



SYSTEMS WITH RELIABILITY, LLP
BROADCAST ANTENNAS AND TRANSMISSION LINE

PATTERN CERTIFICATION
DIRECTIONAL FM ANTENNA
WYBQ
July 29, 2013

Call Sign	:	WYBQ
Location	:	Leesport, PA
Frequency	:	88.3 MHz
Channel	:	202A
Antenna Model	:	FMEEDS/1-DA
Maximum Antenna Gain	:	
Vertical	:	2.662 / 4.252 dB
Horizontal	:	0.004 / -24.008 dB

ANTENNA DESCRIPTION

A custom designed FMEEDS/1-DA antenna was fabricated to conform to the prescribed directional azimuth pattern. The antenna bay consists of a vertically polarized, dipole radiating element and vertical parasitic system. The bay is mounted to a 2" (inch) schedule 40 support pole. The support pole is mounted to a Rohn SSV tower. The horizontal component of this antenna was incorporated by off-setting the dipole 2° off of vertical. The horizontal azimuth pattern is calculated to have a directivity of 1.000. The antenna array points 150 degrees from true North.

DESCRIPTION OF TEST PROCEDURE

The test antenna consisted of a single third-scale bay with parasitics and mounting pole. 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. Vertical readings were taken. The desired directional pattern was obtained by utilizing vertical parasitics, adjusting the distance between the tower and the antenna, and modifying the direction of the azimuth heading.

DESCRIPTION OF TEST PARAMETERS AND EQUIPMENT

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 264.9 MHz. The third-scale test antenna was then rotated clockwise in order to achieve 360° (degree) pattern readings. A gain reference was taken using a dipole tuned to 264.9 MHz. Nowhere did the received signal, or resultant documentation, exceed a maximum to minimum ratio of 15dB (decibels).

619 Industrial Park Road, Ebensburg, PA 15931 Tel. 800 762 7743 / 814 472 5436 ♦ Fax 814 472 5552

TEST RESULTS

The attached calculations verify that the **RMS** value of this antenna is **86.9%** of the **RMS** value of the pattern authorized in the related construction permit **BNPED-20071019APD**. The vertical component **RMS** value is **0.575**.

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

Calculated horizontal polarized directivity:	1.000 / 0.000 dB
Measured vertical polarized directivity:	3.029 / 4.812 dB
Measured Elliptical polarized pattern directivity:	3.029 / 4.812 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 = (3.029)(0.9955)(0.833)	= 2.662 / 4.252 dB
H-Pol. Gain = (1.00)(.0045)(0.833)	= 0.004 / -24.008 dB

INSTALLATION AND MOUNTING

The antenna is to be mounted in accordance with the supplied drawings. The antenna center of radiation is to be **72 meters (236.23 ft.)** above ground level. The antenna aperture is **6.08 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 **150 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
1585D00	ELEVATION
1585D01	ANTENNA ORIENTATION
1585D02	BAY MOUNTING DETAIL
1585D03	MOUNTING PIPE INSTALLATION DETAIL
2105A10	TEST RANGE SCHEMATIC

The array shall be mounted according to **DWG. 1585D00**. The antenna elements shall be aligned at the same heading as in **DWG. 1585D01**. This will ensure that the antenna is oriented properly at 150 degrees true north. **DWG. 1585D02** and **DWG. 1585D03** show mounting details antenna and mounting pipe. The test range schematic **DWG. 2105A10** shows the mounting configuration of the antenna setup on our range.

DOCUMENT EXHIBITS

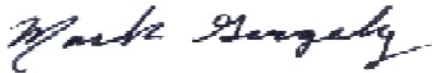
The following exhibits are included as part of this Certificate of Compliance:

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

TEST EQUIPMENT

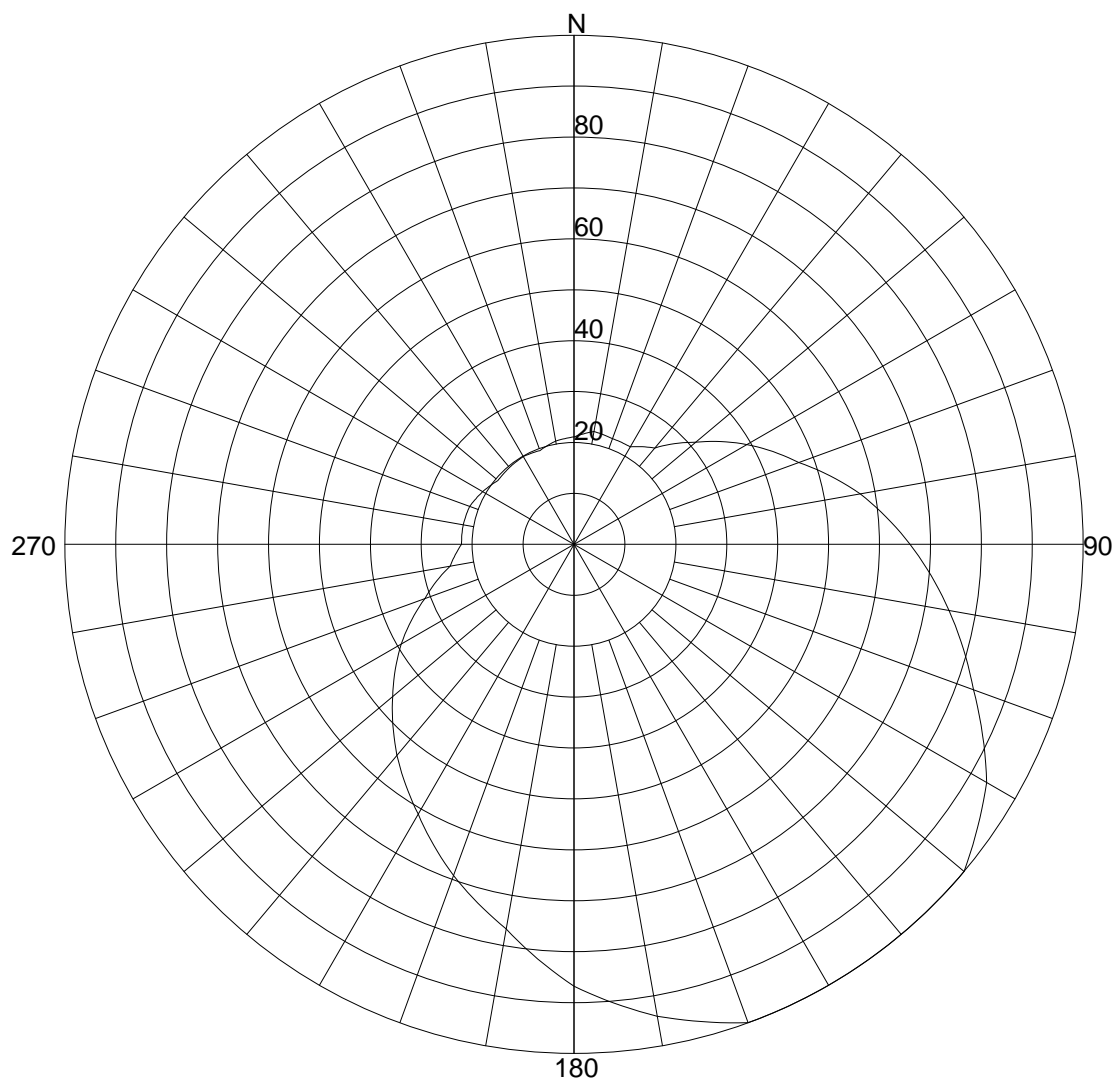
Network Analyzer	:	Hewlett Packard Model # 8753C Serial Number: 08753 – 69138
Computer	:	Pentium 3, 450 MHz, SAMS Range Program
Printer	:	Hewlett-Packard Laser Jet 6L
Positioner	:	Orbit Positioner
All equipment is calibrated to ANSI/NCSL Z540-1-1994 specs		

Prepared by:



Mark A. Gergely
Electrical Engineer
Systems With Reliability LLP

Exhibit 1: Measured Vertical Azimuth Pattern



Azimuth Pattern

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Scale: Linear

Unit: Relative Field

CLIENT: WYBQ

Date: 7/27/2013

ANTENNA TYPE: FMEEDS/1-DA

FREQUENCY: 88.3 MHz

PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.02863 / 4.81dB

PATTERN RMS: 0.575

Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	.2110 (-13.51)	180	.8680 (-1.23)
5	.2180 (-13.23)	185	.8175 (-1.75)
10	.2250 (-12.96)	190	.7670 (-2.3)
15	.2230 (-13.03)	195	.7295 (-2.74)
20	.2210 (-13.11)	200	.6920 (-3.2)
25	.2210 (-13.11)	205	.6520 (-3.72)
30	.2210 (-13.11)	210	.6120 (-4.26)
35	.2340 (-12.62)	215	.5765 (-4.78)
40	.2470 (-12.15)	220	.5410 (-5.34)
45	.2795 (-11.07)	225	.5030 (-5.97)
50	.3120 (-10.12)	230	.4650 (-6.65)
55	.3520 (-9.07)	235	.4285 (-7.36)
60	.3920 (-8.13)	240	.3920 (-8.13)
65	.4310 (-7.31)	245	.3520 (-9.07)
70	.4700 (-6.56)	250	.3120 (-10.12)
75	.5205 (-5.67)	255	.2795 (-11.07)
80	.5710 (-4.87)	260	.2470 (-12.15)
85	.6155 (-4.22)	265	.2340 (-12.62)
90	.6600 (-3.61)	270	.2210 (-13.11)
95	.7040 (-3.05)	275	.2210 (-13.11)
100	.7480 (-2.52)	280	.2210 (-13.11)
105	.7915 (-2.03)	285	.2195 (-13.17)
110	.8350 (-1.57)	290	.2180 (-13.23)
115	.8855 (-1.06)	295	.2125 (-13.45)
120	.9360 (-0.57)	300	.2070 (-13.68)
125	.9680 (-0.28)	305	.2010 (-13.94)
130	1.0000 (0)	310	.1950 (-14.2)
135	1.0000 (0)	315	.1960 (-14.15)
140	1.0000 (0)	320	.1970 (-14.11)
145	1.0000 (0)	325	.1980 (-14.07)
150	1.0000 (0)	330	.1990 (-14.02)
155	1.0000 (0)	335	.1975 (-14.09)
160	1.0000 (0)	340	.1960 (-14.15)
165	.9705 (-0.26)	345	.2010 (-13.94)
170	.9410 (-0.53)	350	.2060 (-13.72)
175	.9045 (-0.87)	355	.2085 (-13.62)

Systems With Reliability

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ANTENNA TYPE: FMEEDS/1-DA

FREQUENCY: 88.3 MHz

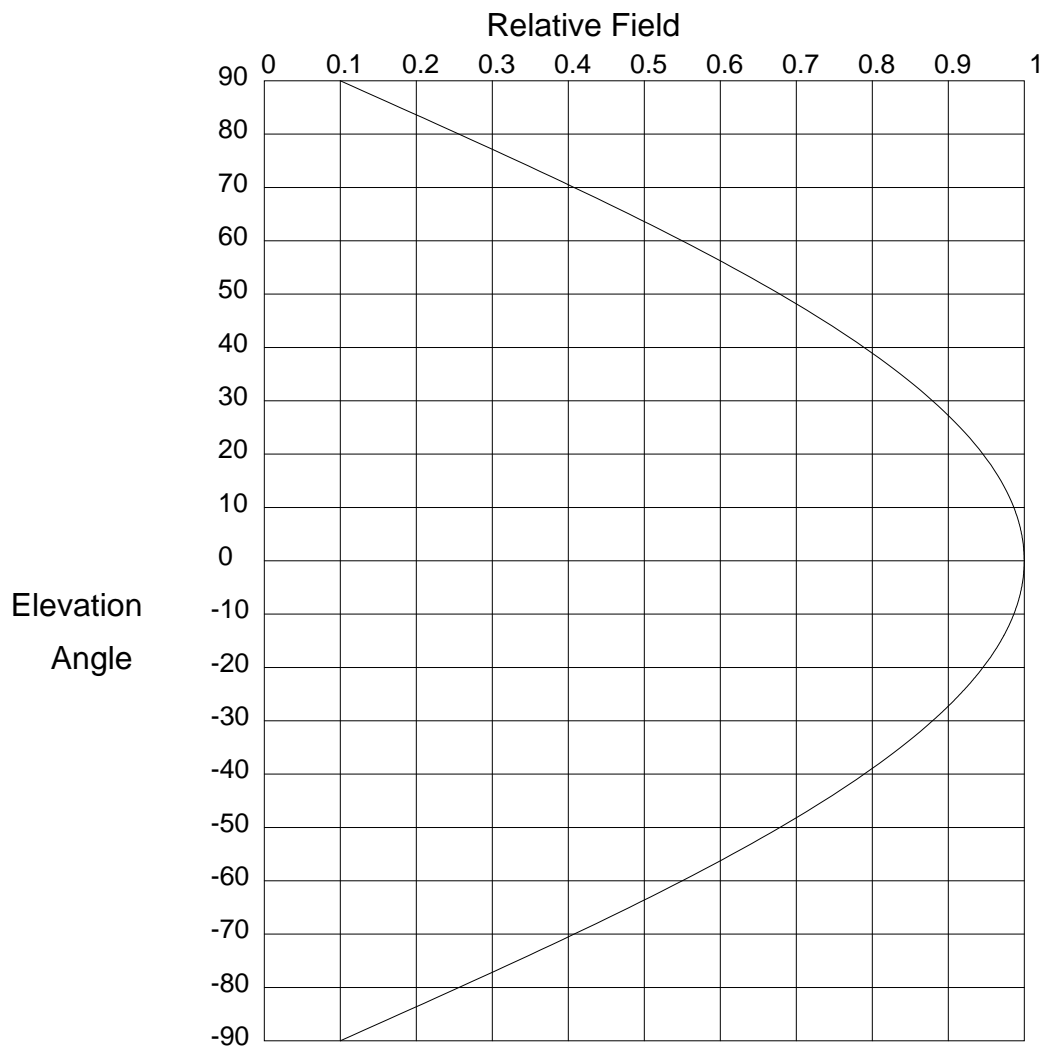
PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 3.02863 / 4.81dB

PATTERN RMS: 0.575

Exhibit 2: Elevation Pattern



Elevation Pattern

Scale: Linear

Units: Field, Relative

Systems With Reliability

CLIENT: WYBQ

Date: 7/27/2013

ANTENNA TYPE: FMEEDS/1-DA

FREQUENCY: 88.3 MHz

PATTERN POL.: Elliptical

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)
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

Page 1 of 3

CLIENT: WYBQ

Date: 7/27/2013

ANTENNA TYPE: FMEEDS/1-DA

FREQUENCY: 88.3 MHz

PATTERN POL.: Elliptical

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

Page 2 of 3

CLIENT: WYBQ

Date: 7/27/2013

ANTENNA TYPE: FMEEDS/1-DA

FREQUENCY: 88.3 MHz

PATTERN POL.: Elliptical

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

Page 3 of 3

CLIENT: WYBQ

Date: 7/27/2013

ANTENNA TYPE: FMEEDS/1-DA

FREQUENCY: 88.3 MHz

PATTERN POL.: Elliptical

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, LLP

BROADCAST ANTENNAS AND TRANSMISSION LINE

SYSTEM DATA SHEET

Customer	WYBQ
Contact	Mike Raley
Location	Leesport, PA
Antenna Model	FMEEDS/1-DA
Channel / Frequency	202A / 88.3 MHz

ELECTRICAL SPECIFICATIONS

Antenna Specifications:

	V- POL			H-POL	
License ERP (KW)	0.670			0.001	
FCC Limit Pattern Directivity	2.289	3.597	dB	2.289	3.597 dB
Elevation Directivity	0.883	-0.540	dB	0.883	-0.540 dB
Azimuth Directivity	3.029	4.812	dB	1.000	0.000 dB
Composite Pattern	3.029	4.812	dB	3.029	4.812 dB
Polarization Ratio	0.995			0.005	
RMS Comp./RMS Limit	86.9 %				
Antenna Efficiency %	100			100	
Power Ratio (Pol. Ratio X Efficiency)	0.9955			0.0045	
Antenna Gain	2.662	4.252	dB	0.004	-24.008 dB

Antenna Input Power (KW)	0.252 kW	-5.992 (dBK)
---------------------------------	----------	--------------

Feed Line Specifications:

Line Type: Cablewave	7/8" Virtual Air	50 Ω AVA5-50
Attenuation Per 100 ft (dB)	0.32	dB
Line Length (ft) AGL + 50' Horizontal Run	286.23	ft.
Total Line Attenuation (dB)	0.9074	dB
Line Efficiency	81.15	%
Power Input to the Line (KW)	0.310 kW	-5.084 (dBK)

MECHANICAL SPECIFICATIONS

No. Of Bays	1		
Antenna Aperture	6.08	ft.	1.85 meter
Center of Radiation AGL	236.23	ft.	72.00 meter
Antenna Weight	136.00	lbs.	61.82 kg
Windload (50/33)	301.00	lbs.	Windload CaAc 8.50 ft^2

Prepared by:

David K. Edmiston Jr.
SWR, LLP

Exhibit 4: RMS Calculations



SYSTEMS WITH RELIABILITY, INC.
Broadcast Antennas and Transmission Systems

WYBQ Antenna RMS Comparison

PROPOSED ANTENNA

**Azimuth
Heading** **Relative
Field**

0	0.350
10	0.278
20	0.221
30	0.221
40	0.247
50	0.312
60	0.392
70	0.494
80	0.622
90	0.783
100	0.985
110	1.000
120	1.000
130	1.000
140	1.000
150	1.000
160	1.000
170	1.000
180	1.000
190	1.000
200	0.985
210	0.783
220	0.622
230	0.494
240	0.392
250	0.312
260	0.247
270	0.221
280	0.221
290	0.278
300	0.350
310	0.440
320	0.494
330	0.494
340	0.494
350	0.440

DESIGNED ANTENNA

**Azimuth
Heading** **Relative
Field**

0	0.211
10	0.225
20	0.221
30	0.221
40	0.247
50	0.312
60	0.392
70	0.470
80	0.571
90	0.660
100	0.748
110	0.835
120	0.936
130	1.000
140	1.000
150	1.000
160	1.000
170	0.941
180	0.868
190	0.767
200	0.692
210	0.612
220	0.541
230	0.465
240	0.392
250	0.312
260	0.247
270	0.221
280	0.221
290	0.218
300	0.207
310	0.195
320	0.197
330	0.199
340	0.196
350	0.206

Sum of Relative Field Squared : 15.767
Sum Divided by 36 (Readings) : 0.438
Square Root : 0.662

Sum of Relative Field Squared : 11.907
Sum Divided by 36 (Readings) : 0.331
Square Root : 0.575

Percentage of Construction Permit Antenna Filled :

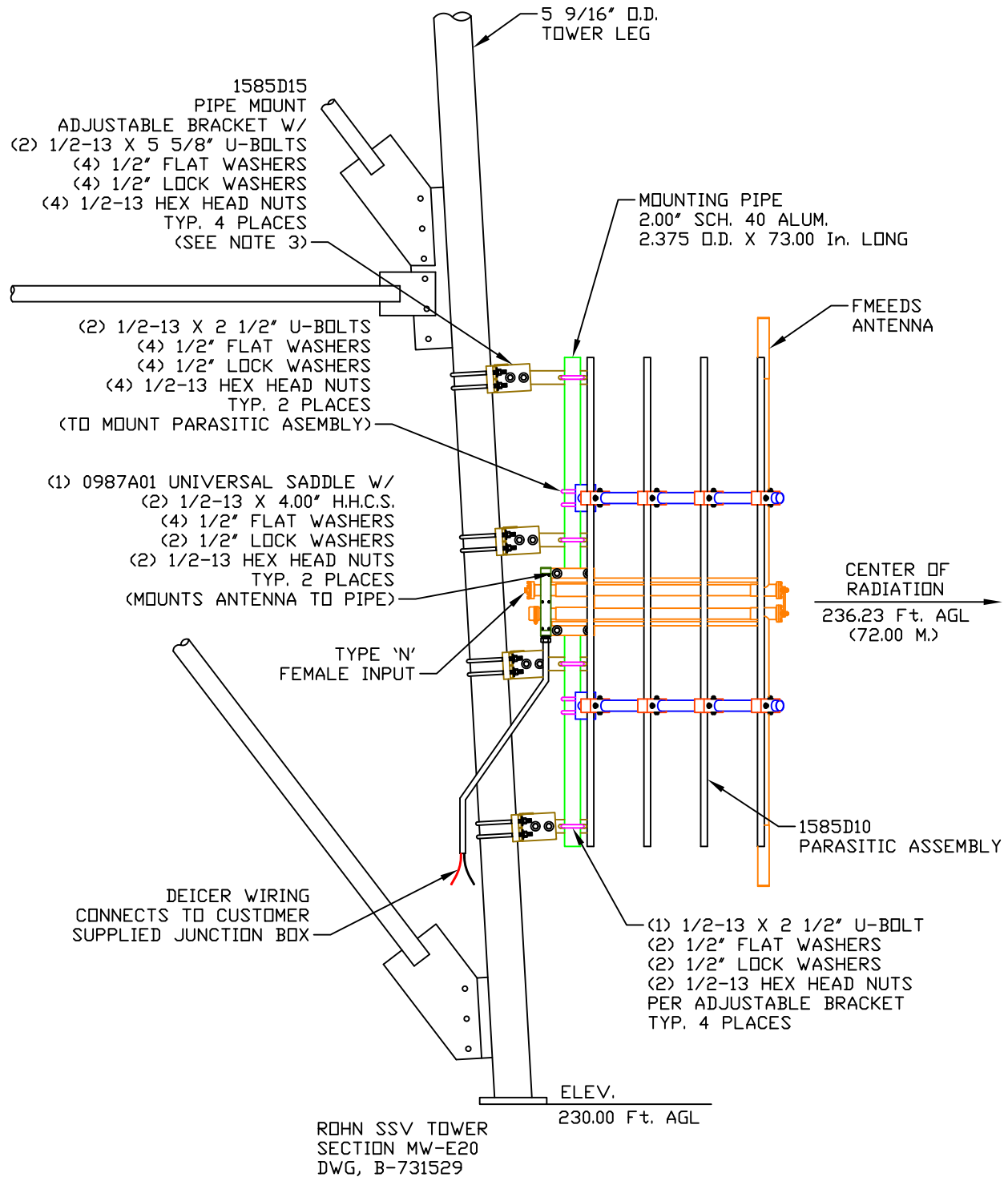
86.9%

NOTES:

1. REFERENCE DWG. 1585D01 FOR ANTENNA ORIENTATION.
2. REFERENCE DWG. 1585D02 FOR PARASITIC/ANTENNA ASSEMBLY.
3. REFERENCE DWG. 1585D03 FOR MOUNTING PIPE INSTALLATION.

DRAWING NUMBER: 1585D00

Exhibit 5: Drawings



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

TITLE: FMEEDS/1-DA, FREQ. 88.3
WYBQ, LEESPORT, PA

MATERIAL:

SIZE REV APPR. DATE
C 1
2
3

ENGINEER:

SCALE:

NAME: RAC

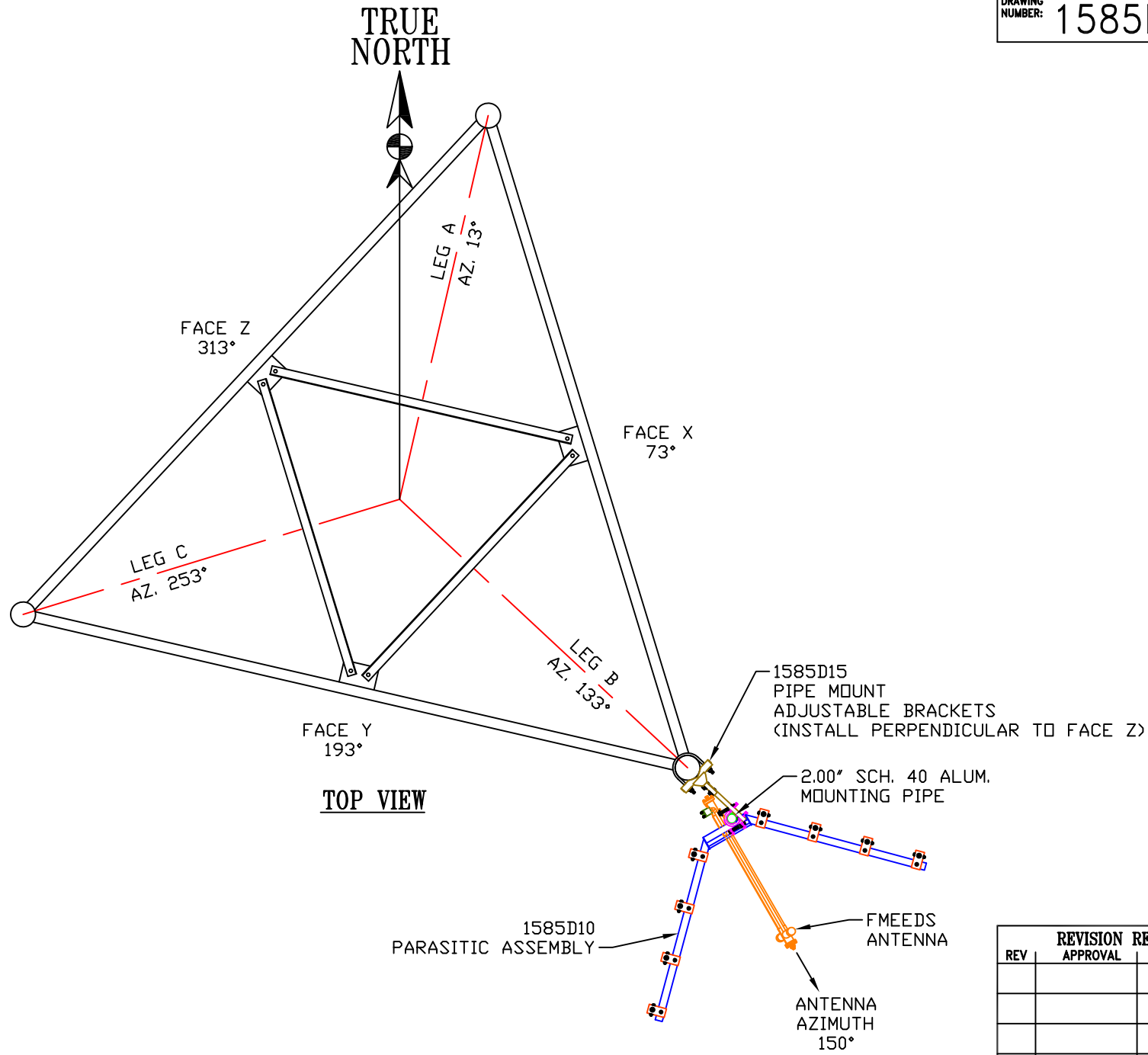
DATE: 6/6/13

SHEET 1 OF 1

DRAWING NUMBER: 1585D00

NOTE:
Exhibit 5(cont'd): Drawings

DRAWING
NUMBER: 1585D01

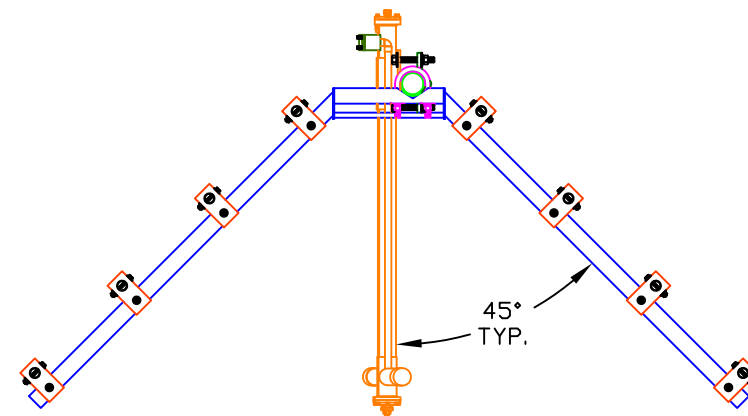
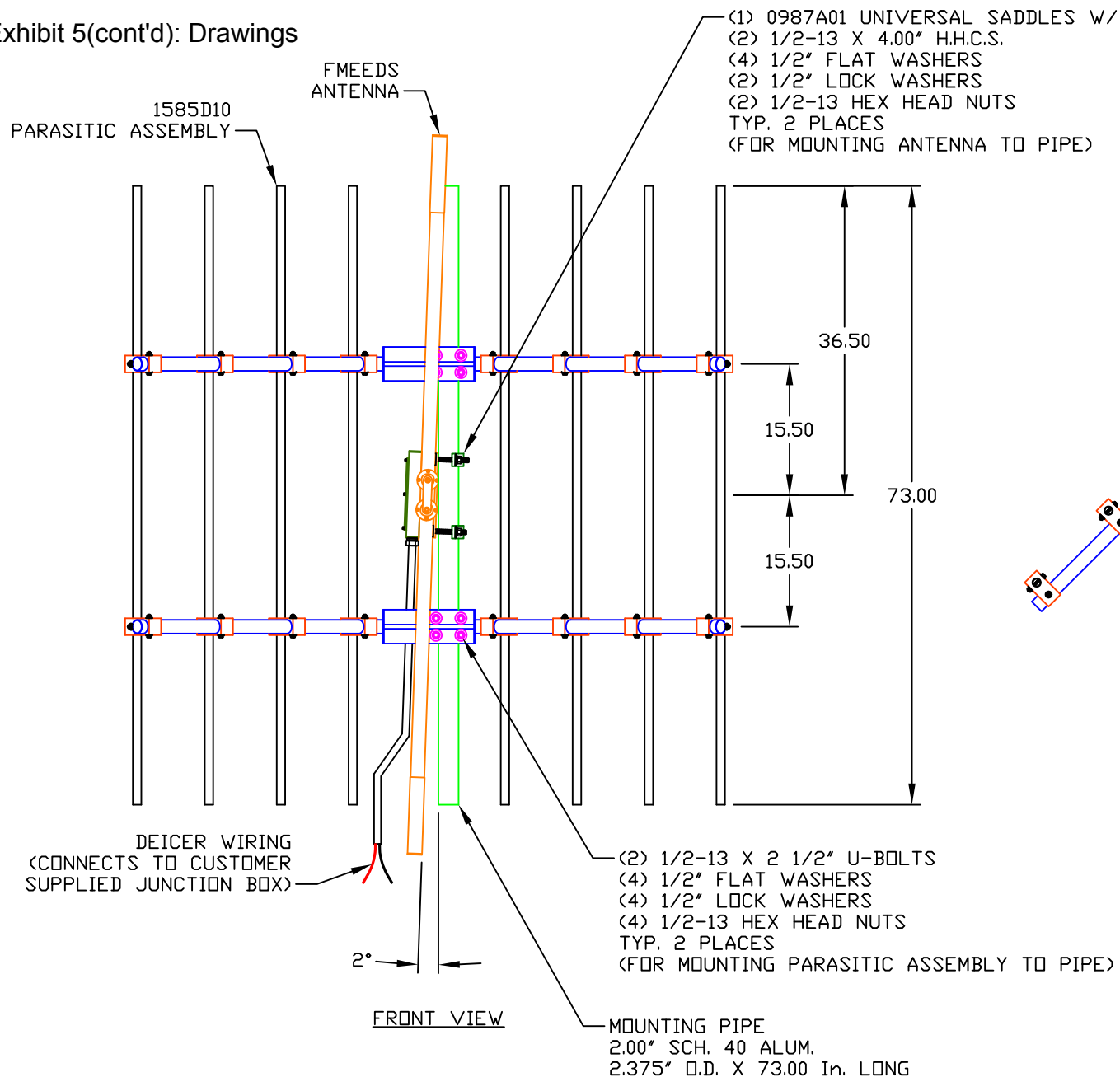


NOTE:

Exhibit 5(cont'd): Drawings

DRAWING
NUMBER:

1585D02



TOP VIEW

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

REVISION RECORD		
REV	APPROVAL	DATE
DRAWING NUMBER:		1585D02
SCALE:	NAME:	DATE:
NTS	RAC	6/6/13
SHEET		1 OF 1



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

TITLE:

FMEEDS/1-DA, FREQ. 88.3
WYBQ, LEESPORT, PA

MATERIAL:

SIZE

A

PARTS MADE BY THIS DRAWING

SCALE: NTS

NAME: RAC

DATE: 6/6/13

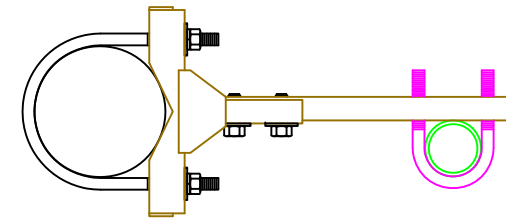
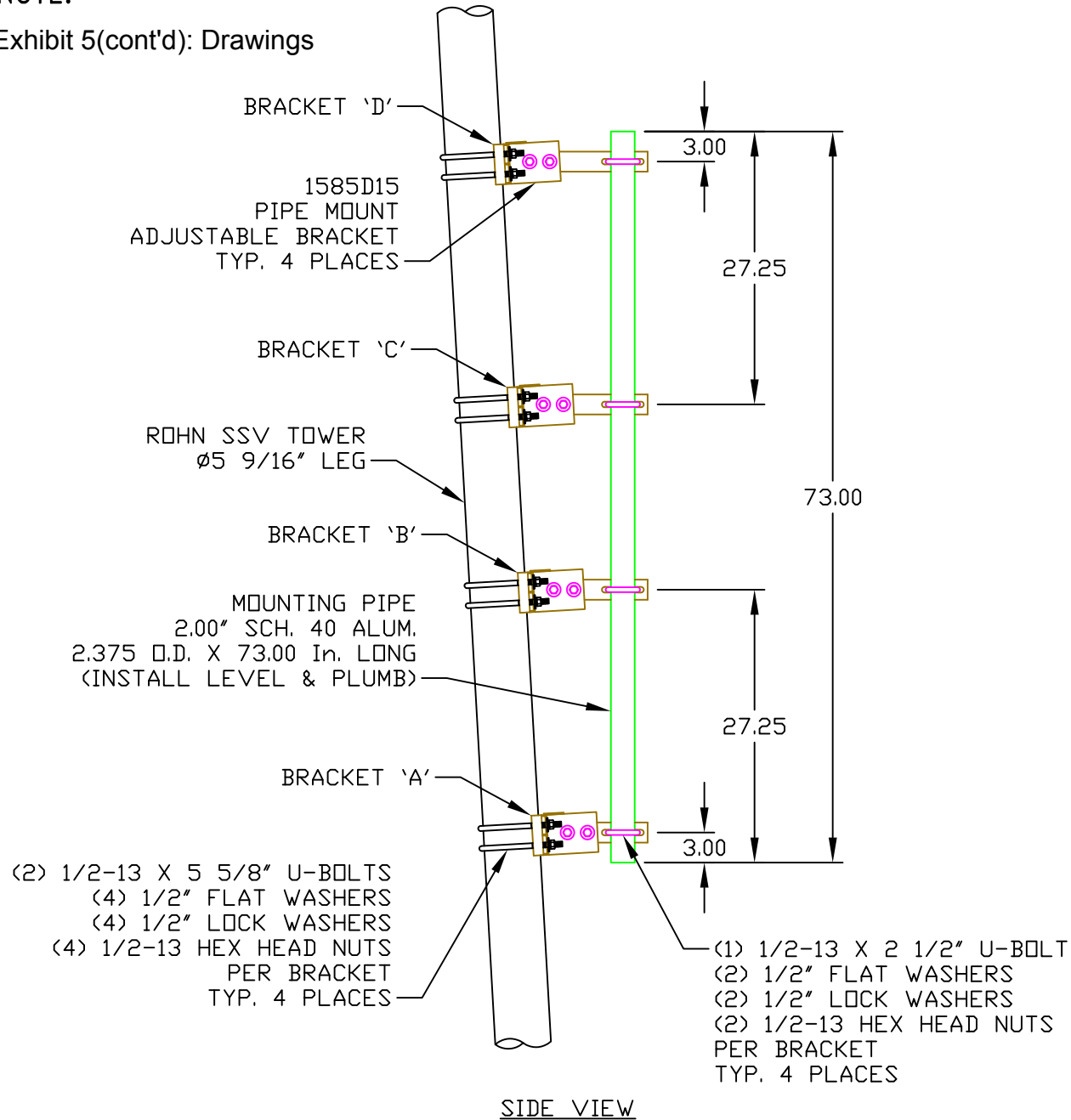
SHEET 1 OF 1

NOTE:

Exhibit 5(cont'd): Drawings

DRAWING
NUMBER:

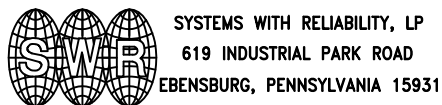
1585D03



TOP VIEW
NOT TO SCALE

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: FMEEDS/1-DA, FREQ. 88.3
WYBQ, LEESPORT, PA
MATERIAL: MOUNTING PIPE
INSTALLATION

SIZE

A

PARTS MADE BY THIS DRAWING

SCALE: NTS

NAME: RAC

DATE: 6/6/13

SHEET 1 OF 1

DRAWING
NUMBER:

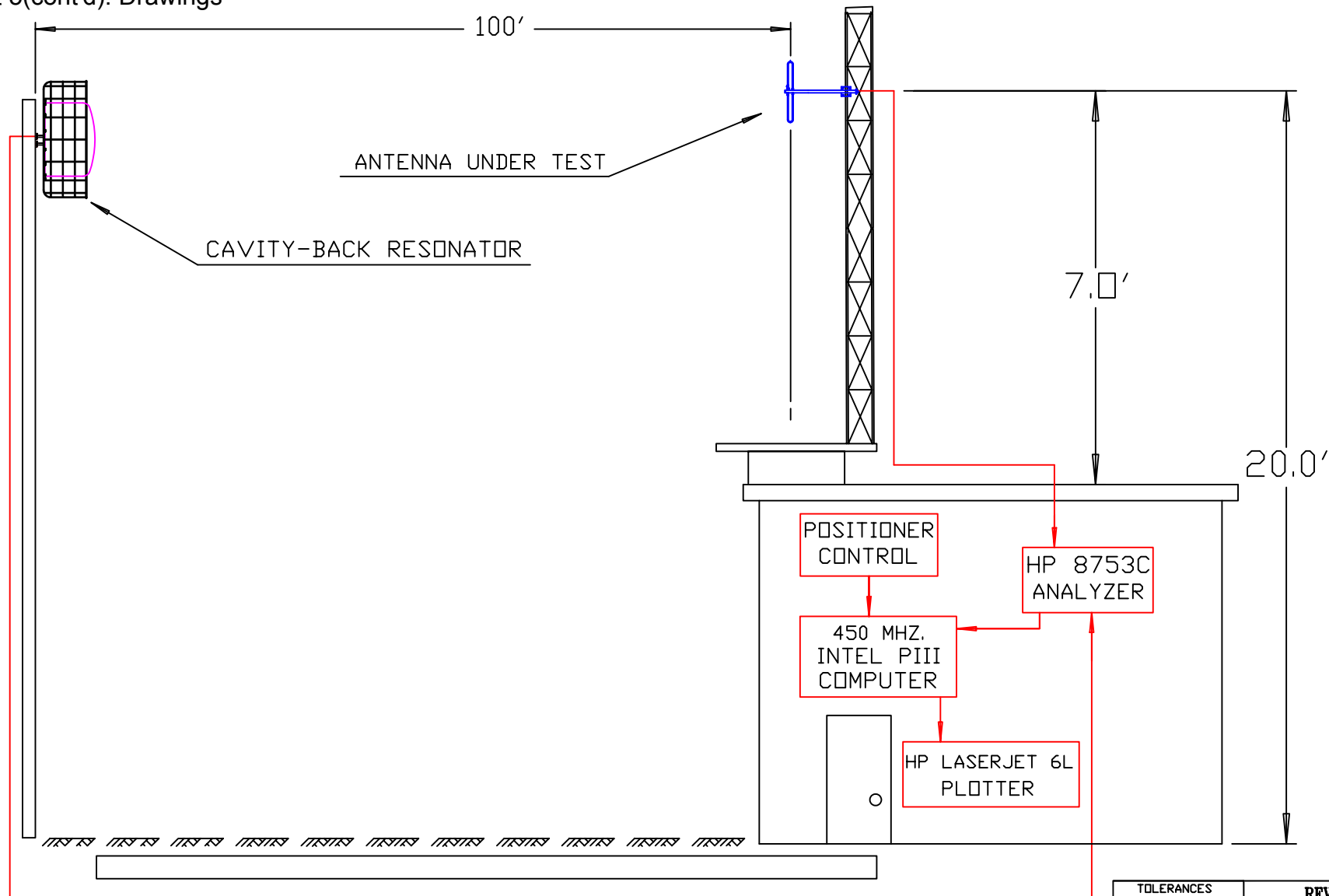
1585D03

NOTE:

Exhibit 5(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

SCALE: NTS

NAME: JRM

DATE: 11/1/98

SHEET 1 OF 1

DRAWING
NUMBER:

2105A10