	**Azimuth Heading**	**Relative Field**
0	0.725	0	0.363
10	0.576	10	0.314
20	0.458	20	0.288
30	0.363	30	0.360
40	0.289	40	0.288
50	0.265	50	0.265
60	0.236	60	0.236
70	0.236	70	0.236
80	0.281	80	0.281
90	0.353	90	0.353
100	0.445	100	0.445
110	0.560	110	0.539
120	0.705	120	0.589
130	0.887	130	0.740
140	1.000	140	0.874
150	1.000	150	0.950
160	1.000	160	1.000
170	1.000	170	0.833
180	1.000	180	0.841
190	1.000	190	0.875
200	1.000	200	0.923
210	1.000	210	0.984
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	0.887	280	0.880
290	0.746	290	0.732
300	0.791	300	0.765
310	0.814	310	0.806
320	0.837	320	0.802
330	0.887	330	0.725
340	0.913	340	0.576
350	0.913	350	0.457

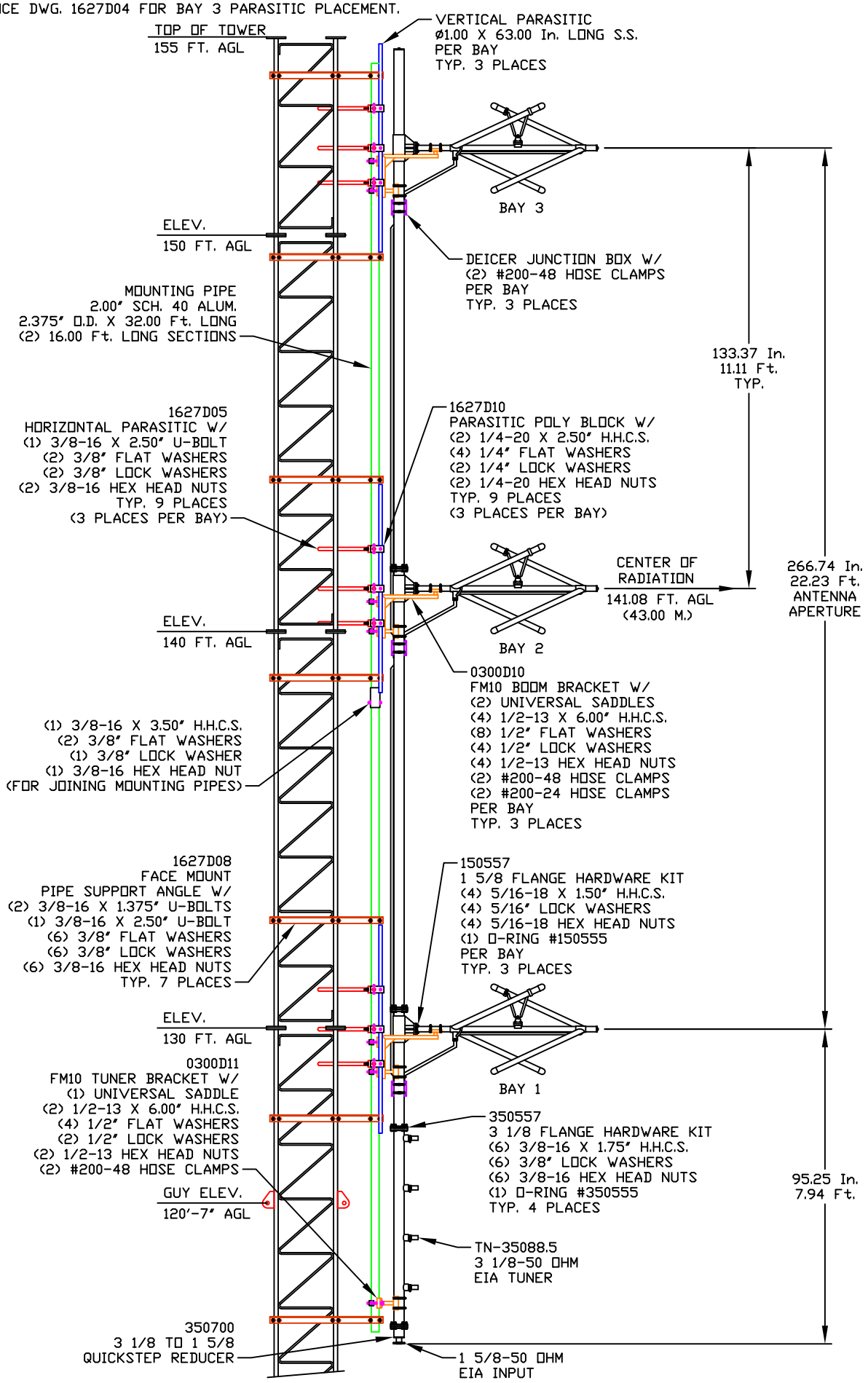
Sum of Relative Field Squared :	**23.249**	**Sum of Relative Field Squared :**	**19.202**
Sum Divided by 36 (Readings) :	**0.646**	**Sum Divided by 36 (Readings) :**	**0.533**
Square Root :	**0.804**	**Square Root :**	**0.730**

Percentage of Construction Permit Antenna Filled : **90.9%**

Exhibit 7: Drawings

DRAWING NUMBER: 1627D00

NOTES:
1. REFERENCE DWG. 1627D01 FOR ANTENNA ORIENTATION.
2. REFERENCE DWG. 1627D02 FOR BAY 1 PARASITIC PLACEMENT.
3. REFERENCE DWG. 1627D03 FOR BAY 2 PARASITIC PLACEMENT.
4. REFERENCE DWG. 1627D04 FOR BAY 3 PARASITIC PLACEMENT.

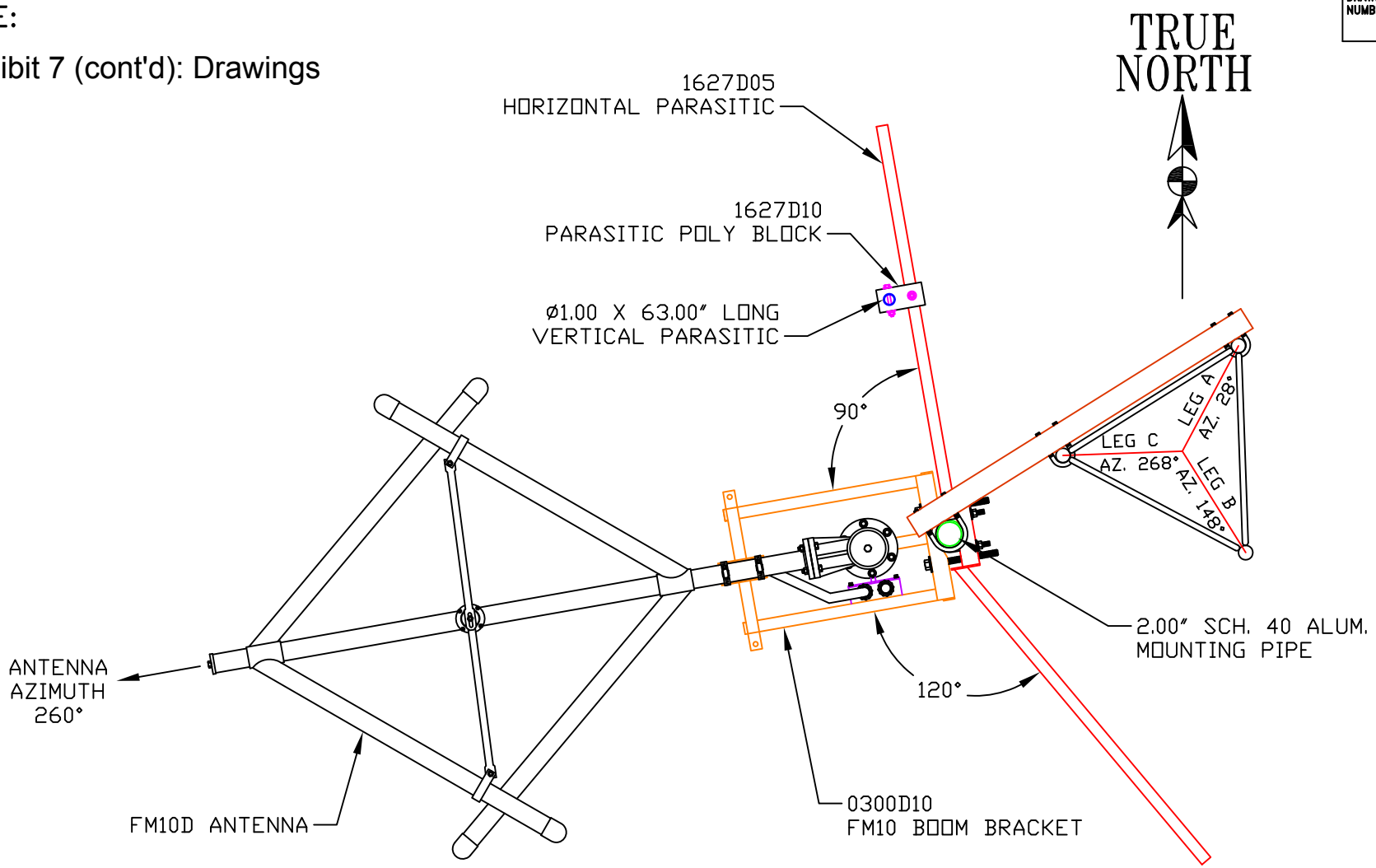


SYSTEMS WITH RELIABILITY, INC 619 INDUSTRIAL PARK ROAD EBENSBURG, PENNSYLVANIA 15931	TITLE: FM10D/3-DA, FREQ. 88.5 WYFU, MASONTOWN, PA MATERIAL:	SIZE C	REV 1 2 3 / APPR. / DATE	ENGINEER:	DRAWING NUMBER: 1627D00		
				SCALE: NTS	NAME: RAC	DATE: 1/5/12	SHEET 1 OF 1

NOTE:

Exhibit 7 (cont'd): Drawings

DRAWING NUMBER: 1627D01



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, INC
619 INDUSTRIAL PARK ROAD
EBENSBURG, PENNSYLVANIA 15931

TITLE: FM10D/3-DA, FREQ. 88.5
WYFU, MASONTOWN, PA

MATERIAL: ANTENNA ORIENTATION
FROM TRUE NORTH

SIZE: A

PARTS MADE BY THIS DRAWING

DRAWING NUMBER: 1627D01

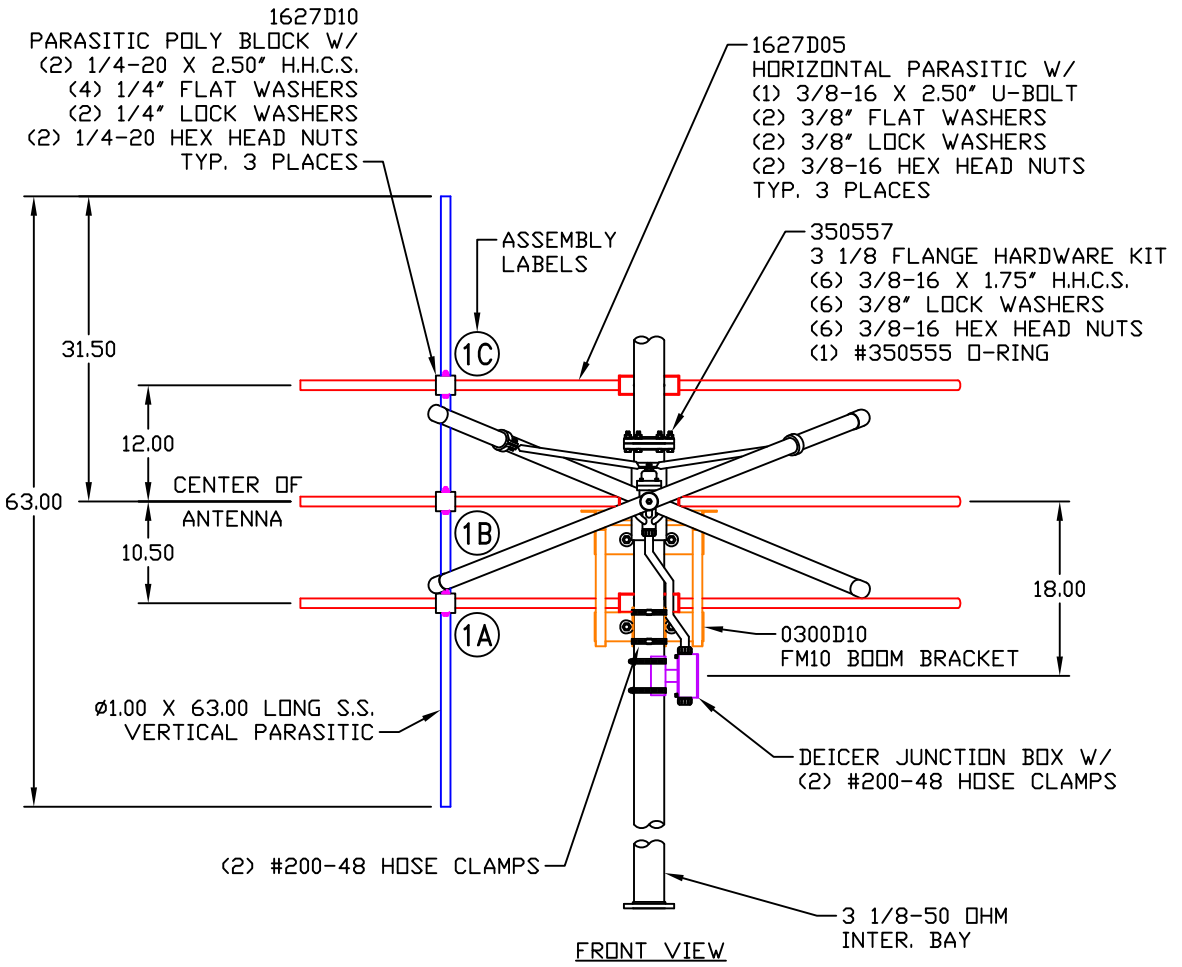
SCALE: NTS | NAME: RAC | DATE: 1/5/12 | SHEET 1 OF 1

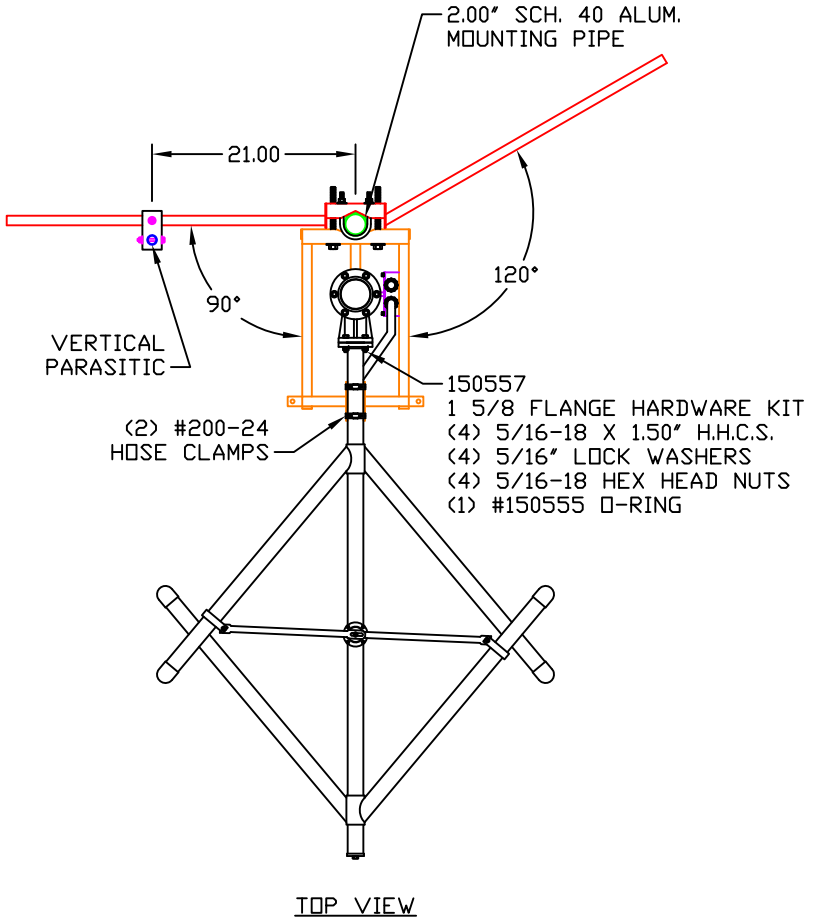
NOTE:

Exhibit 7 (cont'd): Drawings

DRAWING NUMBER: 1627D02

THE PARASITICS & POLY BLOCKS ARE FACTORY DRILLED & LABELED
AS SHOWN IN THE FRONT VIEW.
MATCH ALL CORRESPONDING LABELS DURING ASSEMBLY FOR CORRECT INSTALLATION.





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, INC
619 INDUSTRIAL PARK ROAD
EBENSBURG, PENNSYLVANIA 15931

TITLE: FM10D/3-DA, FREQ. 88.5
WYFU, MASONTOWN, PA

MATERIAL: PARASITIC PLACEMENT
BAY 1

SIZE: A

PARTS MADE BY THIS DRAWING

DRAWING NUMBER: 1627D02

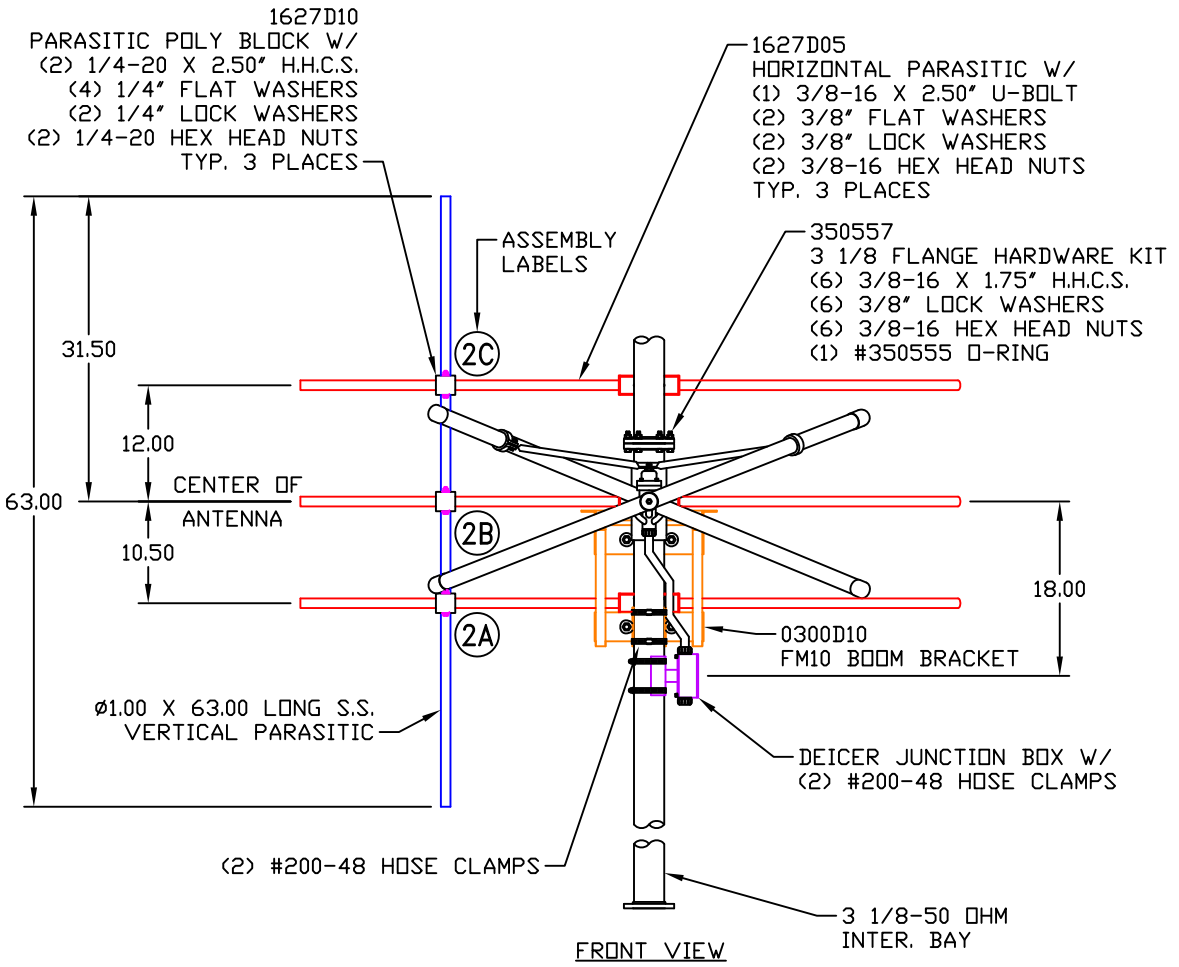
SCALE: NTS | NAME: RAC | DATE: 1/5/12 | SHEET 1 OF 1

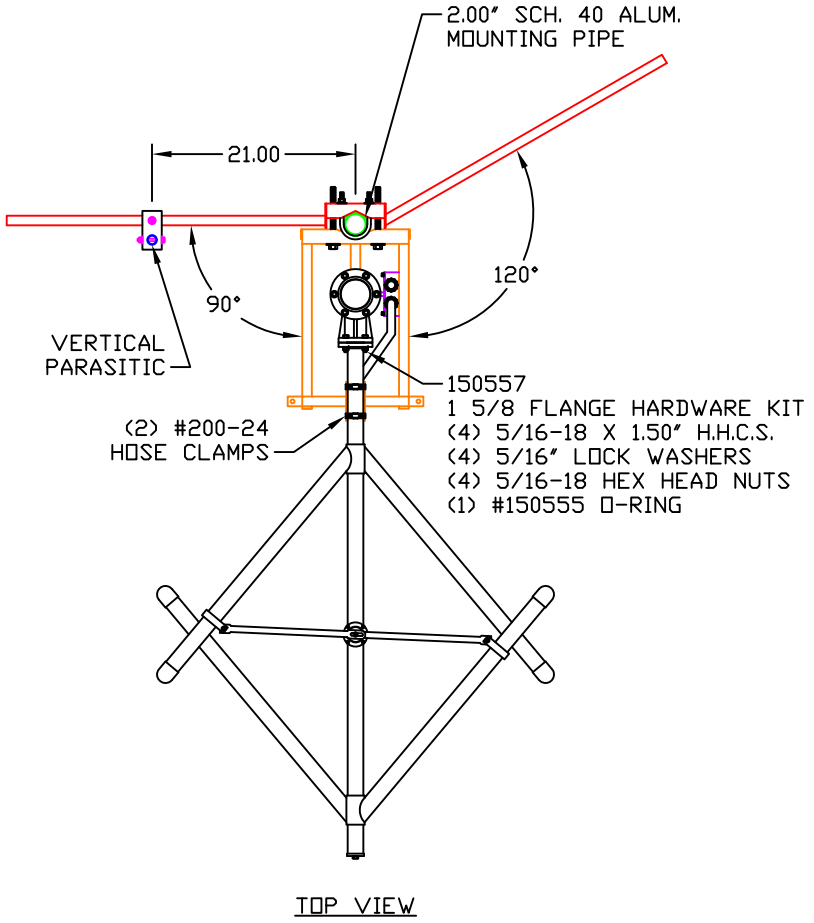
NOTE:

Exhibit 7 (cont'd): Drawings

DRAWING NUMBER: 1627D03

THE PARASITICS & POLY BLOCKS ARE FACTORY DRILLED & LABELED
AS SHOWN IN THE FRONT VIEW.
MATCH ALL CORRESPONDING LABELS DURING ASSEMBLY FOR CORRECT INSTALLATION.





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, INC
619 INDUSTRIAL PARK ROAD
EBENSBURG, PENNSYLVANIA 15931

TITLE: FM10D/3-DA, FREQ. 88.5
WYFU, MASONTOWN, PA

MATERIAL: PARASITIC PLACEMENT
BAY 2

SIZE: A

PARTS MADE BY THIS DRAWING

DRAWING NUMBER: 1627D03

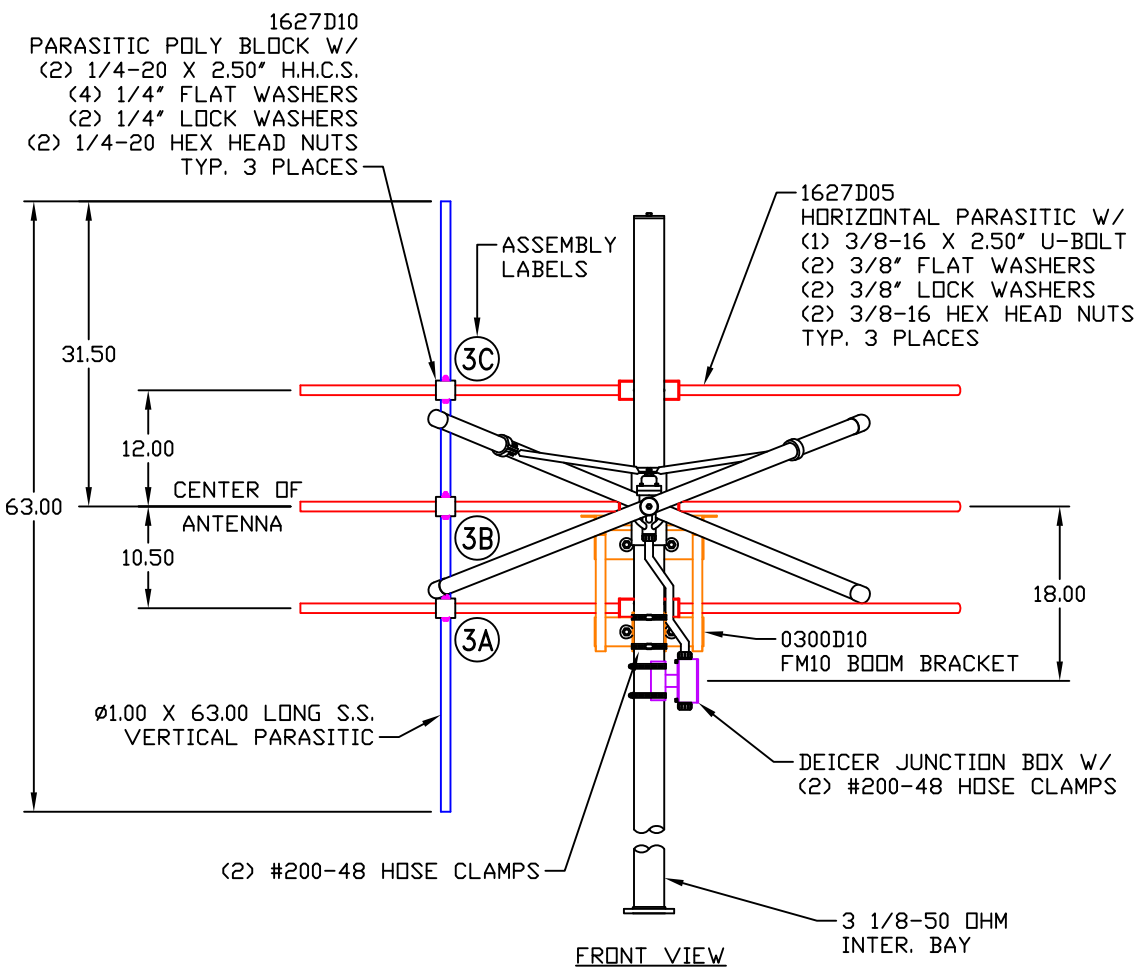
SCALE: NTS | NAME: RAC | DATE: 1/5/12 | SHEET 1 OF 1

NOTE:

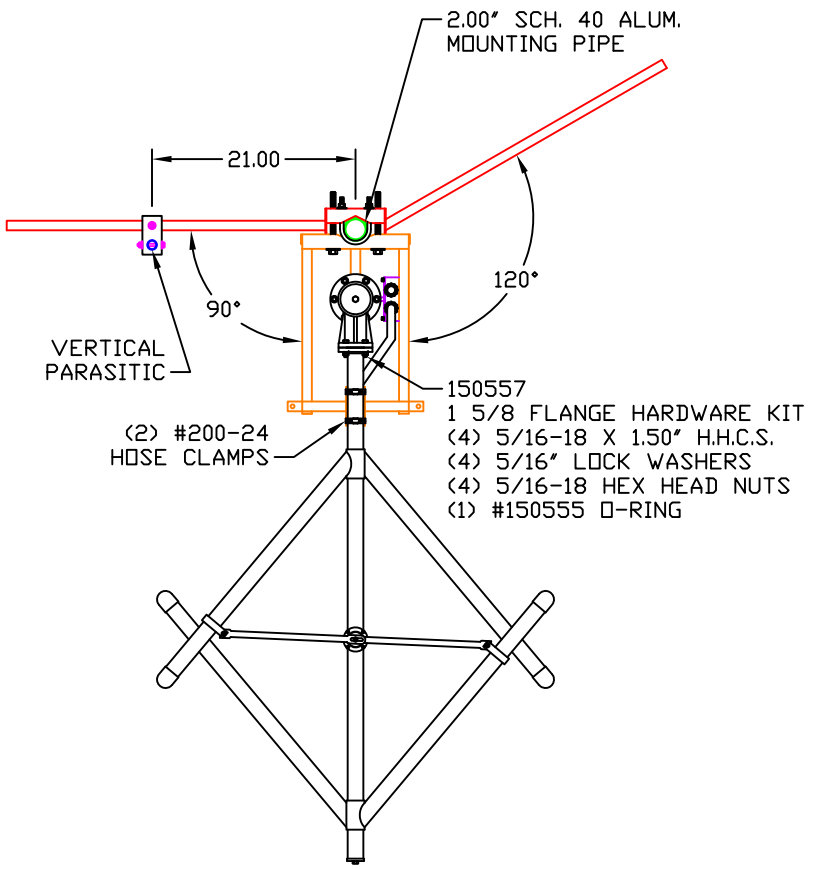
Exhibit 7 (cont'd): Drawings

DRAWING NUMBER: 1627D04

THE PARASITICS & POLY BLOCKS ARE FACTORY DRILLED & LABELED
AS SHOWN IN THE FRONT VIEW.
MATCH ALL CORRESPONDING LABELS DURING ASSEMBLY FOR CORRECT INSTALLATION.



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, INC
619 INDUSTRIAL PARK ROAD
EBENSBURG, PENNSYLVANIA 15931

TITLE: FM10D/3-DA, FREQ. 88.5
WYFU, MASONTOWN, PA

MATERIAL: PARASITIC PLACEMENT
BAY 3

SIZE: A

PARTS MADE BY THIS DRAWING

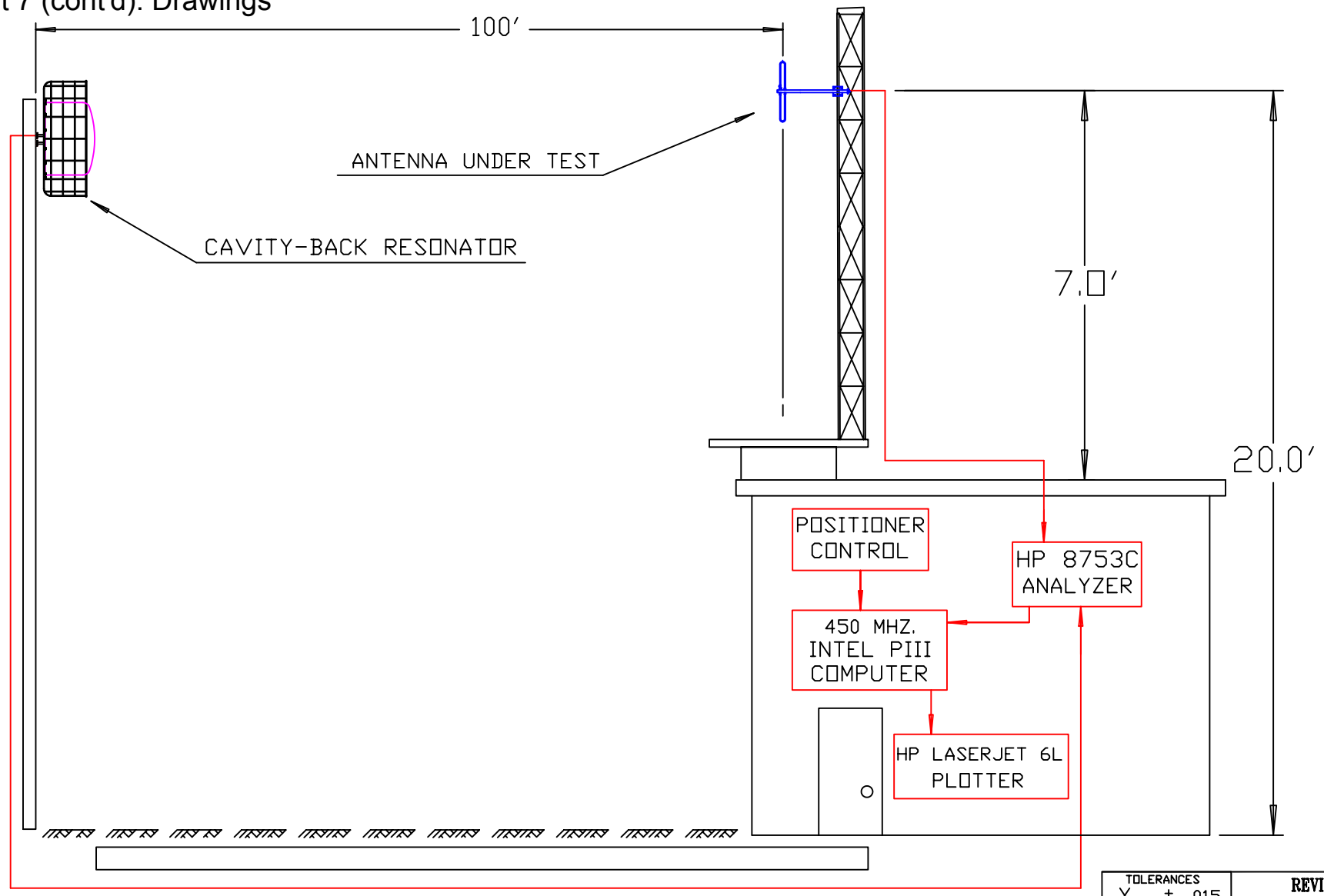
DRAWING NUMBER: 1627D04

SCALE: NTS | NAME: RAC | DATE: 1/5/12 | 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

DRAWING NUMBER: 2105A10

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

TITLE: TEST RANGE SCHEMATIC

MATERIAL:

SIZE: A

PARTS MADE BY THIS DRAWING

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