SYSTEMS WITH RELIABILITY, LLP
BROADCAST ANTENNAS AND TRANSMISSION LINE

PATTERN CERTIFICATION

DIRECTIONAL FM ANTENNA
KSKQ
November 19, 2013

Call Sign	:	KSKQ
Location	:	Ashland, OR
Frequency	:	89.5 MHz
Channel	:	208C2
Antenna Model	:	FMECR/2-DA
Maximum Antenna Gain		
Horizontal	:	**2.596/ 4.143 dB**
Vertical	:	**2.596/ 4.143 dB**

ANTENNA DESCRIPTION

A custom designed FMECR/2-DA antenna was fabricated to conform to the prescribed directional azimuth pattern. The antenna consists of two (2) circularly polarized, radome enclosed cross-V dipole radiating elements full-wave spaced mounted to a Rohn 45G eighteen (18)" (inch) face tower. The antenna array points 290 degrees true north.

DESCRIPTION OF TEST PROCEDURE

The test antenna consisted of a single third-scale bay. 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, modifying the direction of the azimuth heading and parasitic elements were utilized to direct the signal.

DESCRIPTION OF TEST PARAMETERS AND EQUIPMENT

Horizontal and vertical pattern readings were taken by mounting a sampling antenna - a vertical/horizontal dipole, Cavity Back Resonator (CBR) antenna bay - approximately 100' (feet) from the third-scale antenna model. The height was adjusted to achieve a uniform field at the third-scale test antenna location. The CBR antenna was operated in receive mode, at frequency 268.5 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 268.5 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 ***91.5%*** of the **RMS** value of the pattern authorized in the related construction permit **BPED-20120822AAA.** The vertical component **RMS** value is **0.603**. The horizontal component **RMS** value is **0.613**. The circular polarized component **RMS** value is **0.672**.

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

Measured vertical polarized directivity:	**2.750 / 4.393 dB**
Measured horizontal polarized directivity:	**2.665 / 4.257 dB**
Measured circular polarized pattern directivity:	**2.216 / 3.456 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 = (2.750)(.4922)(1.918) **= 2.596/ 4.143 dB**
H-Pol. Gain = (2.665)(.5078)(1.918) **= 2.596/ 4.143 dB**

INSTALLATION AND MOUNTING

The antenna is to be mounted in accordance with the supplied drawings. The antenna center of radiation is to be **19** ***meters (62.34 ft.)*** above ground level. The antenna aperture is **10.99 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 ***290 degrees*** true North.

The system's orientation and the mounting details are described in the following drawings:

DRAWING NO.	**TITLE**
1842D00	ANTENNA ELEVATION DETAIL
1842D01	ANTENNA ORENTATION
1842D02	TYPICAL BAY ASSEMBLY
1842D03	HORIZONTAL PARASITIC PLACEMENT
1842D04	ANTI-ROTATION ARM INSTALLATION
2105A10	TEST RANGE SCHEMATIC

The array shall be mounted according to all details outlined in **DWG. 1842D00** The antenna elements shall be aligned at the same heading as in **DWG. 1842D01**. This will ensure that the antenna is oriented properly at 290 degrees true north. The antenna bays shall be assembled and installed according to **DWG. 1842D02** to **DWG. 1842D05.** This will ensure the antenna is installed correctly as it was tested on our range. The test range schematic **DWG. 2105A10** shows the mounting configuration of the antenna setup on our range.

DOCUMENT EXHIBITS

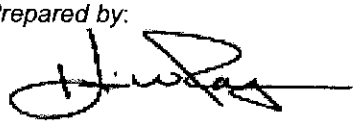
The following exhibits are included as part of this Certificate of Compliance:

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

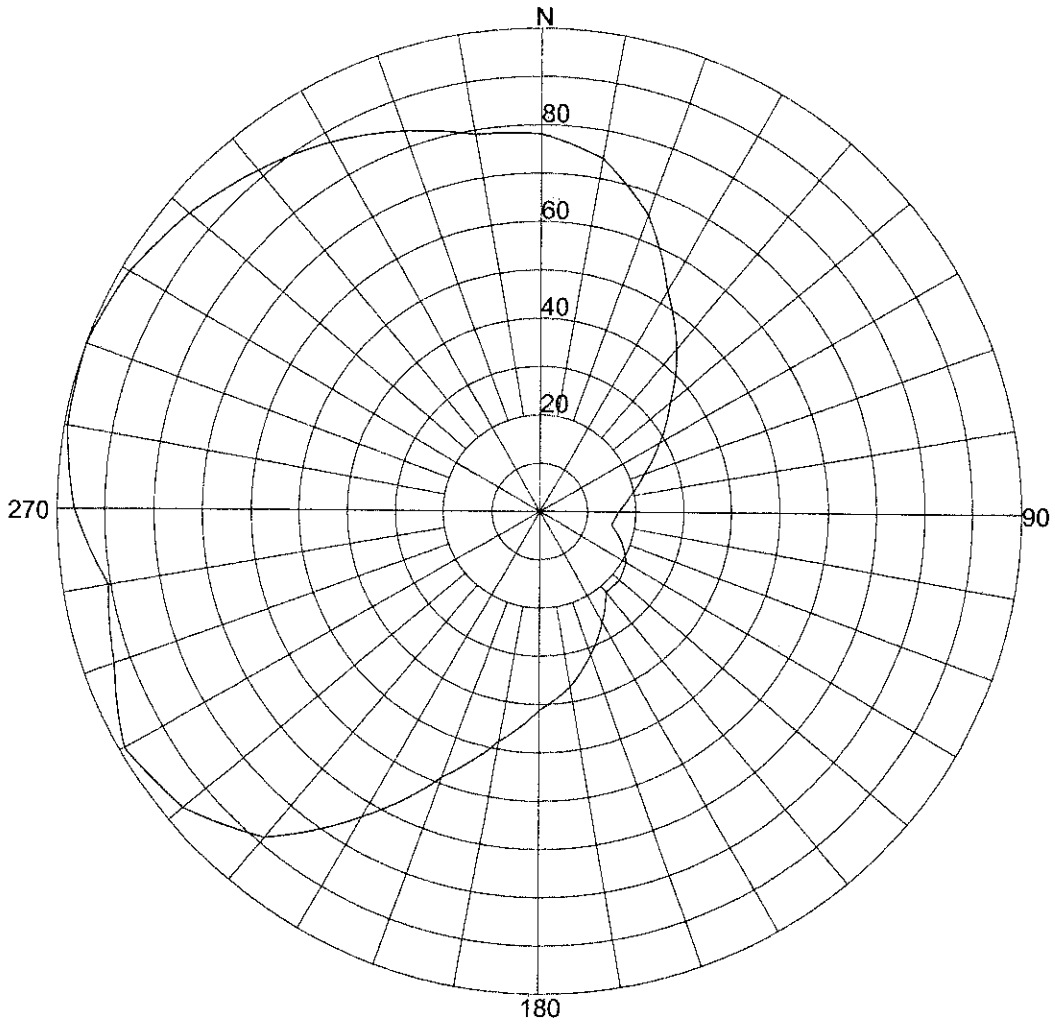
Prepared by:



Kevin W. Rager
Antenna Engineer
Systems With Reliability LLP

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

Exhibit 1: Circular Polarized Azimuth Pattern (Composite)



Azimuth Pattern

Scale: Linear

Unit: Relative Field

Systems With Reliability LLC

CLIENT: *KSKQ*

Date: 11/19/2013

ANTENNA TYPE: FMECR/2-DA

FREQUENCY: 89.5 MHz

PATTERN POL.: Circular

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 2.21613 / 3.46dB

PATTERN RMS: *0.672*

Micro-Tek Eng. Ver. 2.5

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

Relative Field Tabulation(Azimuth)

Azimuth Heading	Relative Field(dB)	Azimuth Heading	Relatve Field(dB)
0	.7810 (-2.14)	180	.4120 (-7.68)
5	.7615 (-2.36)	185	.4475 (-6.96)
10	.7420 (-2.58)	190	.4830 (-6.3)
15	.6980 (-3.11)	195	.5350 (-5.42)
20	.6540 (-3.68)	200	.5870 (-4.61)
25	.5915 (-4.55)	205	.6600 (-3.6)
30	.5290 (-5.51)	210	.7330 (-2.69)
35	.4850 (-6.27)	215	.8095 (-1.82)
40	.4410 (-7.09)	220	.8860 (-1.04)
45	.3975 (-7.99)	225	.9235 (-0.68)
50	.3540 (-9)	230	.9610 (-0.34)
55	.3210 (-9.84)	235	.9750 (-0.21)
60	.2880 (-10.78)	240	.9890 (-0.09)
65	.2595 (-11.68)	245	.9620 (-0.33)
70	.2310 (-12.69)	250	.9350 (-0.57)
75	.2110 (-13.47)	255	.9200 (-0.71)
80	.1910 (-14.33)	260	.9050 (-0.86)
85	.1775 (-14.97)	265	.9340 (-0.58)
90	.1640 (-15.65)	270	.9630 (-0.32)
95	.1580 (-15.97)	275	.9780 (-0.18)
100	.1520 (-16.31)	280	.9930 (-0.05)
105	.1675 (-15.47)	285	.9965 (-0.02)
110	.1830 (-14.7)	290	1.0000 (0.01)
115	.1955 (-14.13)	295	.9915 (-0.07)
120	.2080 (-13.6)	300	.9830 (-0.14)
125	.2130 (-13.39)	305	.9675 (-0.28)
130	.2180 (-13.19)	310	.9520 (-0.42)
135	.2170 (-13.23)	315	.9340 (-0.58)
140	.2160 (-13.27)	320	.9160 (-0.75)
145	.2395 (-12.38)	325	.8970 (-0.93)
150	.2630 (-11.57)	330	.8780 (-1.12)
155	.2885 (-10.77)	335	.8565 (-1.34)
160	.3140 (-10.03)	340	.8350 (-1.56)
165	.3410 (-9.32)	345	.8130 (-1.79)
170	.3680 (-8.66)	350	.7910 (-2.03)
175	.3900 (-8.16)	355	.7860 (-2.08)

Systems With Reliability LLC

CLIENT: *KSKQ* Date: 11/19/2013

ANTENNA TYPE: FMECR/2-DA

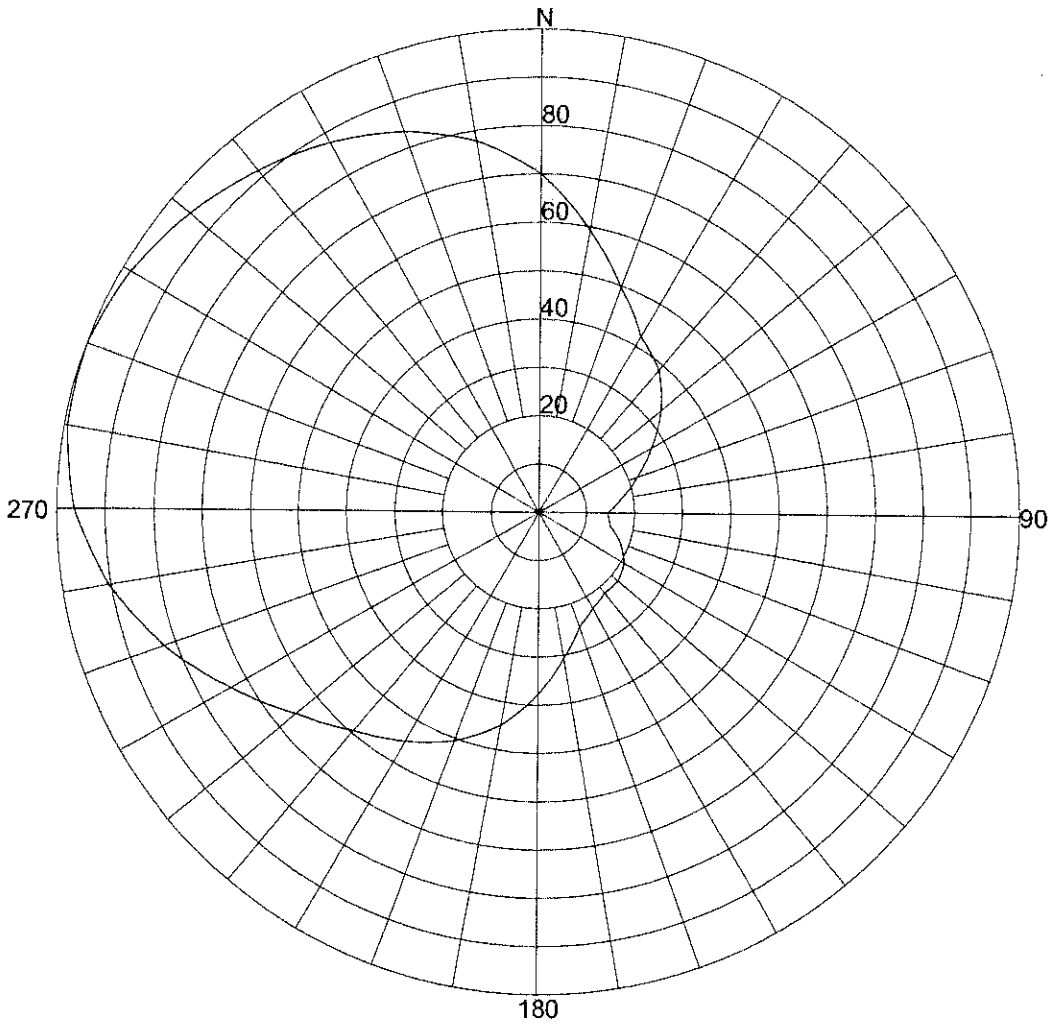
FREQUENCY: 89.5 MHz

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

AZ. DIRECTIVITY: 2.21613 / 3.46dB PATTERN RMS: *0.672*

Micro-Tek Eng. Ver. 2.5

Exhibit 2: Measured Horizontal Polarized Azimuth Pattern



Azimuth Pattern

Scale: Linear

Unit: Relative Field

Systems With Reliability LLC

CLIENT: *KSKQ*

Date: 11/19/2013

ANTENNA TYPE: FMECR/2-DA

FREQUENCY: 89.5 MHz

PATTERN POL.: Horizontal

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 2.6649 / 4.26dB

PATTERN RMS: *0.613*

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	.7000 (-3.09)	180	.3770 (-8.45)
5	.6465 (-3.78)	185	.4125 (-7.67)
10	.5930 (-4.52)	190	.4480 (-6.96)
15	.5445 (-5.26)	195	.4765 (-6.42)
20	.4960 (-6.07)	200	.5050 (-5.92)
25	.4590 (-6.74)	205	.5275 (-5.54)
30	.4220 (-7.47)	210	.5500 (-5.18)
35	.4045 (-7.84)	215	.5720 (-4.84)
40	.3870 (-8.22)	220	.5940 (-4.51)
45	.3590 (-8.87)	225	.6245 (-4.08)
50	.3310 (-9.58)	230	.6550 (-3.66)
55	.3005 (-10.41)	235	.6960 (-3.14)
60	.2700 (-11.34)	240	.7370 (-2.64)
65	.2440 (-12.22)	245	.7815 (-2.13)
70	.2180 (-13.19)	250	.8260 (-1.65)
75	.1970 (-14.07)	255	.8655 (-1.24)
80	.1760 (-15.04)	260	.9050 (-0.86)
85	.1600 (-15.86)	265	.9340 (-0.58)
90	.1440 (-16.77)	270	.9630 (-0.32)
95	.1480 (-16.54)	275	.9780 (-0.18)
100	.1520 (-16.31)	280	.9930 (-0.05)
105	.1675 (-15.47)	285	.9965 (-0.02)
110	.1830 (-14.7)	290	1.0000 (0.01)
115	.1955 (-14.13)	295	.9915 (-0.07)
120	.2080 (-13.6)	300	.9830 (-0.14)
125	.2130 (-13.39)	305	.9675 (-0.28)
130	.2180 (-13.19)	310	.9520 (-0.42)
135	.2170 (-13.23)	315	.9340 (-0.58)
140	.2160 (-13.27)	320	.9160 (-0.75)
145	.2220 (-13.03)	325	.8970 (-0.93)
150	.2280 (-12.8)	330	.8780 (-1.12)
155	.2395 (-12.38)	335	.8565 (-1.34)
160	.2510 (-11.97)	340	.8350 (-1.56)
165	.2785 (-11.07)	345	.8070 (-1.85)
170	.3060 (-10.26)	350	.7790 (-2.16)
175	.3415 (-9.31)	355	.7395 (-2.61)

Systems With Reliability LLC

CLIENT: *KSKQ* Date: 11/19/2013

ANTENNA TYPE: FMECR/2-DA

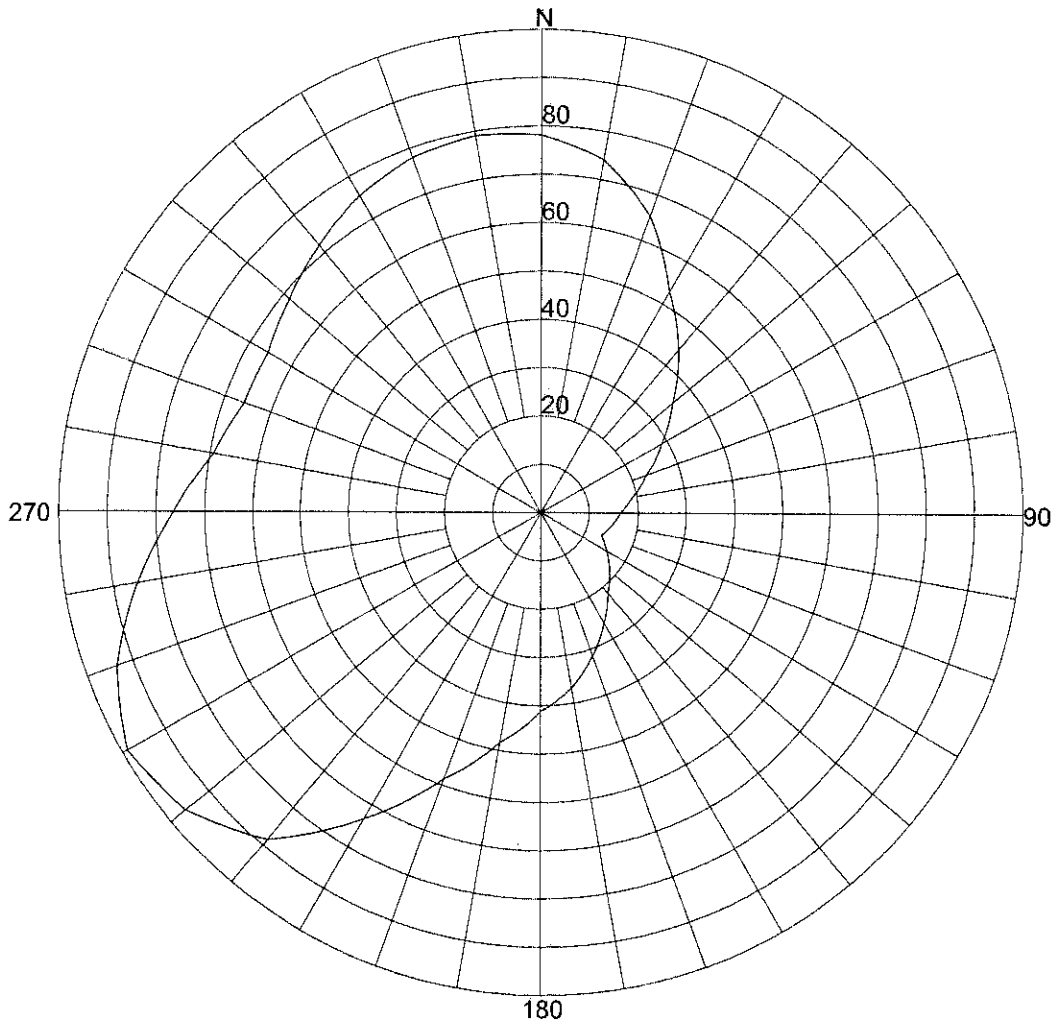
FREQUENCY: 89.5 MHz

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

AZ. DIRECTIVITY: 2.6649 / 4.26dB PATTERN RMS: *0.613*

Micro-Tek Eng. Ver. 2.5

Exhibit 3: Measured Vertical Polarized Azimuth Pattern



Azimuth Pattern

Scale: Linear

Unit: Relative Field

Systems With Reliability LLC

CLIENT: *KSKQ*

Date: 11/19/2013

ANTENNA TYPE: FMECR/2-DA

FREQUENCY: 89.5 MHz

PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 2.74974 / 4.39dB

PATTERN RMS: *0.603*

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	.7810 (-2.14)	180	.4120 (-7.68)
5	.7615 (-2.36)	185	.4475 (-6.96)
10	.7420 (-2.58)	190	.4830 (-6.3)
15	.6980 (-3.11)	195	.5350 (-5.42)
20	.6540 (-3.68)	200	.5870 (-4.61)
25	.5915 (-4.55)	205	.6600 (-3.6)
30	.5290 (-5.51)	210	.7330 (-2.69)
35	.4850 (-6.27)	215	.8095 (-1.82)
40	.4410 (-7.09)	220	.8860 (-1.04)
45	.3975 (-7.99)	225	.9235 (-0.68)
50	.3540 (-9)	230	.9610 (-0.34)
55	.3210 (-9.84)	235	.9750 (-0.21)
60	.2880 (-10.78)	240	.9890 (-0.09)
65	.2595 (-11.68)	245	.9620 (-0.33)
70	.2310 (-12.69)	250	.9350 (-0.57)
75	.2110 (-13.47)	255	.8925 (-0.98)
80	.1910 (-14.33)	260	.8500 (-1.4)
85	.1775 (-14.97)	265	.8060 (-1.86)
90	.1640 (-15.65)	270	.7620 (-2.35)
95	.1565 (-16.05)	275	.7270 (-2.76)
100	.1490 (-16.48)	280	.6920 (-3.19)
105	.1410 (-16.95)	285	.6745 (-3.41)
110	.1330 (-17.46)	290	.6570 (-3.64)
115	.1455 (-16.68)	295	.6575 (-3.63)
120	.1580 (-15.97)	300	.6580 (-3.62)
125	.1720 (-15.24)	305	.6710 (-3.45)
130	.1860 (-14.56)	310	.6840 (-3.29)
135	.2010 (-13.89)	315	.7015 (-3.07)
140	.2160 (-13.27)	320	.7190 (-2.85)
145	.2395 (-12.38)	325	.7370 (-2.64)
150	.2630 (-11.57)	330	.7550 (-2.43)
155	.2885 (-10.77)	335	.7675 (-2.29)
160	.3140 (-10.03)	340	.7800 (-2.15)
165	.3410 (-9.32)	345	.7855 (-2.09)
170	.3680 (-8.66)	350	.7910 (-2.03)
175	.3900 (-8.16)	355	.7860 (-2.08)

Systems With Reliability LLC

CLIENT: *KSKQ* Date: 11/19/2013

ANTENNA TYPE: FMECR/2-DA

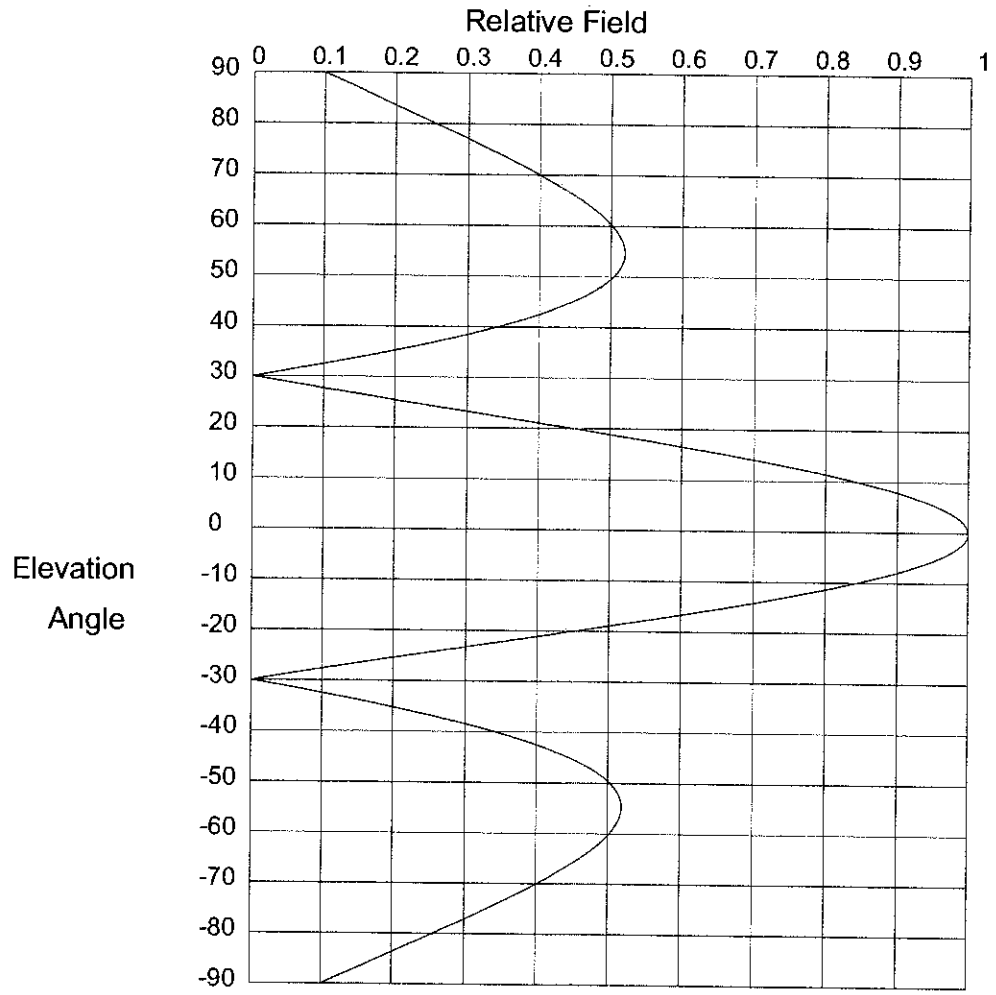
FREQUENCY: 89.5 MHz

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

AZ. DIRECTIVITY: 2.74974 / 4.39dB PATTERN RMS: *0.603*

Micro-Tek Eng. Ver. 2.5

Exhibit 4: Elevation Pattern



Elevation Pattern

Scale: Linear

Units: Field, Relative

Systems With Reliability

CLIENT: *KSKQ* Date: 11/19/2013

ANTENNA TYPE: FMECR/2-DA

FREQUENCY: 89.5 MHz

PATTERN POL.: Circular

DIRECTIVITY(Peak): 1.918/2.828 dBd

DIRECTIVITY(Horiz): 1.918/2.828 dBd

Beam Tilt (Deg.) : *0*

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

Micro-Tek Eng. Ver. 2.52

Exhibit 4 (cont'd): Elevation Pattern Tabulations

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: *KSKQ* Date: 11/19/2013
ANTENNA TYPE: FMECR/2-DA
FREQUENCY: 89.5 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 4 (cont'd): Elevation Pattern Tabulations

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: *KSKQ* Date: 11/19/2013

ANTENNA TYPE: FMECR/2-DA

FREQUENCY: 89.5 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 4 (cont'd): Elevation Pattern Tabulations

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: *KSKQ* Date: 11/19/2013

ANTENNA TYPE: FMECR/2-DA

FREQUENCY: 89.5 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	KSKQ
Contact	Michael McGuire
Location	Ashland, OR
Antenna Model	FMECR/2-DA
Channel / Frequency	208C2 /89.5 MHz

ELECTRICAL SPECIFICATIONS

Antenna Specifications:

		H-POL	dB		V. Pol.	dB	
License ERP (KW)		0.560	-2.518	**dB**	0.560	-2.518	**dB**
FCC Limit Pattern Directivity		1.856	2.685	**dB**	1.856	2.685	**dB**
Elevation Directivity		1.918	2.828	**dB**	1.918	2.828	**dB**
Azimuth Directivity		2.665	4.257	**dB**	2.750	4.393	**dB**
Composite Pattern		2.216	3.456	**dB**	2.216	3.456	**dB**
Polarization Ratio		0.508	-2.943	**dB**	0.492	-3.079	**dB**
RMS Comp./RMS Limit	91.5 %						
Antenna Efficiency %		100			100		
Power Ratio (Pol. Ratio X Efficiency)		0.5078			0.4922		
Antenna Gain		2.596	4.143	**dB**	2.596	4.143	**dB**

Antenna Input Power (KW) 0.216 **kW** -6.661 **(dBK)**

Feed Line Specifications:

Line Type: Andrew	7/8" Foam	**50 Ω LDF5-50A**	
Attenuation Per 100 ft (dB)	0.34	**dB**	
Line Length (ft) AGL + 30' Horizontal Run	92.34	**ft.**	
Total Line Attenuation (dB)	0.3167	**dB**	
Line Efficiency	92.97	**%**	
Power Input to the Line (KW)	0.232	**kW**	-6.344 **(dBK)**

MECHANICAL SPECIFICATIONS

No. Of Bays	2				
Antenna Aperture	10.99	**ft.**		3.35	**meter**
Center of Radiation AGL	62.34	**ft.**		19.00	**meter**
Antenna Weight	168.00	**lbs.**		76.36	**kg**
Windload (50/33)	406.00	**lbs.**	**Windload CaAc**	11.60	**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

KSKQ Antenna RMS Comparison

PROPOSED ANTENNA		DESIGNED ANTENNA	
Azimuth Heading	Relative Field	Azimuth Heading	Relative Field
0	1.000	0	0.781
10	0.917	10	0.742
20	0.733	20	0.654
30	0.585	30	0.529
40	0.468	40	0.441
50	0.374	50	0.354
60	0.299	60	0.288
70	0.239	70	0.231
80	0.191	80	0.191
90	0.178	90	0.164
100	0.178	100	0.152
110	0.200	110	0.183
120	0.224	120	0.208
130	0.251	130	0.218
140	0.282	140	0.216
150	0.316	150	0.263
160	0.355	160	0.314
170	0.398	170	0.368
180	0.477	180	0.412
190	0.510	190	0.483
200	0.638	200	0.587
210	0.799	210	0.733
220	0.977	220	0.886
230	1.000	230	0.961
240	1.000	240	0.989
250	1.000	250	0.935
260	1.000	260	0.905
270	1.000	270	0.963
280	1.000	280	0.993
290	1.000	290	1.000
300	1.000	300	0.983
310	1.000	310	0.952
320	1.000	320	0.916
330	1.000	330	0.878
340	1.000	340	0.835
350	1.000	350	0.791

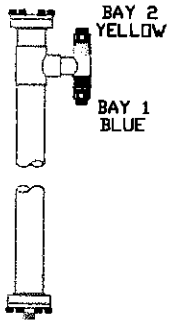
Sum of Relative Field Squared :	19.430	Sum of Relative Field Squared :	16.268
Sum Divided by 36 (Readings) :	0.540	Sum Divided by 36 (Readings) :	0.452
Square Root :	0.735	Square Root :	0.672

Percentage of Construction Permit Antenna Filled : 91.5%

Exhibit 7: Drawings

DRAWING NUMBER: 1842D00

REFERENCE DRAWINGS	
DRAWING #	DESCRIPTION
1842D01	ANTENNA ORIENTATION
1842D02	TYPICAL BAY ASSEMBLY
1842D03	HORIZONTAL PARASITIC ASSEMBLY
1842D04	ANTI-ROTATION ARM ASSEMBLY



POWER DIVIDER
COLOR SCHEME

(2) 3/8-16 X 2.50" U-BOLTS
(4) 3/8" FLAT WASHERS
(4) 3/8" LOCK WASHERS
(4) 3/8-16 HEX HEAD NUTS
PER PIPE STAND-OFF BRACKET
TYP. 4 PLACES

1842D25
FACE MOUNT
PIPE STAND-OFF BRACKET W/
(4) 3/8-16 X 1.375" U-BOLTS
(8) 3/8" FLAT WASHERS
(8) 3/8" LOCK WASHERS
(8) 3/8-16 HEX HEAD NUTS
TYP. 4 PLACES

MOUNTING PIPE
2.00" SCH. 40 ALUM.
2.375" O.D. X 16.00 Ft. LONG
(2) 8.00 Ft. LONG SECTIONS

18.00 In.
1.50 Ft.
0.46 M.

30.00 In.
2.50 Ft.
0.76 M.

1842D15
Ø1.625 X 9.00 Ft. LONG S.S.
HORIZONTAL PARASITIC W/
INSULATED BRACKET &
GROUNDING BRACKET
PER BAY
TYP. 2 PLACES
(INSTALL AT THE SAME ELEVATION
AND PERPENDICULAR TO EACH FMECR
ANTENNA BAY)

ARB-36
FIBERGLASS INSULATED
ANTI-ROTATION ARM
Ø1.00" X 3.00 Ft. LONG W/
(1) 1460D10
ANTI-ROTATION PLATE & HARDWARE
PER BAY
TYP. 2 PLACES

BAY 2
YELLOW

(2) 5/16-18 X 1.00" H.H.C.S.
(4) 5/16" FLAT WASHERS
(2) 5/16" LOCK WASHERS
(2) 5/16-18 HEX HEAD NUTS
PER BAY
TYP. 2 PLACES
(BOLTS BAY TO BOOM BRACKET)

PD2W-NFNF
TYPE 'N' FEMALE TO
TYPE 'N' FEMALE
2 WAY POWER DIVIDER

1300D00
POWER DIVIDER BRACKET W/
(1) 0987A01 UNIVERSAL SADDLE
(2) 1/2-13 X 4.00" H.H.C.S.
(4) 1/2" FLAT WASHERS
(2) 1/2" LOCK WASHERS
(2) 1/2-13 HEX HEAD NUTS
(2) #HSS24 HOSE CLAMPS

CENTER OF
RADIATION
62.34 Ft. AGL
(19.00 M.)

131.88 In.
10.99 Ft.
3.35 M.
ANTENNA
APERTURE

(4) 1/4-20 X 1.00" H.H.C.S.
(4) 1/4" LOCK WASHERS
(4) 1/4-20 HEX HEAD NUTS
(FOR JOINING MOUNTING PIPES)

TYPE 'N'
FEMALE INPUT

UV RESISTANT
CABLE TIE TYP.

FSJ4-50B
1/2" SUPERFLEX CABLE W/
(1) RIGHT ANGLE 'N' MALE CONNECTOR
(1) TYPE 'N' MALE CONNECTOR
(THE RIGHT ANGLE CONNECTOR
ATTACHES TO THE BAY)
TYP. 2 PLACES

(2) #HSS24 HOSE CLAMPS
PER BAY
TYP. 2 PLACES

1842D09
FMECR BOOM BRACKET W/
(2) 1/2-13 X 2.50" U-BOLTS
(4) 1/2" FLAT WASHERS
(4) 1/2" LOCK WASHERS
(4) 1/2-13 HEX HEAD NUTS
PER BAY
TYP. 2 PLACES

BAY 1
BLUE

FMECR ANTENNA
TYP. 2 PLACES

1842D12
BOLT ON PARASITIC W/
(2) 3/8-16 X 1.75" H.H.C.S.
(2) 3/8" LOCK WASHERS
(2) 3/8-16 HEX HEAD NUTS
TYP. 4 PLACES TOTAL
(2) PLACES PER BOOM BRACKET

1842D30
FACE MOUNT
KNEE BRACE BRACKET W/
(4) 3/8-16 X 1.375" U-BOLTS
(8) 3/8" FLAT WASHERS
(8) 3/8" LOCK WASHERS
(8) 3/8-16 HEX HEAD NUTS
TYP. 4 PLACES

ROHN 45G
TOWER

1842D33
KNEE BRACE W/
(2) 1/2-13 X 1.25" H.H.C.S.
(2) 1/2" LOCK WASHERS
(2) 1/2-13 HEX HEAD NUTS

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

TITLE: FMECR/2-DA, FREQ. 89.5
KSKQ, ASHLAND, OR

MATERIAL:

SIZE	REV	APPR.	DATE
C	1		
	2		
	3		

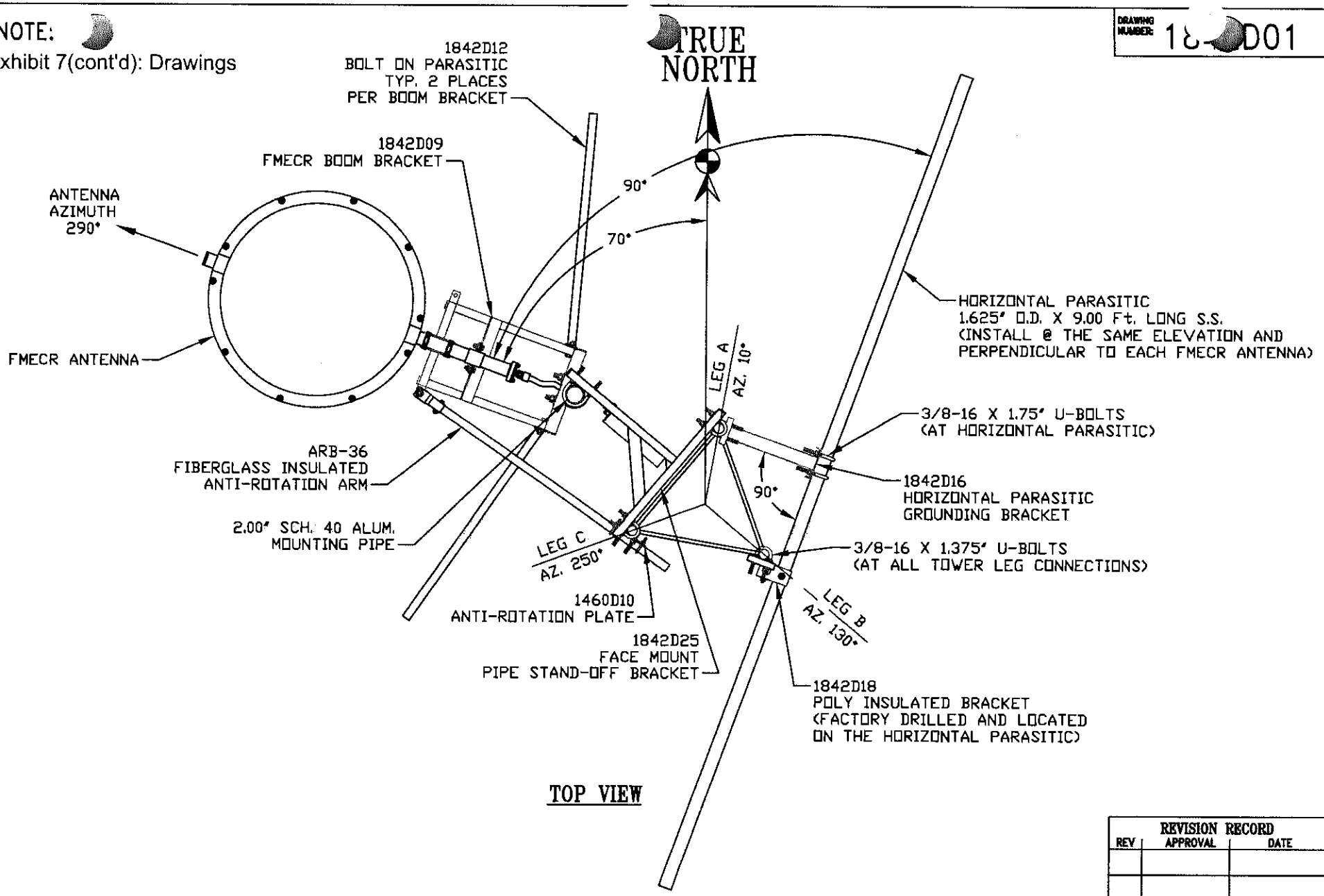
ENGINEER:

DRAWING NUMBER: 1842D00

SCALE: NTS NAME: RAC DATE: 11/18/13 SHEET 1 OF 1

NOTE:
Exhibit 7(cont'd): Drawings

DRAWING NUMBER: 18[illegible]D01



TOP VIEW

REVISION RECORD		
REV	APPROVAL	DATE

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

TITLE: FMECR/2-DA, FREQ. 89.5
KSKQ, ASHLAND, OR

MATERIAL: ANTENNA ORIENTATION
FROM TRUE NORTH

SIZE: A

PARTS MADE BY THIS DRAWING

DRAWING NUMBER: 1842D01

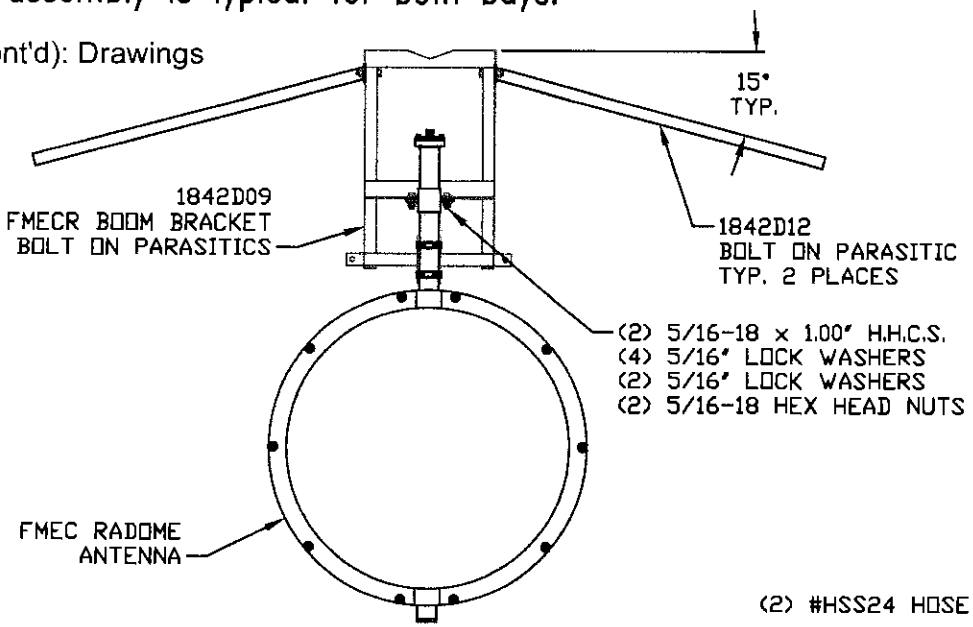
SCALE: NTS | NAME: RAC | DATE: 11/18/13 | SHEET 1 OF 1

NOTE:

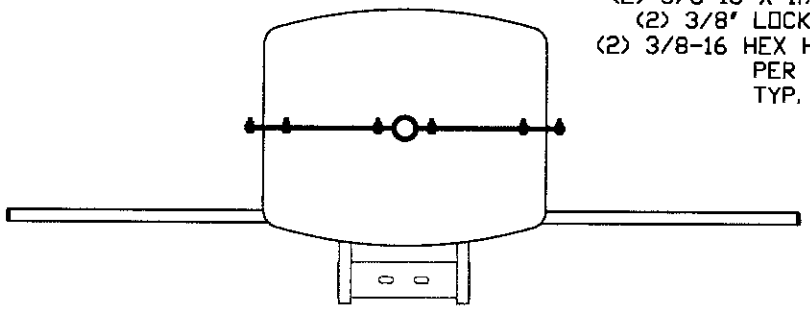
This assembly is typical for both bays.

DRAWING NUMBER: 18[illegible]D02

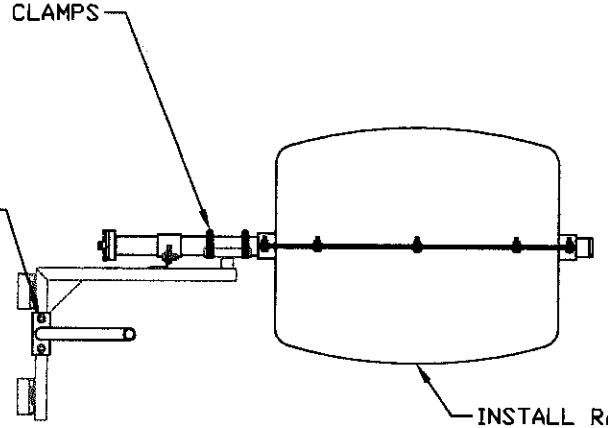
Exhibit 7(cont'd): Drawings



TOP VIEW



FRONT VIEW



SIDE 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: FMECR/2-DA, FREQ. 89.5
KSKQ, ASHLAND, OR

MATERIAL: TYPICAL
BAY ASSEMBLY

SIZE: A

PARTS MADE BY THIS DRAWING

DRAWING NUMBER: 1842D02

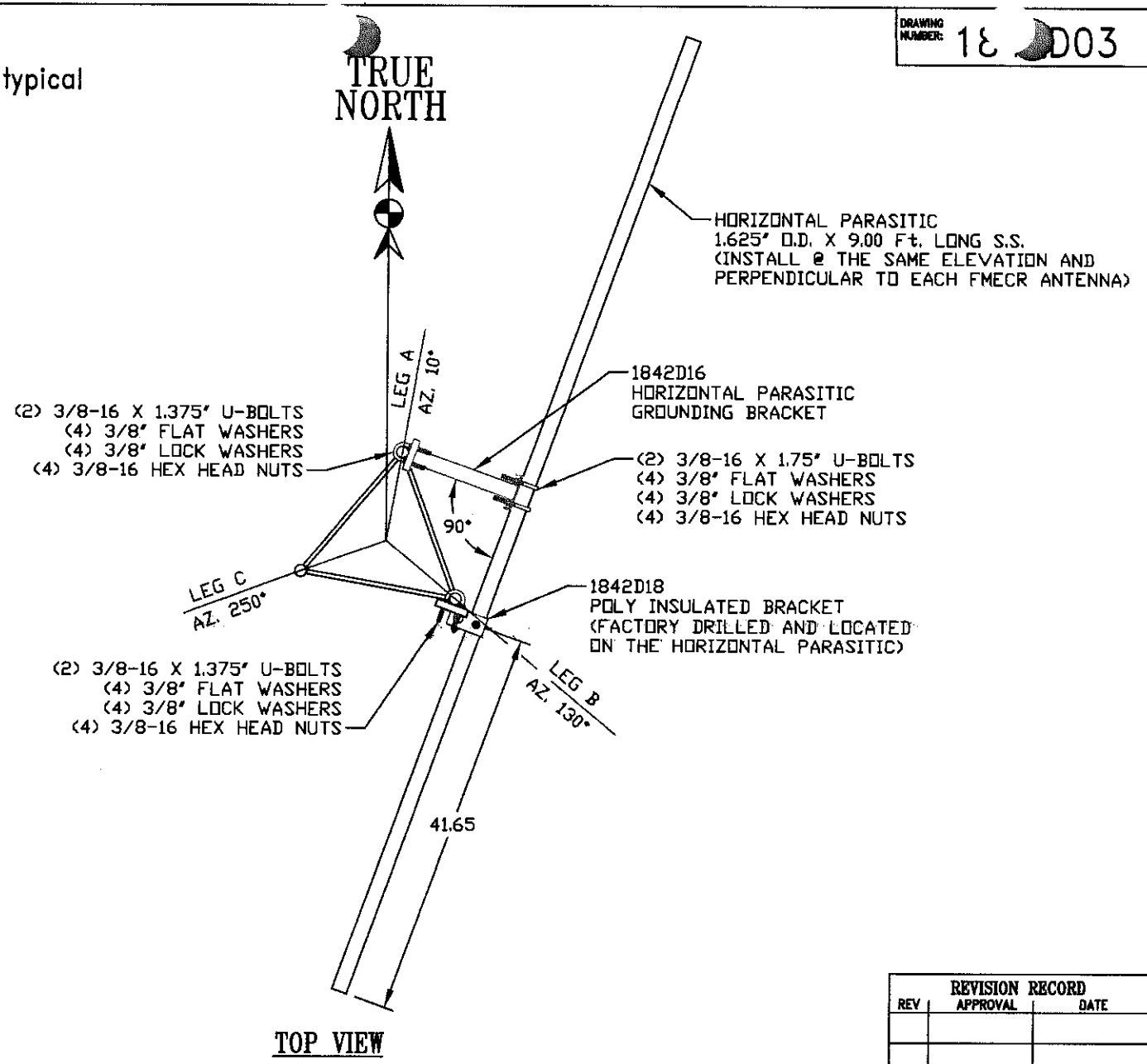
SCALE: NTS | NAME: RAC | DATE: 11/18/13 | SHEET 1 OF 1

NOTE:

This parasitic placement is typical for both bays.

Exhibit 7(cont'd): Drawings

DRAWING NUMBER: 1842D03



TOP VIEW

REVISION RECORD		
REV	APPROVAL	DATE

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

TITLE: FMECR/2-DA, FREQ. 89.5
KSKQ, ASHLAND, OR

MATERIAL: HORIZONTAL PARASITIC PLACEMENT

SIZE: A

PARTS MADE BY THIS DRAWING

DRAWING NUMBER: 1842D03

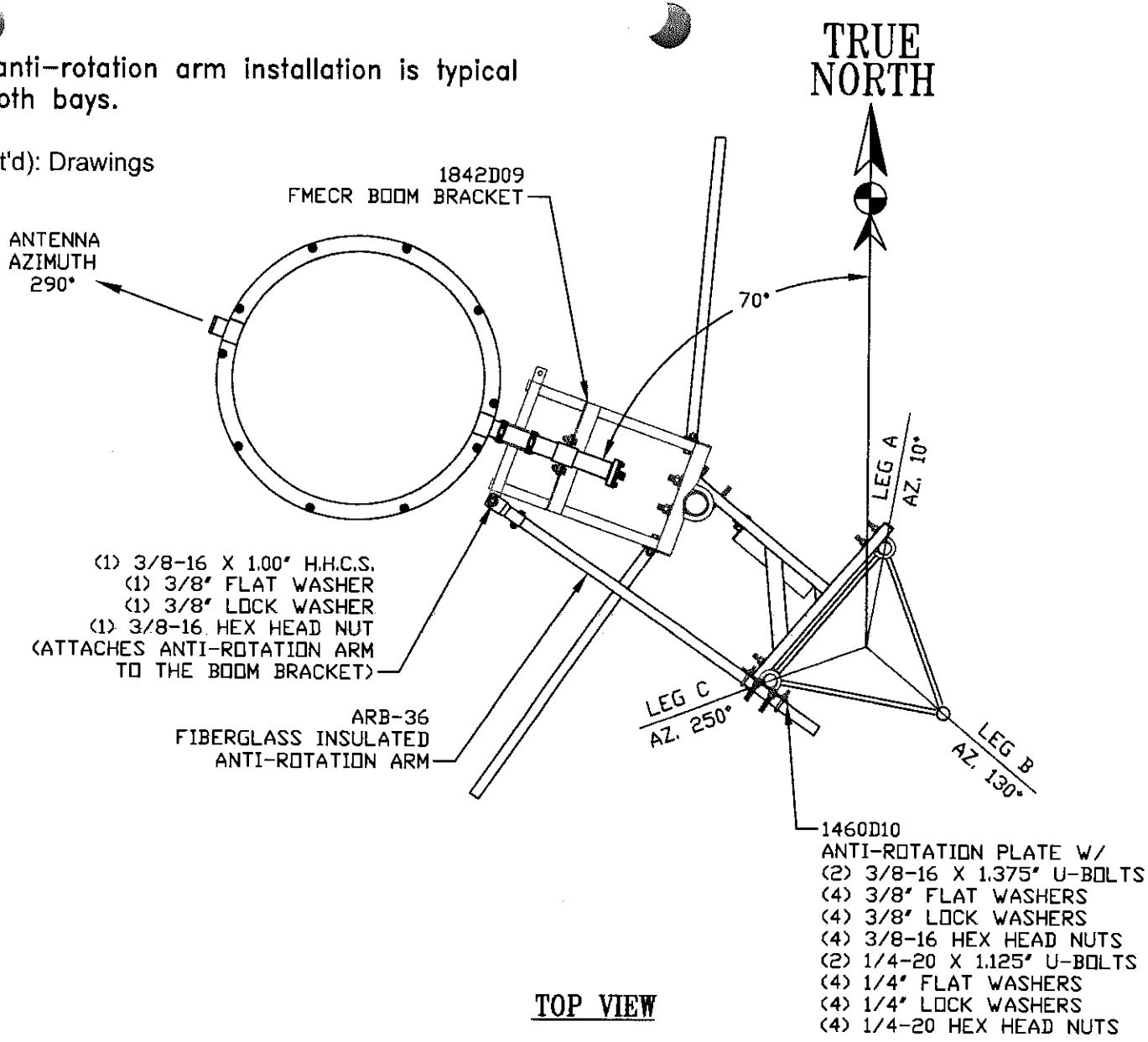
SCALE: NTS | NAME: RAC | DATE: 11/18/13 | SHEET 1 OF 1

NOTE:

This anti-rotation arm installation is typical for both bays.

Exhibit 7(cont'd): Drawings

DRAWING NUMBER: 18-1D04



TOP VIEW

REVISION RECORD		
REV	APPROVAL	DATE

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

TITLE: FMECR/2-DA, FREQ. 89.5 KSKQ, ASHLAND, OR

MATERIAL: ANTI-ROTATION ARM INSTALLATION

SIZE: A

PARTS MADE BY THIS DRAWING

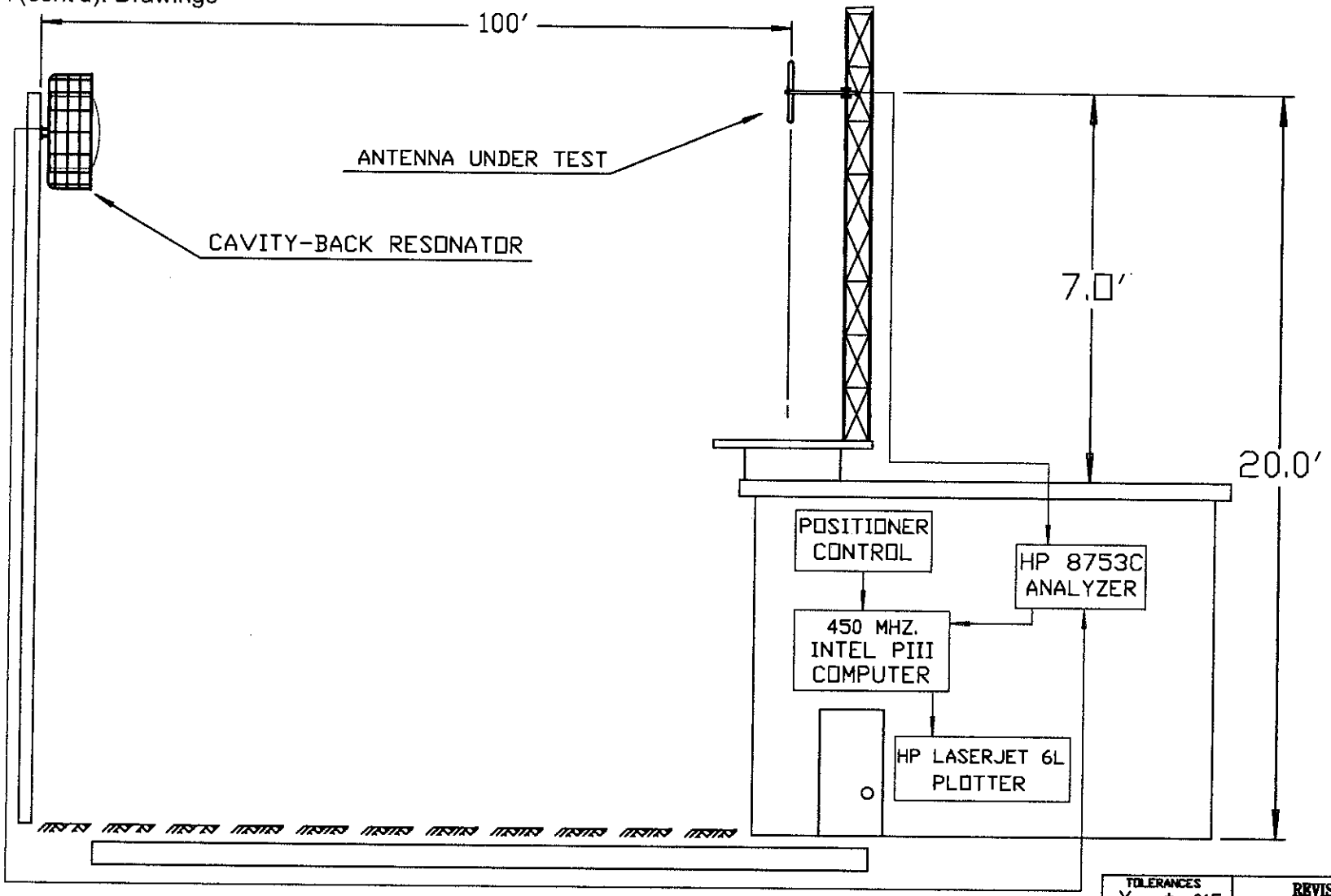
DRAWING NUMBER: 1842D04

SCALE: NTS | NAME: RAC | DATE: 11/18/13 | SHEET 1 OF 1

NOTE:

Exhibit 7(cont'd): Drawings

DRAWING NUMBER: 21[illegible]A10



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

www.swr-rf.com

1-800-762-7743

MADE IN U.S.A.

SYSTEMS WITH RELIABILITY, INC.

Broadcast Antennas and Transmission Systems

619 Industrial Park Road
P.O. BOX 856
Ebensburg, PA 15931
Phone: 1-800-762-7743
814-472-5436
Fax: 1-814-472-5552
Email: davide@swr-rf.com

Visit us at the World Wide Web!
http://www.swr-rf.com