



BROADCAST ANTENNAS

20 2

Shop order # 1302  
FMEC/3 PLUS-HWS-DA  
99.5 MHz



Installation Instructions

SWR LP

06/06/2022

KAKS

GOSHEN, AR

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## *SECTION I*

### **GENERAL DESCRIPTION**

#### **INTRODUCTION**

This technical manual contains information required to install, test, operate, and service the *FMEC Low Power FM Antennas*. This consists of various sections which, provides the following type of information:

- A. **SECTION I. GENERAL DESCRIPTION.** Provides a description of the equipment, identifies the major components, and lists the specifications.
- B. **SECTION II. PRINCIPLES OF OPERATION.** Provides a description of how the antenna operates.
- C. **SECTION III. INSTALLATION.** Provides information relative to the installation of the antenna components and the installation of components on the tower.
- D. **SECTION IV. MAINTENANCE.** Provides information pertaining to preventive and scheduled maintenance.
- E. **SECTION V. TEST REPORT.** Provides data measured at the SWR Antenna Test Site to demonstrate the measured electrical and radiation characteristics of the antenna. This section also provides other reports required by the customer specifications.

#### **EQUIPMENT SUPPLIED**

The FMEC antenna supplied is shown in the SWR installation drawing located at the Appendix, FMEC parts list, identify all major components supplied and the Antenna Specification Summary exhibits the Mechanical and Electrical Characteristics of the Antenna

#### **GENERAL DESCRIPTION**

The antenna system supplied is an FMEC Low Power FM Antenna. The antenna is designed to meet the power handling and pattern specifications as requested.

## **SECTION II**

### **PRINCIPLES OF OPERATION**

#### **2.1.0 INTRODUCTION**

The *FMEC Low Power FM Antenna* is ideal for low power FM broadcast stations or translators that require circular polarization. This antenna type is available for frequencies ranging from 88-108 MHz. It is circularly polarized; to provide dual polarization necessary for whip antennas and other antennas not oriented to receive vertically or horizontally polarized signals. It has a 500 watts rating per bay and may be tacked up to 6 bays for additional gain.

#### **2.2.0 FUNCTIONAL DESCRIPTION**

2.2.1 The *FMEC Low Power FM Antenna* is a coaxial fed system basically consisted of radiating elements attached to a supporting line section.

2.2.2 It has four dipoles; each arm is about 1/4 wavelength and is shunt fed. These are supported in a four-arm structure. The dipoles overlap so that the current flow around the dipole or element is circular. Pattern circularity is +/- 2 dB for the 4 arm.

2.2.3 These radiators are stacked about one wavelength apart in a rigid coax feed line to obtain the necessary power gain.

#### **2.3.0 PATTERN OPTIMIZATION**

2.3.1 Like any of the FM antennas, its patterns are strongly affected by the supporting structure. The pole or tower tends to distort the radiation pattern, seriously affecting station coverage in some directions.

#### **WARNING**

**IMPROPER ANTENNA INSTALLATION CAN CAUSE SERIOUS PATTERN PROBLEMS.**

2.3.2 *FMEC* antennas were adjusted for the best Omni-directional pattern possible or to proven minimum ERP values in particular azimuth directions.

### *SECTION III*

## **INSTALLATION**

### **3.1.0 INTRODUCTION**

- 3.1.1 Installation of the antenna should be properly planned and carried out, to avoid delays and unwarranted costs. Make sure that all materials are on hand before calling for rigging services.
- 3.1.2 Riggers must be mechanically well equipped to do the job. They should also be knowledgeable about antennas and coax line and should inspect the tower and check the mounting design of the brackets, prior to the arrival of the entire crew.

### **3.2.0 RECEIVING AND UNPACKING**

- 3.2.1 The antenna elements are normally shipped in boxes, usually numbered and the total number is indicated on each box; contact shipper if boxes are not all delivered, or if equipment received is damaged. **DO NOT STORE THE MATERIALS OUTDOORS, BOXED OR OTHERWISE.**
- 3.2.2 Once received, open and examine for shipping damages so that any necessary claims may be filed with the shipping company immediately. Check the material against the packing list.
- 3.2.3 Carefully remove the radiating elements. Lifting only from the 1 5/8" boom section.

### **WARNING**

**DO NOT HANDLE ELEMENTS BY THE RADIATING DIPOLES OR THE FEED ARMS.**

- 3.2.4 The box with the installation drawing and instruction manual is usually *Box # 1*. Open it first so that the balance of the items may be easily identified and counted. Contact SWR for missing materials or for damages in the materials caused by shipping.

### **3.3.0 EXCHANGES**

- 3.3.1 In case of damages, file a claim with the carrier and return prepaid to SWR, Inc. for repair.

### **3.4.0 INSTALLATION PRE-CHECK AND CAUTIONS**

- 3.4.1 The antenna elements are shipped in boxes separated from the coax feed line sections.
- 3.4.2 The radiating elements are packed Two (2) to a box; hardware is normally packed with its associated bay. Check the contents of each box against the packing list.
- 3.4.3 U-bolt type fasteners are provided for round member tower leg mounting and vertical pipe installations.

**NOTE**

**MAKE SURE THAT ALL THE MATERIALS ARE ON HAND BEFORE RIGGING JOB BEGINS.**

- 3.3.4. Examine the elements for bent radiating arm and cracks. If cracked, file a claim with the freighting carrier and return prepaid to SWR for repair. The elements have been carefully packed to withstand strain and should not be damaged under normal truck handling.
- 3.3.5 The station engineer should inspect the antenna components before the riggers arrive. Any damaged part should be replaced in order to insure minimum delay in installation.
- 3.3.6 Keep all moisture, dirt or any foreign matter of coaxial parts and elements.

**NOTE**

**DO NOT LEAVE THE ANTENNA PARTS WHERE RAIN OR MOISTURE CAN ENTER. STORE INDOORS AND KEEP UNITS CAPPED AS RECEIVED**

- 3.3.7 Protect all antenna parts from physical damage and abuse. Do not allow any part of the antenna to bang against tower steel, concrete or permit it to drag in the dirt.

**NOTE**

**HOIST ANTENNA MEMBERS CAREFULLY WITH A TAG LINE TO PREVENT DAMAGE BY STRIKING AGAINST THE TOWER. ANTENNA BAYS ARE TO BE HOISTED ONE AT A TIME SO AS NOT TO BEND OR DAMAGE THE ANTENNA.**

**3.5.0 MOUNTING INSTRUCTIONS**

- 3.5.1 The FM antenna has been shipped with the complete hardware necessary for its installation.
- 3.5.2 Look at the installation drawing at the back of this manual. The drawing shows all the mounting dimensions. **THEY SHOULD BE FOLLOWED WITHIN A +/- 1/2 INCH FOR BEST RESULTS.**
- 3.5.3 Choose the tower leg or face in the direction where maximum signal is desired. Mark on this leg or face the location of the center of radiation of the antenna array. This installation requires the positioning of the bay at its correct location and fastened to the tower leg or face with the proper U-bolts provided.
- 3.5.4 Hoist the assembled antenna into the air. Use proper hoisting nylon slings, keeping the assembly in a vertical position for ease of installation. Bays should be aligned vertically plumb. Secure feedlines approximately every 24”.
- 3.5.5 Utilize the mounting brackets supplied with the antenna to secure the vertical support pipe.

- 3.5.6 All connections should be wrapped with rubber tape and wrapped with a final cover of vinyl tape, which is also provided. An electrical outdoor coating can also be applied.
- 3.5.7 The full complement of flange bolts must be used and they should be tightened to 210-inch lbs.
- 3.5.8 If semi-flexible cable such as Heliac or Flexwell is used, it should be firmly tied down at least every 3ft of coax line.
- 3.5.9 Lines should be grounded every 200 ft (60m) on long vertical runs. It should also be grounded at the top and at the bottom of the vertical run and again at the front where it enters the equipment building. Grounding kits are available for all standard transmission line cables. These kits provide a low resistance method of connecting the ground system to the main transmission line.
- 3.5.10 Install the lightning rod one foot (0.3m) higher than the uppermost part of the obstruction light.
- 3.5.11 The FM antenna itself should be firmly grounded on the tower.
- 3.5.12 A ground system should be located immediately around the base of the tower. This should have a direct current loss of less than 10 ohms to earth ground. This low resistance may be obtained using ground wires buried in the soil.

**WARNING**

**THE LINE MANUFACTURER'S HANGERS SHOULD BE USED. THE LINES SHOULD NOT BE ATTACHED TO THE TOWER USING WRAP-LOCK STRAPS.**

- 3.5.18 Pressurization is not required for this type of antenna.

## *SECTION IV*

### **MAINTENANCE**

#### **4.1.0 SAFETY WARNING**

##### **WARNING**

**ONLY QUALIFIED PERSONNEL SHOULD BE ENGAGED TO PERFORM A “TOWER-TOP” INSPECTION OF THE ANTENNA. ONLY PERSONS WITH PREVIOUS FIELD EXPERIENCE IN TOWER CLIMBING AND ANTENNA INSPECTION SHOULD BE CONSIDERED QUALIFIED.**

**BEFORE CLIMBING INTO THE APERTURE OF THE ANTENNA AND PRIOR TO INSPECTION, ALL TRANSMITTER POWER MUST BE TURNED OFF. PRECAUTIONS SHOULD BE TAKEN TO PREVENT RESTORATION OF TRANSMITTER POWER DURING THE ANTENNA INSPECTION. THE DANGER FROM HIGH POWER RF RADIATION IS SEVERE AND EVEN MINIMAL EXPOSURE CAN CAUSE LONG LASTING EFFECTS.**

**IF TRANSMITTER POWER IS RESTORED DURING THE INSPECTION, THE INSPECTOR SHOULD IMMEDIATELY RETURN TO A POSITION BELOW TOWER TOP OR OUTSIDE THE ANTENNA APERTURE AND INSTRUCT THE OPERATOR TO TURN OFF THE TRANSMITTER POWER. UNDER NO CIRCUMSTANCES SHOULD HE CONTINUE THE INSPECTION UNTIL THE TRANSMITTER POWER IS TURNED OFF AND PRECAUTIONS HAVE BEEN TAKEN THAT THE POWER CAN BE RESTORED DURING FURTHER INSPECTIONS.**

#### **4.2.0 SERVICE INTERVALS**

- 4.2.1 A qualified rigger should check the antenna system every time obstruction lights are replaced or if lights are not used, at least once a year. The rigger should look for vibration and storm damage, loose or broken coax hangers and missing or loose hardware.
- 4.2.2 Signs of arcing across exposed insulators should also be checked. Wipe clean all exposed insulators in each antenna element with a rag soaked in 91% isopropyl or other solvent alcohol (Denatured Alcohol).

##### **WARNING**

**DO NOT USE CARBON TETRACHLORIDE!**

#### **4.3.0 PRESSURIZATION**

4.3.1 Antennas do not require pressurization.

#### **4.4.0 FASTENERS AND HARDWARE**

4.4.1 Structural Fasteners: High strength hot dip galvanized for bracket bolts and nuts with locking devices are recommended at all structural connections. Inspect for damaged or missing fasteners and replace.

#### **4.5.0 CLIMBING FACILITIES**

4.5.1 This antenna is not typically equipped with climbing devices. Access to the antenna can be accomplished via the support tower as required.

#### **4.6.0 GENERAL CORROSION PROTECTION AND REPAIR (for Special Support Brackets Only)**

4.6.1 Hot dip galvanized structural steel if the finish has been damaged due to handling, field welding etc., the following procedure should be followed to insure adequate corrosion protection:

- A. Remove rust, scale, and old paint by wire brushing, sanding or sand blasting.
- B. Apply Z.R.C. metal conditioner per label directions. Allow to set a minimum of 5 minutes prior to wiping.
- C. Apply a heavy, brush coat of Z.R.C. cold galvanizing compound per label directions. Allow to dry for 12 hours.
- D. Apply a second brush coat of Z.R.C. cold galvanizing compound. Allow ample cure time prior to applying any topcoat.

4.6.2 In areas of severe corrosion, additional protection can be provided by top coating with epoxy mastic such as Carboline's Carbomastic 15.

4.6.3 Aluminum: If the finish has been damaged due to handling, corrosion, etc. clean damaged area using a non-ferrous wire brush. Clean affected area using a suitable detergent or cleaning agent. Apply a protective coat of enamel or other suitable paint.

#### **4.7.0 ELECTRICAL DEICING (OPTIONAL)**

4.7.1 Refer to installation drawing for installation notes and operating voltages, etc.

**DEICING SYSTEM SHOULD NOT BE OPERATED WHEN AMBIENT TEMPERATURE IS HIGHER THAN 40° F. DAMAGE TO ANTENNA OR DEICERS MAY RESULT.**

**4.8.0 TECHNICAL ASSISTANCE**

- 4.8.1 SWR Technical and Trouble shooting assistance is available during normal business hours (8:00am – 5:00pm). Emergency service is available 24 hours a day. **USA Office:** 619 Industrial Park Road, PO Box 856, Ebensburg, PA 15931 ***Tel. No.*** : 1-800-762-7743 ***Fax:*** 814-472-5552 **PHILIPPINES (ASIA) Office:** 31 E Scout Bayoran St. Quezon City Tel. No.: 632-411-0066 Fax No.: 632-410-6527

## *SECTION V*

### **REPORTS**

#### **5.1.0 INTRODUCTION**

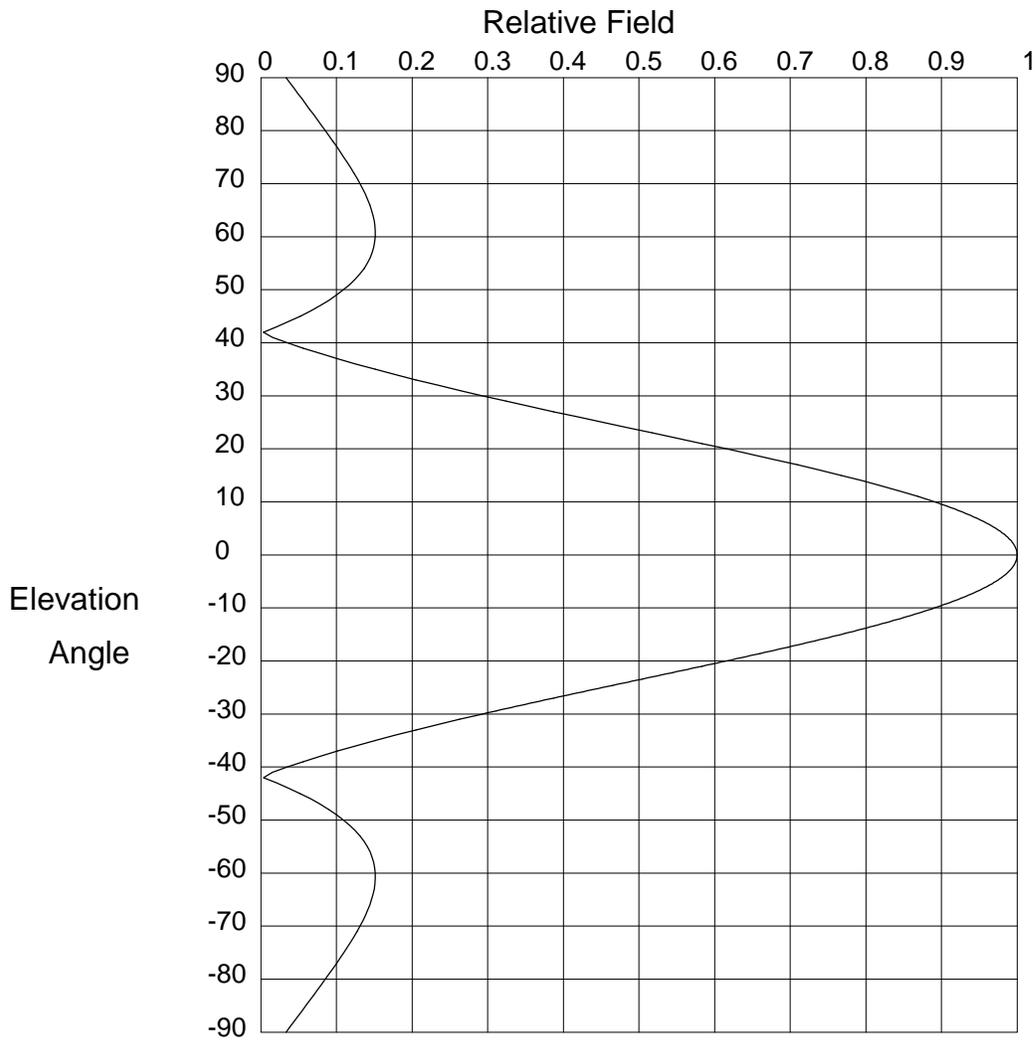
5.1.1 This section contains the technical manual reports.

#### **5.2.0 ELEVATION PLANE PATTERN**

A calculated elevation plane pattern is included. Measured elevation patterns are included in the FM Antenna Test Data Section.

#### **5.2.1 VSWR MEASUREMENTS**

Measured input impedance of the array is included in the FM Antenna Test Data Section and is recorded on an expanded Smith Chart plot. The plot is continuous across the frequency band of the channel.



## Elevation Pattern

Scale: Linear

Units: Field, Relative

### Systems With Reliability (SWR, L.P.)

CLIENT: *KAKS*

Date: 1/24/2022

ANTENNA TYPE: FMEC/3-PLUS-HWS-DA

FREQUENCY: 99.5

PATTERN POL.: Circular

DIRECTIVITY(Peak): 2.025/3.064 dBd

Beam Tilt (Deg.) : 0

DIRECTIVITY(Horiz): 2.025/3.064 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	.033 (-29.542)	52.0	.125 (-18.072)	14.0	.795 (-1.996)
89.0	.039 (-28.275)	51.0	.118 (-18.59)	13.0	.821 (-1.714)
88.0	.044 (-27.17)	50.0	.109 (-19.22)	12.0	.846 (-1.455)
87.0	.049 (-26.19)	49.0	.10 (-19.99)	11.0	.869 (-1.218)
86.0	.054 (-25.311)	48.0	.09 (-20.939)	10.0	.891 (-1.004)
85.0	.059 (-24.514)	47.0	.078 (-22.127)	9.8	.895 (-0.963)
84.0	.065 (-23.786)	46.0	.066 (-23.653)	9.6	.899 (-0.924)
83.0	.07 (-23.116)	45.0	.052 (-25.698)	9.4	.903 (-0.885)
82.0	.075 (-22.497)	44.0	.037 (-28.651)	9.2	.907 (-0.848)
81.0	.08 (-21.923)	43.0	.021 (-33.646)	9.0	.911 (-0.811)
80.0	.085 (-21.388)	42.0	.003 (-49.299)	8.8	.915 (-0.775)
79.0	.09 (-20.889)	41.0	.015 (-36.401)	8.6	.918 (-0.739)
78.0	.095 (-20.422)	40.0	.035 (-29.143)	8.4	.922 (-0.705)
77.0	.10 (-19.986)	39.0	.056 (-25.058)	8.2	.926 (-0.672)
76.0	.105 (-19.577)	38.0	.078 (-22.158)	8.0	.929 (-0.639)
75.0	.11 (-19.195)	37.0	.101 (-19.889)	7.8	.932 (-0.607)
74.0	.114 (-18.838)	36.0	.126 (-18.013)	7.6	.936 (-0.576)
73.0	.119 (-18.506)	35.0	.151 (-16.408)	7.4	.939 (-0.546)
72.0	.123 (-18.197)	34.0	.178 (-15.004)	7.2	.942 (-0.517)
71.0	.127 (-17.912)	33.0	.205 (-13.753)	7.0	.945 (-0.488)
70.0	.131 (-17.65)	32.0	.234 (-12.626)	6.8	.948 (-0.46)
69.0	.135 (-17.41)	31.0	.263 (-11.599)	6.6	.951 (-0.434)
68.0	.138 (-17.195)	30.0	.293 (-10.658)	6.4	.954 (-0.408)
67.0	.141 (-17.003)	29.0	.324 (-9.791)	6.2	.957 (-0.382)
66.0	.144 (-16.835)	28.0	.355 (-8.987)	6.0	.96 (-0.358)
65.0	.146 (-16.692)	27.0	.387 (-8.24)	5.8	.962 (-0.334)
64.0	.148 (-16.576)	26.0	.42 (-7.544)	5.6	.965 (-0.312)
63.0	.15 (-16.487)	25.0	.452 (-6.894)	5.4	.967 (-0.29)
62.0	.151 (-16.427)	24.0	.485 (-6.286)	5.2	.97 (-0.269)
61.0	.151 (-16.398)	23.0	.518 (-5.717)	5.0	.972 (-0.248)
60.0	.151 (-16.401)	22.0	.551 (-5.183)	4.8	.974 (-0.229)
59.0	.151 (-16.44)	21.0	.583 (-4.684)	4.6	.976 (-0.21)
58.0	.149 (-16.518)	20.0	.615 (-4.216)	4.4	.978 (-0.192)
57.0	.147 (-16.638)	19.0	.647 (-3.778)	4.2	.98 (-0.175)
56.0	.144 (-16.805)	18.0	.678 (-3.369)	4.0	.982 (-0.159)
55.0	.141 (-17.024)	17.0	.709 (-2.987)	3.8	.984 (-0.143)
54.0	.136 (-17.302)	16.0	.739 (-2.632)	3.6	.985 (-0.128)
53.0	.131 (-17.648)	15.0	.767 (-2.302)	3.4	.987 (-0.115)

## Systems With Reliability (SWR, L.P.)

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CLIENT: KAKS

Date: 1/24/2022

ANTENNA TYPE: FMEC/3-PLUS-HWS-DA

FREQUENCY: 99.5

PATTERN POL.: Circular

DIRECTIVITY(Peak): 2.025/3.064 dBd

Beam Tilt (Deg.) : 0

DIRECTIVITY(Horiz): 2.025/3.064 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	.988 (-0.101)	-4.4	.978 (-0.192)	-12.0	.846 (-1.455)
3.0	.99 (-0.089)	-4.6	.976 (-0.21)	-12.2	.841 (-1.505)
2.8	.991 (-0.078)	-4.8	.974 (-0.229)	-12.4	.836 (-1.555)
2.6	.992 (-0.067)	-5.0	.972 (-0.248)	-12.6	.831 (-1.607)
2.4	.993 (-0.057)	-5.2	.97 (-0.269)	-12.8	.826 (-1.66)
2.2	.994 (-0.048)	-5.4	.967 (-0.29)	-13.0	.821 (-1.714)
2.0	.995 (-0.04)	-5.6	.965 (-0.312)	-13.2	.816 (-1.768)
1.8	.996 (-0.032)	-5.8	.962 (-0.334)	-13.4	.811 (-1.824)
1.6	.997 (-0.025)	-6.0	.96 (-0.358)	-13.6	.805 (-1.88)
1.4	.998 (-0.019)	-6.2	.957 (-0.382)	-13.8	.80 (-1.937)
1.2	.998 (-0.014)	-6.4	.954 (-0.408)	-14.0	.795 (-1.996)
1.0	.999 (-0.01)	-6.6	.951 (-0.434)	-14.2	.789 (-2.055)
.8	.999 (-0.006)	-6.8	.948 (-0.46)	-14.4	.784 (-2.115)
.6	1.00 (-0.004)	-7.0	.945 (-0.488)	-14.6	.778 (-2.176)
.4	1.00 (-0.002)	-7.2	.942 (-0.517)	-14.8	.773 (-2.238)
.2	1.00 (0)	-7.4	.939 (-0.546)	-15.0	.767 (-2.302)
.0	1.00 (0)	-7.6	.936 (-0.576)	-15.2	.762 (-2.366)
-.2	1.00 (0)	-7.8	.932 (-0.607)	-15.4	.756 (-2.431)
-.4	1.00 (-0.002)	-8.0	.929 (-0.639)	-15.6	.75 (-2.497)
-.6	1.00 (-0.004)	-8.2	.926 (-0.672)	-15.8	.744 (-2.564)
-.8	.999 (-0.006)	-8.4	.922 (-0.705)	-16.0	.739 (-2.632)
-1.0	.999 (-0.01)	-8.6	.918 (-0.739)	-16.2	.733 (-2.701)
-1.2	.998 (-0.014)	-8.8	.915 (-0.775)	-16.4	.727 (-2.771)
-1.4	.998 (-0.019)	-9.0	.911 (-0.811)	-16.6	.721 (-2.842)
-1.6	.997 (-0.025)	-9.2	.907 (-0.848)	-16.8	.715 (-2.914)
-1.8	.996 (-0.032)	-9.4	.903 (-0.885)	-17.0	.709 (-2.987)
-2.0	.995 (-0.04)	-9.6	.899 (-0.924)	-17.2	.703 (-3.062)
-2.2	.994 (-0.048)	-9.8	.895 (-0.963)	-17.4	.697 (-3.137)
-2.4	.993 (-0.057)	-10.0	.891 (-1.004)	-17.6	.691 (-3.213)
-2.6	.992 (-0.067)	-10.2	.887 (-1.045)	-17.8	.685 (-3.291)
-2.8	.991 (-0.078)	-10.4	.882 (-1.087)	-18.0	.678 (-3.369)
-3.0	.99 (-0.089)	-10.6	.878 (-1.13)	-18.2	.672 (-3.449)
-3.2	.988 (-0.101)	-10.8	.874 (-1.173)	-18.4	.666 (-3.529)
-3.4	.987 (-0.115)	-11.0	.869 (-1.218)	-18.6	.66 (-3.611)
-3.6	.985 (-0.128)	-11.2	.865 (-1.264)	-18.8	.654 (-3.694)
-3.8	.984 (-0.143)	-11.4	.86 (-1.31)	-19.0	.647 (-3.778)
-4.0	.982 (-0.159)	-11.6	.855 (-1.357)	-19.2	.641 (-3.863)
-4.2	.98 (-0.175)	-11.8	.851 (-1.406)	-19.4	.635 (-3.95)

## Systems With Reliability (SWR, L.P.)

Page 2 of 3

CLIENT: KAKS

Date: 1/24/2022

ANTENNA TYPE: FMEC/3-PLUS-HWS-DA

FREQUENCY: 99.5

PATTERN POL.: Circular

DIRECTIVITY(Peak): 2.025/3.064 dBd

Beam Tilt (Deg.) : 0

DIRECTIVITY(Horiz): 2.025/3.064 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	.628 (-4.037)	-27.2	.381 (-8.385)	-54.0	.136 (-17.302)
-19.8	.622 (-4.126)	-27.4	.374 (-8.533)	-55.0	.141 (-17.024)
-20.0	.615 (-4.216)	-27.6	.368 (-8.682)	-56.0	.144 (-16.805)
-20.2	.609 (-4.307)	-27.8	.362 (-8.834)	-57.0	.147 (-16.638)
-20.4	.603 (-4.399)	-28.0	.355 (-8.987)	-58.0	.149 (-16.518)
-20.6	.596 (-4.493)	-28.2	.349 (-9.143)	-59.0	.151 (-16.44)
-20.8	.59 (-4.588)	-28.4	.343 (-9.302)	-60.0	.151 (-16.401)
-21.0	.583 (-4.684)	-28.6	.336 (-9.462)	-61.0	.151 (-16.398)
-21.2	.577 (-4.781)	-28.8	.33 (-9.625)	-62.0	.151 (-16.427)
-21.4	.57 (-4.88)	-29.0	.324 (-9.791)	-63.0	.15 (-16.487)
-21.6	.564 (-4.979)	-29.2	.318 (-9.959)	-64.0	.148 (-16.576)
-21.8	.557 (-5.081)	-29.4	.312 (-10.13)	-65.0	.146 (-16.692)
-22.0	.551 (-5.183)	-29.6	.305 (-10.303)	-66.0	.144 (-16.835)
-22.2	.544 (-5.287)	-29.8	.299 (-10.479)	-67.0	.141 (-17.003)
-22.4	.538 (-5.392)	-30.0	.293 (-10.658)	-68.0	.138 (-17.195)
-22.6	.531 (-5.499)	-31.0	.263 (-11.599)	-69.0	.135 (-17.41)
-22.8	.524 (-5.607)	-32.0	.234 (-12.626)	-70.0	.131 (-17.65)
-23.0	.518 (-5.717)	-33.0	.205 (-13.753)	-71.0	.127 (-17.912)
-23.2	.511 (-5.827)	-34.0	.178 (-15.004)	-72.0	.123 (-18.197)
-23.4	.505 (-5.94)	-35.0	.151 (-16.408)	-73.0	.119 (-18.506)
-23.6	.498 (-6.054)	-36.0	.126 (-18.013)	-74.0	.114 (-18.838)
-23.8	.492 (-6.169)	-37.0	.101 (-19.889)	-75.0	.11 (-19.195)
-24.0	.485 (-6.286)	-38.0	.078 (-22.158)	-76.0	.105 (-19.577)
-24.2	.478 (-6.404)	-39.0	.056 (-25.058)	-77.0	.10 (-19.986)
-24.4	.472 (-6.524)	-40.0	.035 (-29.143)	-78.0	.095 (-20.422)
-24.6	.465 (-6.646)	-41.0	.015 (-36.401)	-79.0	.09 (-20.889)
-24.8	.459 (-6.769)	-42.0	.003 (-49.299)	-80.0	.085 (-21.388)
-25.0	.452 (-6.894)	-43.0	.021 (-33.646)	-81.0	.08 (-21.923)
-25.2	.446 (-7.021)	-44.0	.037 (-28.651)	-82.0	.075 (-22.497)
-25.4	.439 (-7.149)	-45.0	.052 (-25.698)	-83.0	.07 (-23.116)
-25.6	.433 (-7.279)	-46.0	.066 (-23.653)	-84.0	.065 (-23.786)
-25.8	.426 (-7.411)	-47.0	.078 (-22.127)	-85.0	.059 (-24.514)
-26.0	.42 (-7.544)	-48.0	.09 (-20.939)	-86.0	.054 (-25.311)
-26.2	.413 (-7.68)	-49.0	.10 (-19.99)	-87.0	.049 (-26.19)
-26.4	.407 (-7.817)	-50.0	.109 (-19.22)	-88.0	.044 (-27.17)
-26.6	.40 (-7.956)	-51.0	.118 (-18.59)	-89.0	.039 (-28.275)
-26.8	.394 (-8.097)	-52.0	.125 (-18.072)	-90.0	.033 (-29.542)
-27.0	.387 (-8.24)	-53.0	.131 (-17.648)	90.0	.00 (-50)

## Systems With Reliability (SWR, L.P.)

Page 3 of 3

CLIENT: KAKS

Date: 1/24/2022

ANTENNA TYPE: FMEC/3-PLUS-HWS-DA

FREQUENCY: 99.5

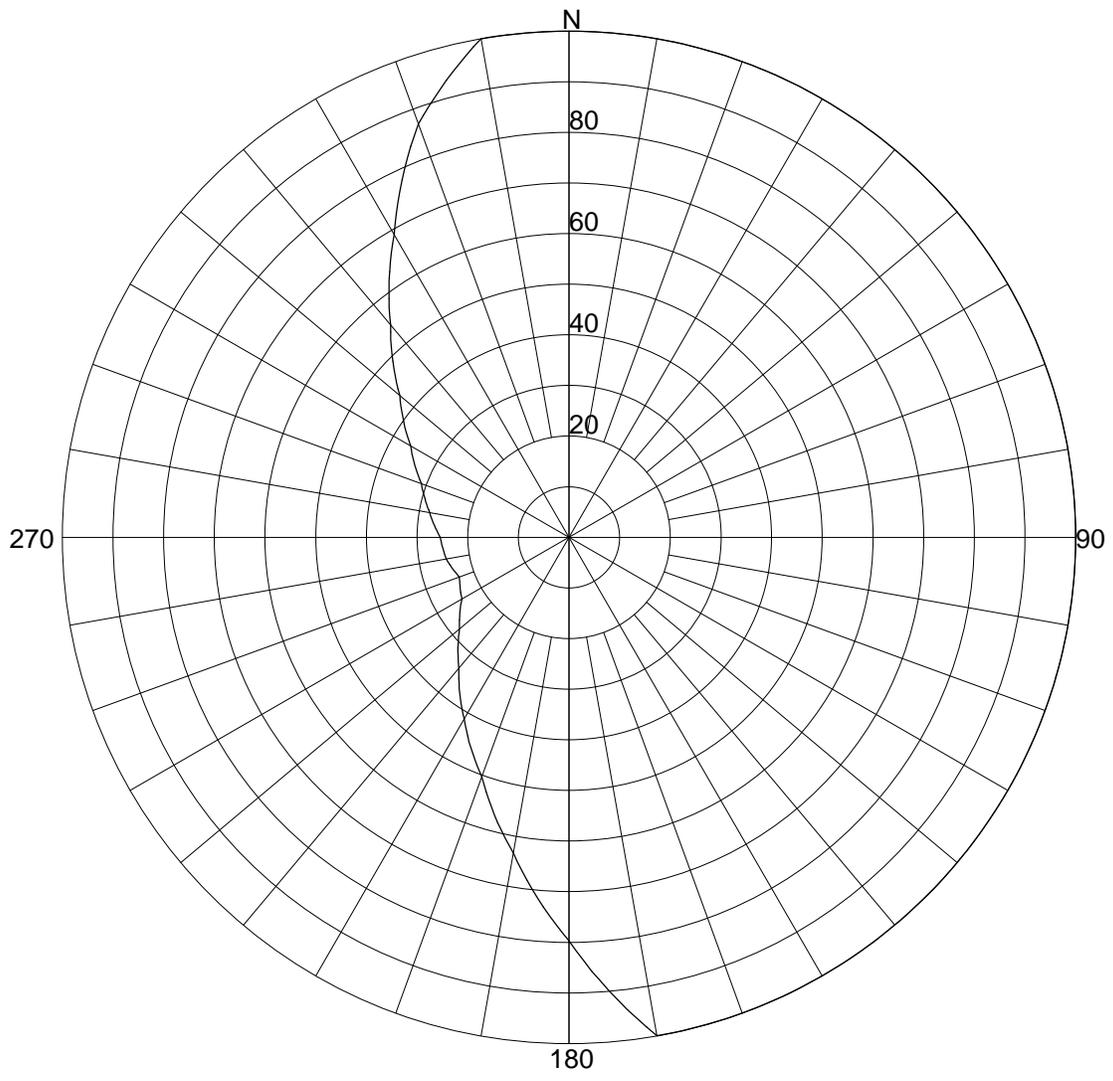
PATTERN POL.: Circular

DIRECTIVITY(Peak): 2.025/3.064 dBd

Beam Tilt (Deg.) : 0

DIRECTIVITY(Horiz): 2.025/3.064 dBd

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



### Azimuth Pattern

## Systems With Reliability (SWR, L.P.)

Scale: Linear  
 Unit: Relative Field

CLIENT: <i>KAKS (FCC)</i>	Date: 1/24/2022
ANTENNA TYPE: FMEC/3-PLUS-HWS_DA	
FREQUENCY: 99.5	
PATTERN POL.: Circular	CIRCULARITY(+/-dB):
AZ. DIRECTIVITY: 1.57307 / 1.97dB	PATTERN RMS: 0.797

## Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	1.0000 ( 0 )	180	.7970 (-1.97 )
5	1.0000 ( 0 )	185	.7150 (-2.91 )
10	1.0000 ( 0 )	190	.6330 (-3.97 )
15	1.0000 ( 0 )	195	.5680 (-4.91 )
20	1.0000 ( 0 )	200	.5030 (-5.97 )
25	1.0000 ( 0 )	205	.4585 (-6.77 )
30	1.0000 ( 0 )	210	.4140 (-7.66 )
35	1.0000 ( 0 )	215	.3760 (-8.5 )
40	1.0000 ( 0 )	220	.3380 (-9.42 )
45	1.0000 ( 0 )	225	.3100 (-10.17 )
50	1.0000 ( 0 )	230	.2820 (-11 )
55	1.0000 ( 0 )	235	.2630 (-11.6 )
60	1.0000 ( 0 )	240	.2440 (-12.25 )
65	1.0000 ( 0 )	245	.2370 (-12.51 )
70	1.0000 ( 0 )	250	.2300 (-12.77 )
75	1.0000 ( 0 )	255	.2380 (-12.47 )
80	1.0000 ( 0 )	260	.2460 (-12.18 )
85	1.0000 ( 0 )	265	.2500 (-12.04 )
90	1.0000 ( 0 )	270	.2540 (-11.9 )
95	1.0000 ( 0 )	275	.2665 (-11.49 )
100	1.0000 ( 0 )	280	.2790 (-11.09 )
105	1.0000 ( 0 )	285	.2945 (-10.62 )
110	1.0000 ( 0 )	290	.3100 (-10.17 )
115	1.0000 ( 0 )	295	.3355 (-9.49 )
120	1.0000 ( 0 )	300	.3610 (-8.85 )
125	1.0000 ( 0 )	305	.3985 (-7.99 )
130	1.0000 ( 0 )	310	.4360 (-7.21 )
135	1.0000 ( 0 )	315	.4920 (-6.16 )
140	1.0000 ( 0 )	320	.5480 (-5.22 )
145	1.0000 ( 0 )	325	.6190 (-4.17 )
150	1.0000 ( 0 )	330	.6900 (-3.22 )
155	1.0000 ( 0 )	335	.7795 (-2.16 )
160	1.0000 ( 0 )	340	.8690 (-1.22 )
165	1.0000 ( 0 )	345	.9345 (-0.59 )
170	1.0000 ( 0 )	350	1.0000 ( 0 )
175	.8985 (-0.93 )	355	1.0000 ( 0 )

## Systems With Reliability (SWR, L.P.)

CLIENT: *KAKS (FCC)*

Date: 1/24/2022

ANTENNA TYPE: *FMEC/3-PLUS-HWS\_DA*

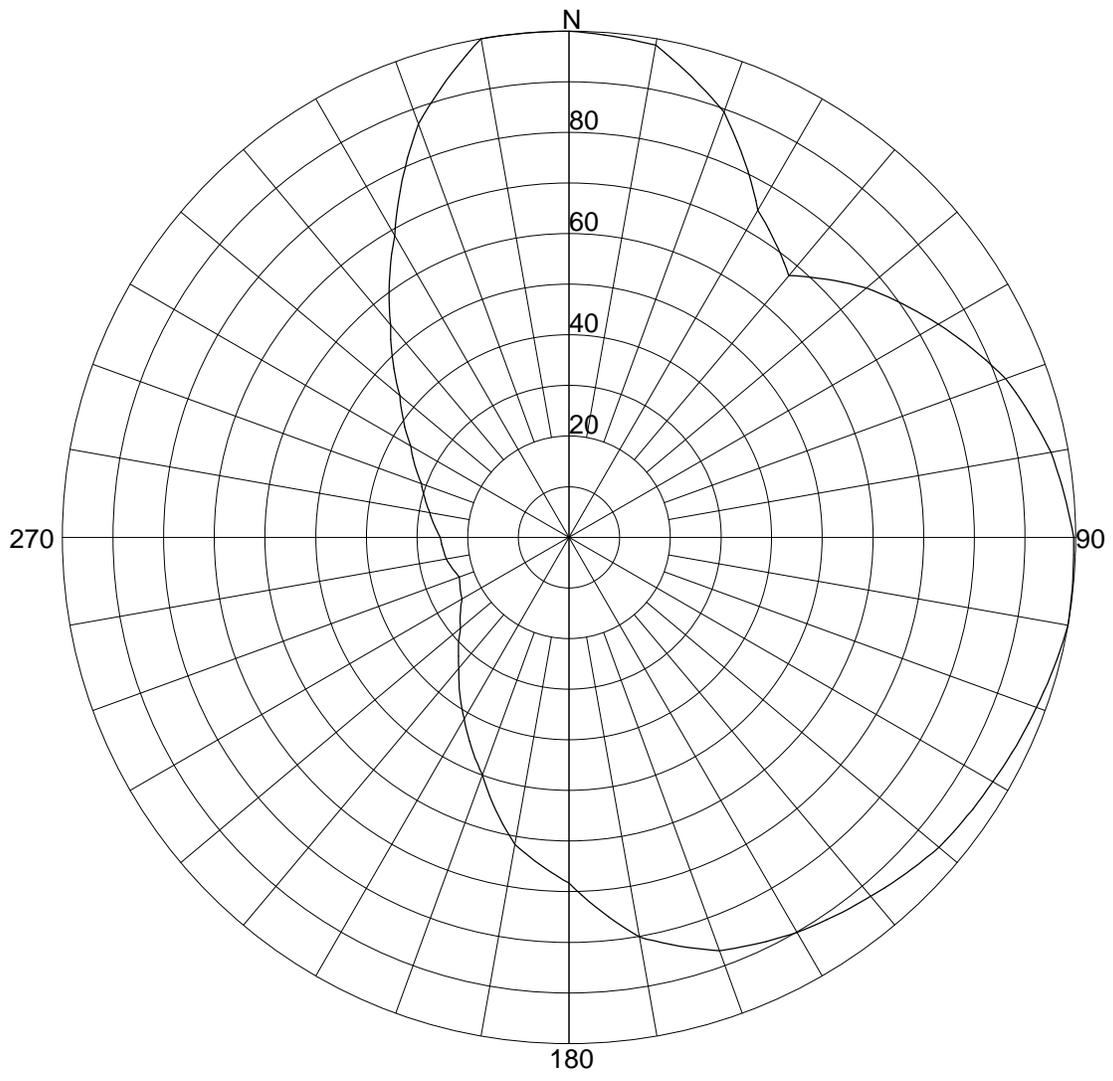
FREQUENCY: *99.5*

PATTERN POL.: *Circular*

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: *1.57307 / 1.97dB*

PATTERN RMS: *0.797*



### Azimuth Pattern

## Systems With Reliability (SWR, L.P.)

Scale: Linear  
 Unit: Relative Field

CLIENT: <i>KAKS(COMPOSITE)</i>	Date: 6/6/2022
ANTENNA TYPE: FMEC/3-PLUS-HWS-DA	
FREQUENCY: 99.5	
PATTERN POL.: Circular	CIRCULARITY(+/-dB):
AZ. DIRECTIVITY: 1.85502 / 2.68dB	PATTERN RMS: 0.734

## Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	1.0000 ( 0 )	180	.6830 (-3.31 )
5	.9935 (-0.06 )	185	.6495 (-3.75 )
10	.9870 (-0.11 )	190	.6160 (-4.21 )
15	.9405 (-0.53 )	195	.5578 (-5.07 )
20	.8940 (-0.97 )	200	.4995 (-6.03 )
25	.8200 (-1.72 )	205	.4568 (-6.81 )
30	.7460 (-2.55 )	210	.4140 (-7.66 )
35	.7105 (-2.97 )	215	.3760 (-8.5 )
40	.6750 (-3.41 )	220	.3380 (-9.42 )
45	.7205 (-2.85 )	225	.3088 (-10.21 )
50	.7660 (-2.32 )	230	.2795 (-11.07 )
55	.8040 (-1.89 )	235	.2618 (-11.64 )
60	.8420 (-1.49 )	240	.2440 (-12.25 )
65	.8795 (-1.12 )	245	.2370 (-12.51 )
70	.9170 (-0.75 )	250	.2300 (-12.77 )
75	.9415 (-0.52 )	255	.2380 (-12.47 )
80	.9660 (-0.3 )	260	.2460 (-12.18 )
85	.9810 (-0.17 )	265	.2500 (-12.04 )
90	.9960 (-0.03 )	270	.2540 (-11.9 )
95	.9980 (-0.02 )	275	.2665 (-11.49 )
100	1.0000 ( 0 )	280	.2790 (-11.09 )
105	.9910 (-0.08 )	285	.2945 (-10.62 )
110	.9820 (-0.16 )	290	.3100 (-10.17 )
115	.9740 (-0.23 )	295	.3355 (-9.49 )
120	.9660 (-0.3 )	300	.3610 (-8.85 )
125	.9595 (-0.36 )	305	.3985 (-7.99 )
130	.9530 (-0.42 )	310	.4360 (-7.21 )
135	.9395 (-0.54 )	315	.4920 (-6.16 )
140	.9260 (-0.67 )	320	.5480 (-5.22 )
145	.9135 (-0.79 )	325	.6183 (-4.18 )
150	.9010 (-0.91 )	330	.6885 (-3.24 )
155	.8850 (-1.06 )	335	.7788 (-2.17 )
160	.8690 (-1.22 )	340	.8690 (-1.22 )
165	.8355 (-1.56 )	345	.9345 (-0.59 )
170	.8020 (-1.92 )	350	1.0000 ( 0 )
175	.7425 (-2.59 )	355	1.0000 ( 0 )

## Systems With Reliability (SWR, L.P.)

CLIENT: *KAKS(COMPOSITE)*

Date: 6/6/2022

ANTENNA TYPE: FMEC/3-PLUS-HWS-DA

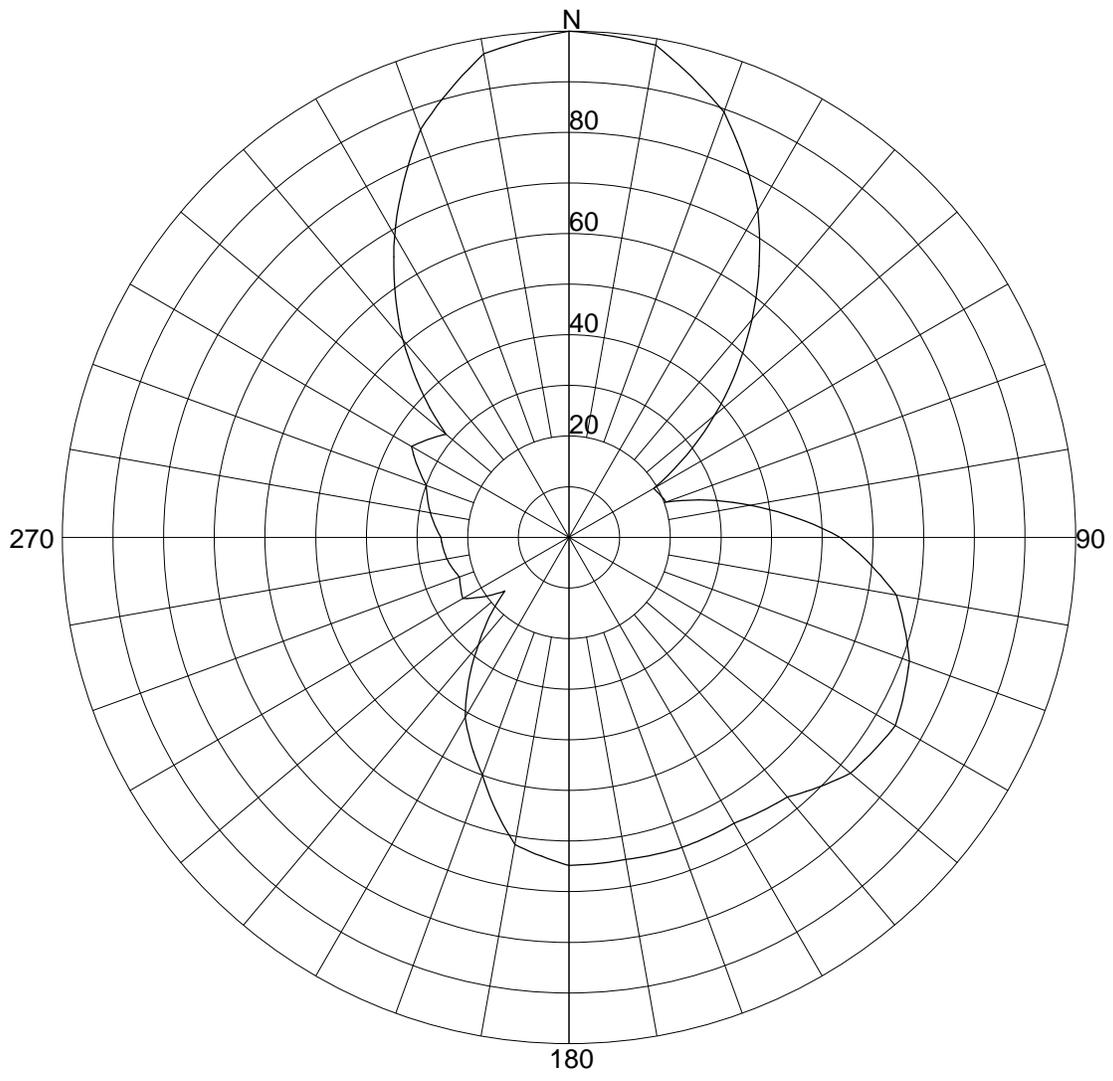
FREQUENCY: 99.5

PATTERN POL.: Circular

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 1.85502 / 2.68dB

PATTERN RMS: 0.734



### Azimuth Pattern

## Systems With Reliability (SWR, L.P.)

Scale: Linear  
 Unit: Relative Field

CLIENT: <i>KAKS(HORIZONTAL)</i>	Date: 6/6/2022
ANTENNA TYPE: FMEC/3-PLUS-HWS_DA	
FREQUENCY: 99.5	
PATTERN POL.: Horizontal	CIRCULARITY(+/-dB):
AZ. DIRECTIVITY: 2.92179 / 4.66dB	PATTERN RMS: 0.585

## Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	1.0000 ( 0 )	180	.6480 (-3.77 )
5	.9935 (-0.06 )	185	.6320 (-3.99 )
10	.9870 (-0.11 )	190	.6160 (-4.21 )
15	.9405 (-0.53 )	195	.5578 (-5.07 )
20	.8940 (-0.97 )	200	.4995 (-6.03 )
25	.8200 (-1.72 )	205	.4548 (-6.84 )
30	.7460 (-2.55 )	210	.4100 (-7.74 )
35	.6540 (-3.69 )	215	.3445 (-9.26 )
40	.5620 (-5.01 )	220	.2790 (-11.09 )
45	.4685 (-6.59 )	225	.2220 (-13.07 )
50	.3750 (-8.52 )	230	.1650 (-15.65 )
55	.2840 (-10.93 )	235	.2035 (-13.83 )
60	.1930 (-14.29 )	240	.2420 (-12.32 )
65	.1985 (-14.04 )	245	.2360 (-12.54 )
70	.2040 (-13.81 )	250	.2300 (-12.77 )
75	.2835 (-10.95 )	255	.2375 (-12.49 )
80	.3630 (-8.8 )	260	.2450 (-12.22 )
85	.4490 (-6.96 )	265	.2490 (-12.08 )
90	.5350 (-5.43 )	270	.2530 (-11.94 )
95	.5955 (-4.5 )	275	.2655 (-11.52 )
100	.6560 (-3.66 )	280	.2780 (-11.12 )
105	.6855 (-3.28 )	285	.2890 (-10.78 )
110	.7150 (-2.91 )	290	.3000 (-10.46 )
115	.7295 (-2.74 )	295	.3295 (-9.64 )
120	.7440 (-2.57 )	300	.3590 (-8.9 )
125	.7345 (-2.68 )	305	.3380 (-9.42 )
130	.7250 (-2.79 )	310	.3170 (-9.98 )
135	.6975 (-3.13 )	315	.4140 (-7.66 )
140	.6700 (-3.48 )	320	.5110 (-5.83 )
145	.6610 (-3.6 )	325	.5998 (-4.44 )
150	.6520 (-3.72 )	330	.6885 (-3.24 )
155	.6520 (-3.72 )	335	.7728 (-2.24 )
160	.6520 (-3.72 )	340	.8570 (-1.34 )
165	.6490 (-3.76 )	345	.9135 (-0.79 )
170	.6460 (-3.8 )	350	.9700 (-0.26 )
175	.6470 (-3.78 )	355	.9850 (-0.13 )

## Systems With Reliability (SWR, L.P.)

CLIENT: *KAKS(HORIZONTAL)*

Date: 6/6/2022

ANTENNA TYPE: *FMEC/3-PLUS-HWS\_DA*

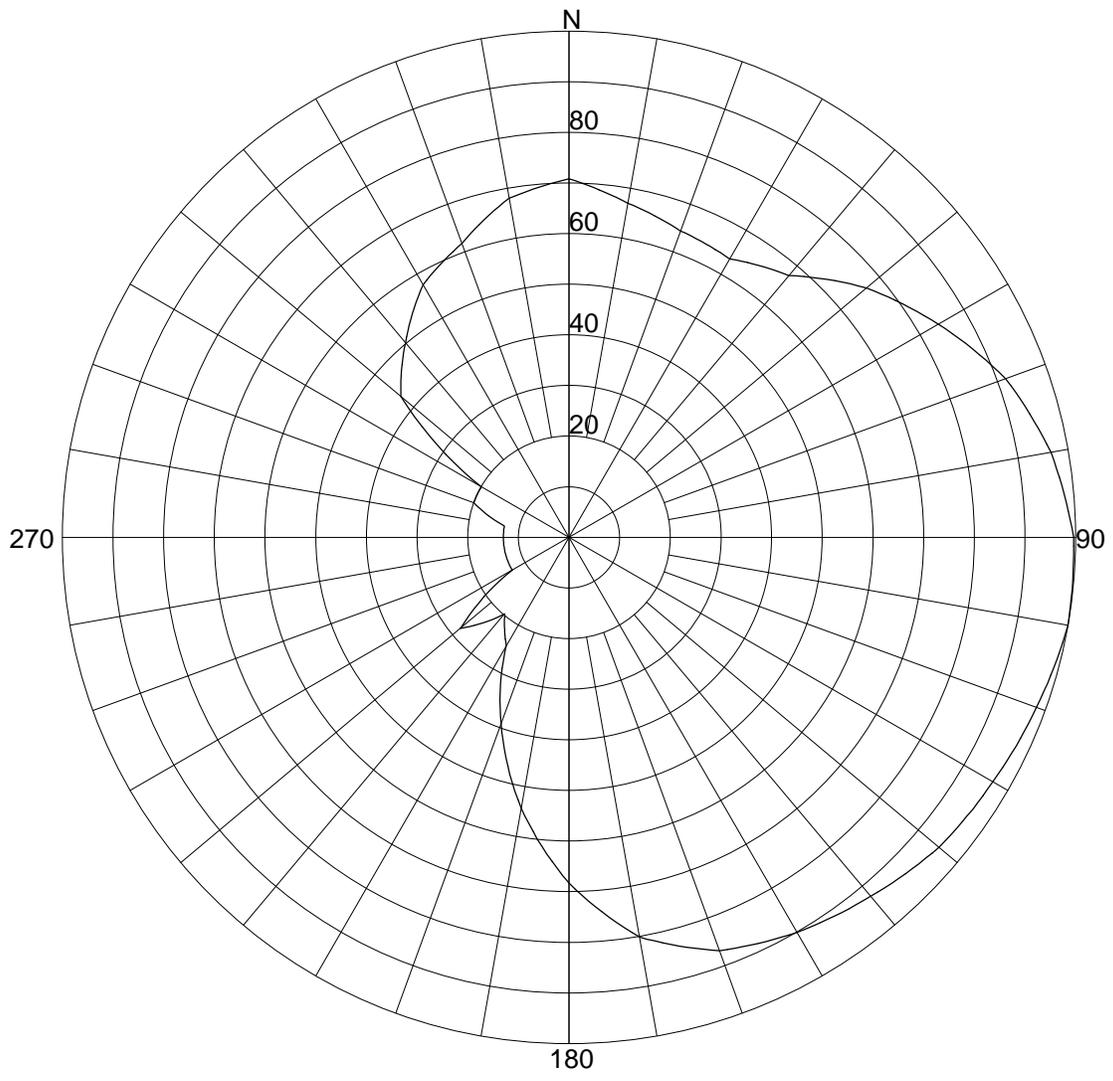
FREQUENCY: *99.5*

PATTERN POL.: *Horizontal*

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: *2.92179 / 4.66dB*

PATTERN RMS: *0.585*



### Azimuth Pattern

## Systems With Reliability (SWR, L.P.)

Scale: Linear  
 Unit: Relative Field

CLIENT: <i>KAKS(VERTICAL)</i>	Date: 6/6/2022
ANTENNA TYPE: FMEC/3-PLUS-HWS-DA	
FREQUENCY: 99.5	
PATTERN POL.: Vertical	CIRCULARITY(+/-dB):
AZ. DIRECTIVITY: 2.2507 / 3.52dB	PATTERN RMS: 0.667

## Relative Field Tabulation(Azimuth)

Azimuth Heading	Normalized Field(dB)	Azimuth Heading	Normalized Field(dB)
0	.7080 (-3 )	180	.6830 (-3.31 )
5	.6890 (-3.24 )	185	.6130 (-4.25 )
10	.6700 (-3.48 )	190	.5430 (-5.3 )
15	.6570 (-3.65 )	195	.4675 (-6.6 )
20	.6440 (-3.82 )	200	.3920 (-8.13 )
25	.6395 (-3.88 )	205	.3195 (-9.91 )
30	.6350 (-3.94 )	210	.2470 (-12.15 )
35	.6550 (-3.68 )	215	.2220 (-13.07 )
40	.6750 (-3.41 )	220	.1970 (-14.11 )
45	.7205 (-2.85 )	225	.2383 (-12.46 )
50	.7660 (-2.32 )	230	.2795 (-11.07 )
55	.8040 (-1.89 )	235	.2045 (-13.79 )
60	.8420 (-1.49 )	240	.1295 (-17.75 )
65	.8795 (-1.12 )	245	.1295 (-17.75 )
70	.9170 (-0.75 )	250	.1295 (-17.75 )
75	.9415 (-0.52 )	255	.1295 (-17.75 )
80	.9660 (-0.3 )	260	.1295 (-17.75 )
85	.9810 (-0.17 )	265	.1295 (-17.75 )
90	.9960 (-0.03 )	270	.1295 (-17.75 )
95	.9980 (-0.02 )	275	.1295 (-17.75 )
100	1.0000 ( 0 )	280	.1295 (-17.75 )
105	.9910 (-0.08 )	285	.1648 (-15.66 )
110	.9820 (-0.16 )	290	.2000 (-13.98 )
115	.9740 (-0.23 )	295	.2000 (-13.98 )
120	.9660 (-0.3 )	300	.2000 (-13.98 )
125	.9595 (-0.36 )	305	.3165 (-9.99 )
130	.9530 (-0.42 )	310	.4330 (-7.27 )
135	.9395 (-0.54 )	315	.4675 (-6.6 )
140	.9260 (-0.67 )	320	.5020 (-5.99 )
145	.9135 (-0.79 )	325	.5390 (-5.37 )
150	.9010 (-0.91 )	330	.5760 (-4.79 )
155	.8850 (-1.06 )	335	.5970 (-4.48 )
160	.8690 (-1.22 )	340	.6180 (-4.18 )
165	.8355 (-1.56 )	345	.6490 (-3.76 )
170	.8020 (-1.92 )	350	.6800 (-3.35 )
175	.7425 (-2.59 )	355	.6940 (-3.17 )

## Systems With Reliability (SWR, L.P.)

CLIENT: *KAKS(VERTICAL)*

Date: 6/6/2022

ANTENNA TYPE: FMEC/3-PLUS-HWS-DA

FREQUENCY: 99.5

PATTERN POL.: Vertical

CIRCULARITY(+/-dB):

AZ. DIRECTIVITY: 2.2507 / 3.52dB

PATTERN RMS: 0.667



SYSTEMS WITH RELIABILITY, LP
Broadcast Antennas & Transmission Systems
SYSTEM DATA SHEET



CALL SIGN / CUSTOMER KAKS (Composite)
LOCATION Goshen, AR
CONTACT Elizabeth Marquis
ANTENNA MODEL FMEC/3-PLUS-HWS-DA
FREQUENCY 99.5 MHz

ELECTRICAL SPECIFICATIONS

Table with columns for specification name and values. Includes Polarization Type (Circular), Polarization Ratio (50.00%), Elevation Directivity (2.025), Azimuth Directivity (1.855), Antenna Efficiency (100.00%), Antenna Gain (1.878), dB Gain (2.737 dB), ERP (3.600 kW), Line Type (7/8" Foam LCF78-50JA), and Req'd. Transmitter Output Power (2.386 kW).

MECHANICAL SPECIFICATIONS

Table with columns for specification name and values. Includes No. Of Bays (3), Center of Radiation AGL (70.10 m), Antenna Aperture (3.01 m), Antenna Total Length (4.38 m), Antenna Weight Excluding Brackets (29.55 kg), and Windload (4.26 ft.^2).

Specifications will be certified upon final construction and testing.
The given values can be used for system planning.

Prepared by:

Handwritten signature of Umesh Babu, Manedi
Umesh Babu, Manedi
SWR, LP Engineering



Broadcast Antennas & Transmission Systems

**SYSTEMS WITH RELIABILITY, LP**

619 Industrial Park Road, Ebensburg, PA 15931  
Phone 814.472.5436 Fax 814.472.5552 www.swr-rf.com

## Certified Proof of Performance

Customer: KAKS / ROX Radio Group, LLC  
Date: 03/01/2022  
Antenna Model: FMEC/3 – PLUS – HWS – DA – 99.5  
Frequencies Tested: 99.5 MHz (+/- 200 KHz)  
Return Loss @ Fc: - 38.134 dB  
Shop Order No.: 21302  
Input: 7/8 EIA Flange

---

A reading of  $-17.7$  dB is indicative of a 1.3:1 VSWR. The component specified has met or exceeds this 1.3:1 VSWR performance specification.

Computer / Vector Network Analyzer plots are enclosed to verify antenna performance.

**Test Performed by:**

---

Charles Edmiston Jr  
Technician



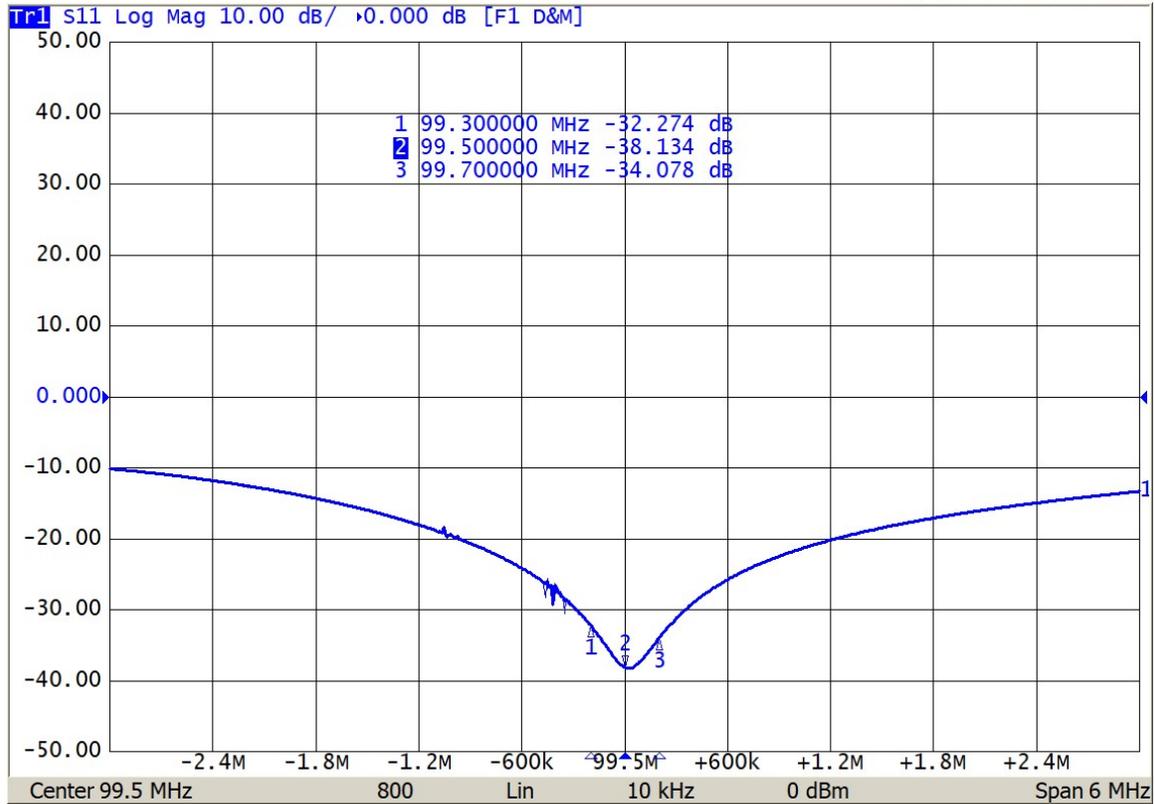
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Phone 814.472.5436 Fax 814.472.5552 www.swr-rf.com

3/1/2022 3:43:51 PM



**Plot 1: Return Loss**



Digital Transmission Systems®

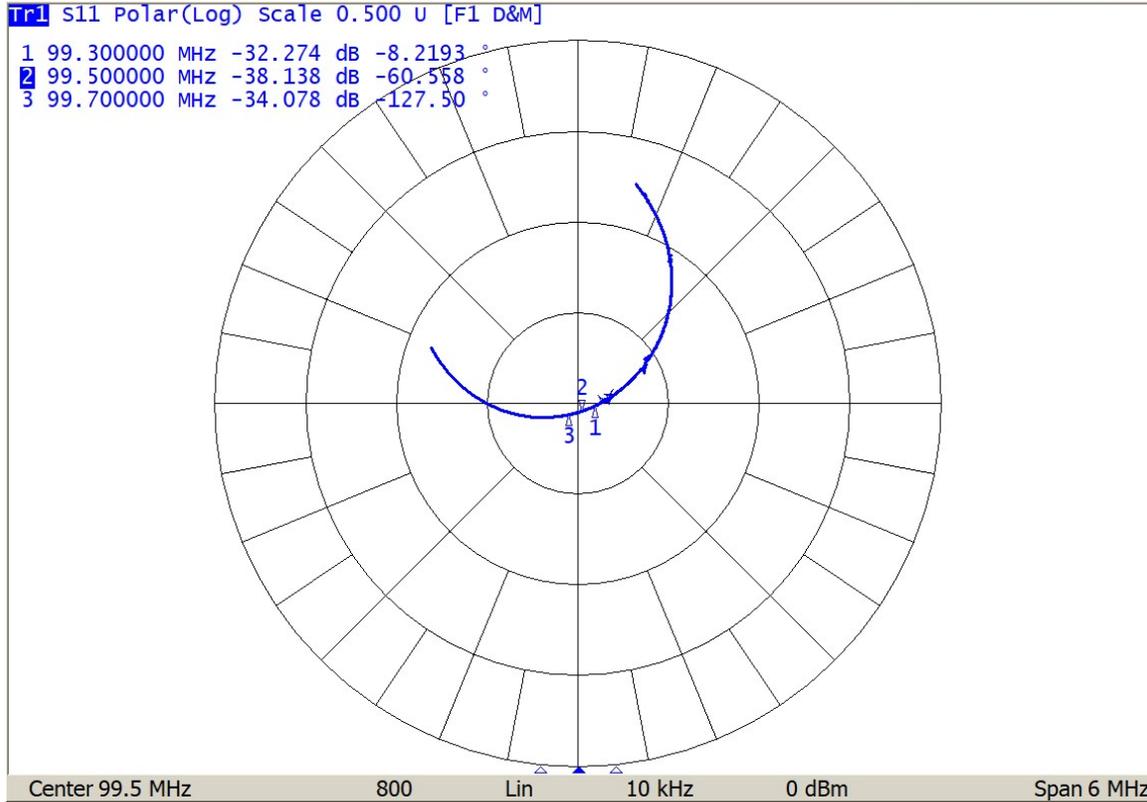
# SYSTEMS WITH RELIABILITY, LP

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3/1/2022 3:47:25 PM



**Plot 2: Polar**



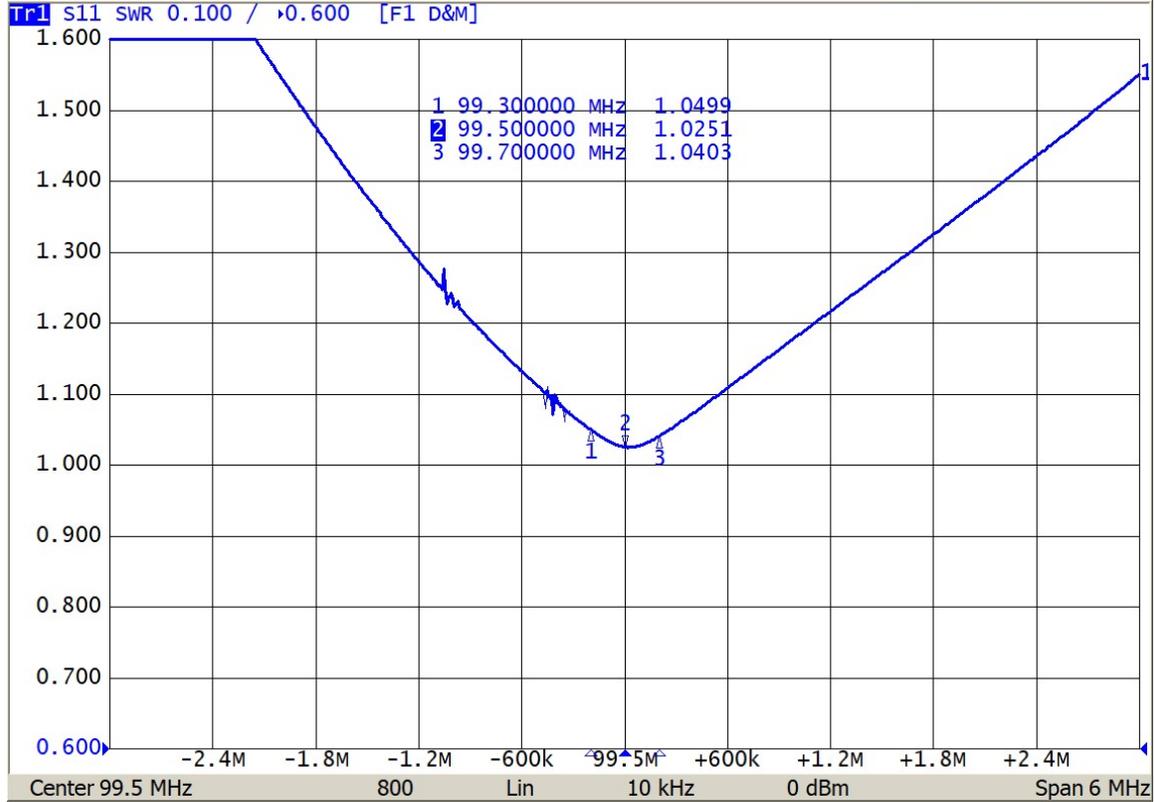
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SYSTEMS WITH RELIABILITY, LP

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Phone 814.472.5436 Fax 814.472.5552 www.swr-rf.com

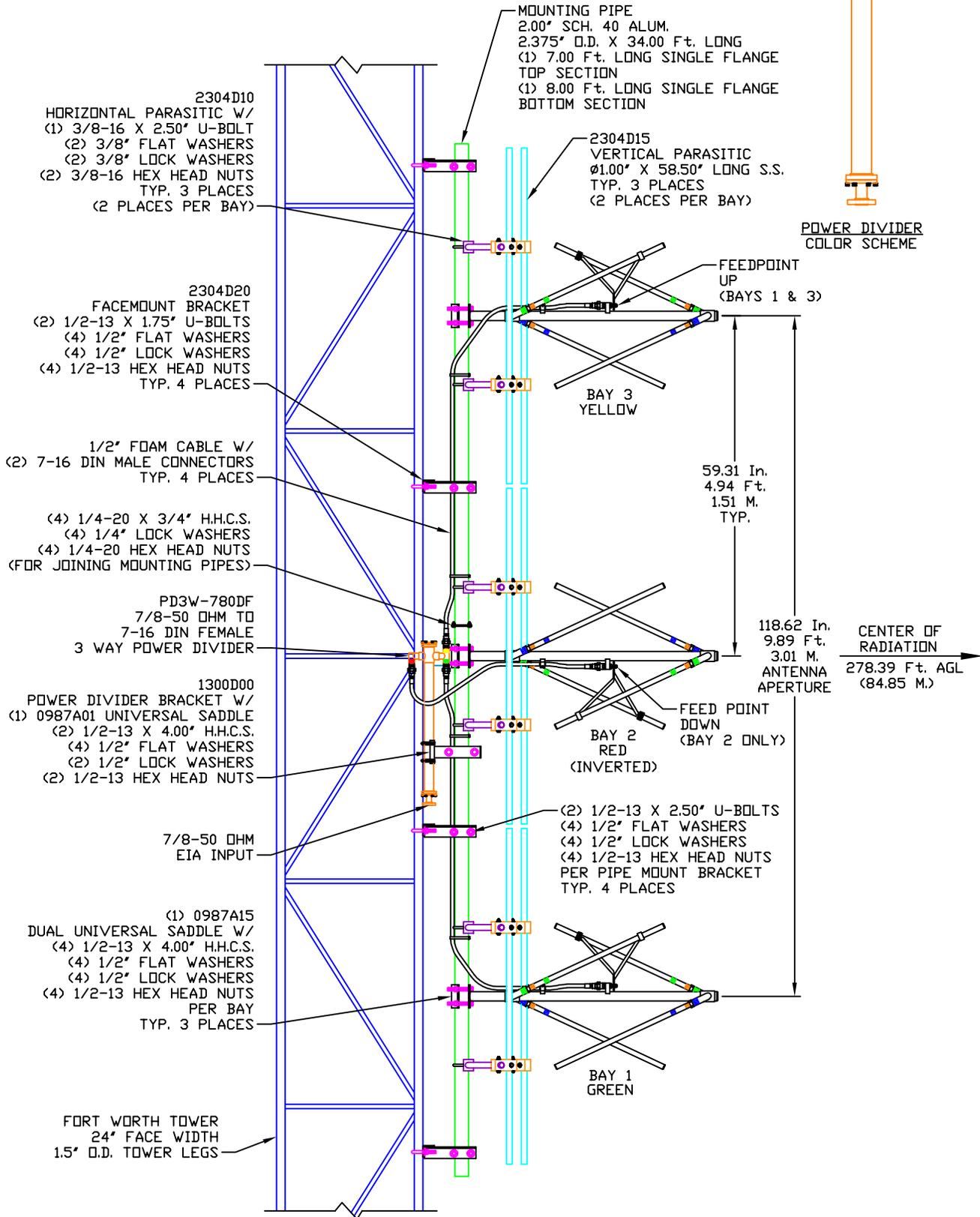
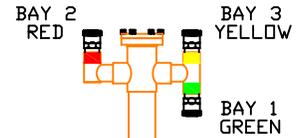
3/1/2022 3:45:34 PM



Plot 3: VSWR

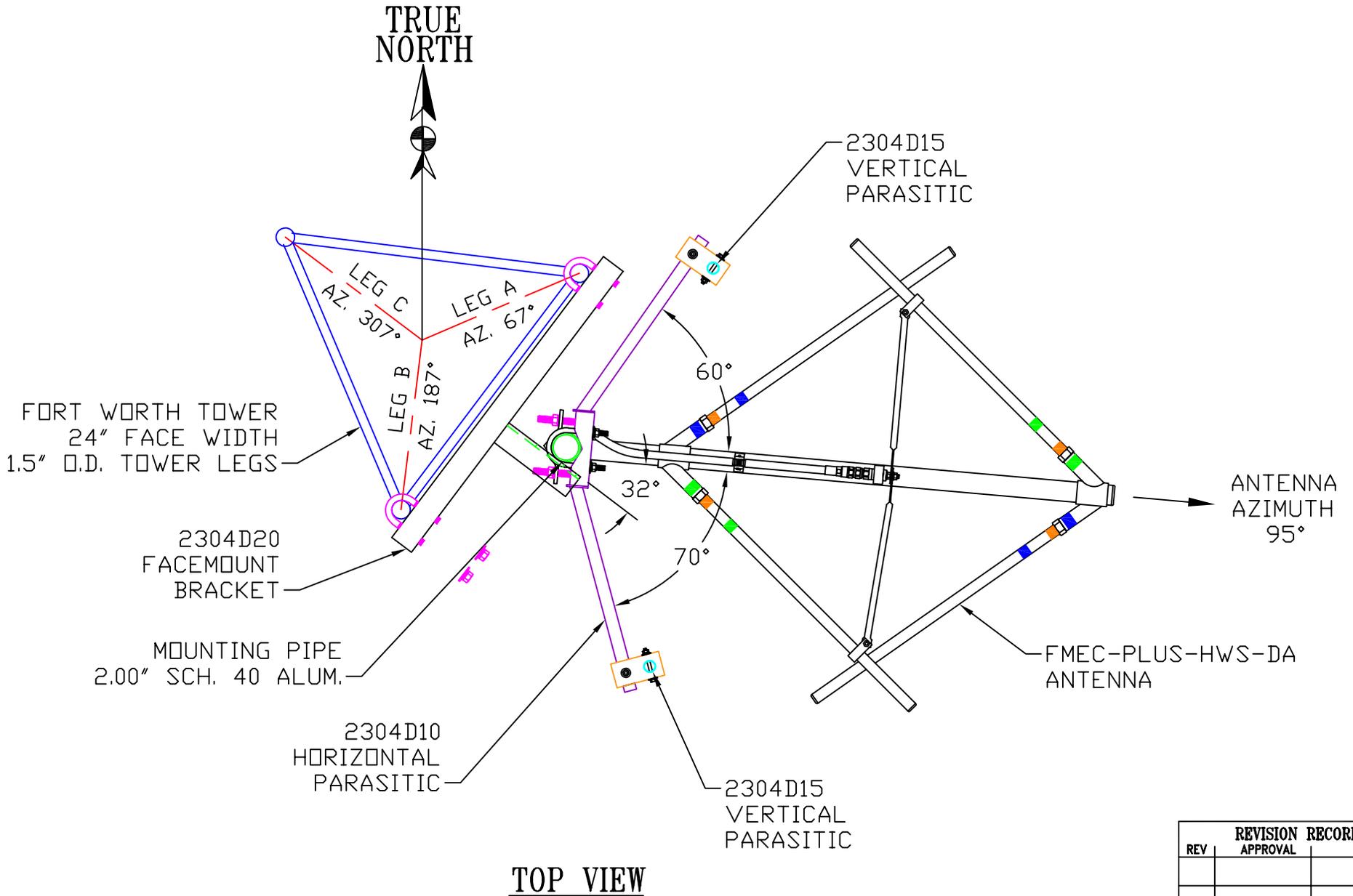
# APPENDIX

1. REFERENCE DWG. 2304D01 FOR ANTENNA ORIENTATION.
2. REFERENCE DWG. 2304D02 FOR BAY 1 PARASITIC PLACEMENT.
3. REFERENCE DWG. 2304D03 FOR BAY 2 PARASITIC PLACEMENT.
3. REFERENCE DWG. 2304D04 FOR BAY 3 PARASITIC PLACEMENT.
5. ITEMS ROTATED IN THIS VIEW FOR CLARITY ONLY.

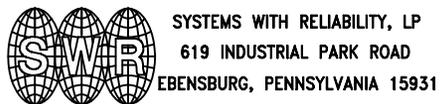


NOTE:

DRAWING NUMBER: 2304D01



REVISION RECORD		
REV	APPROVAL	DATE



TITLE: FMEC/3-PLUS-HWS-DA, FREQ. 99.5  
KAKS, GOSHEN, AR  
ANTENNA ORIENTATION  
FROM TRUE NORTH

MATERIAL:

SIZE: A

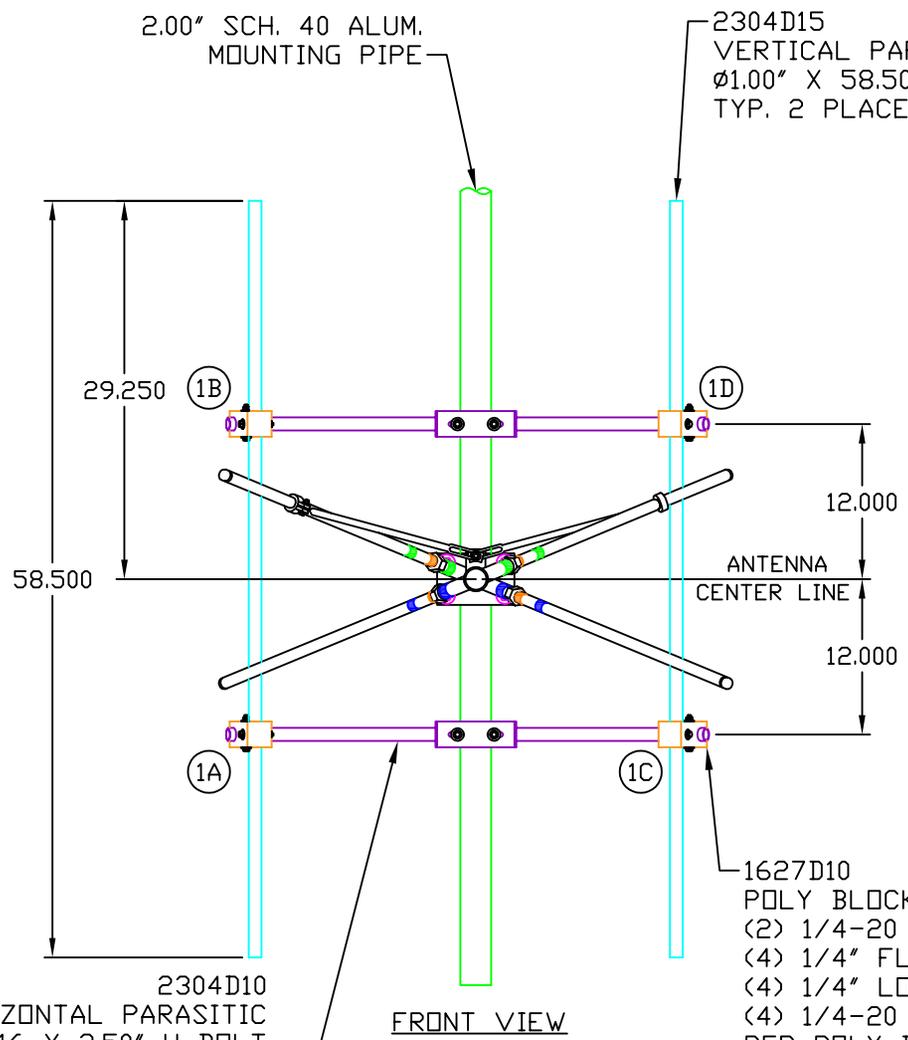
PARTS MADE BY THIS DRAWING

SCALE: NTS NAME: BJH DATE: 3/2/22 SHEET 1 OF 1

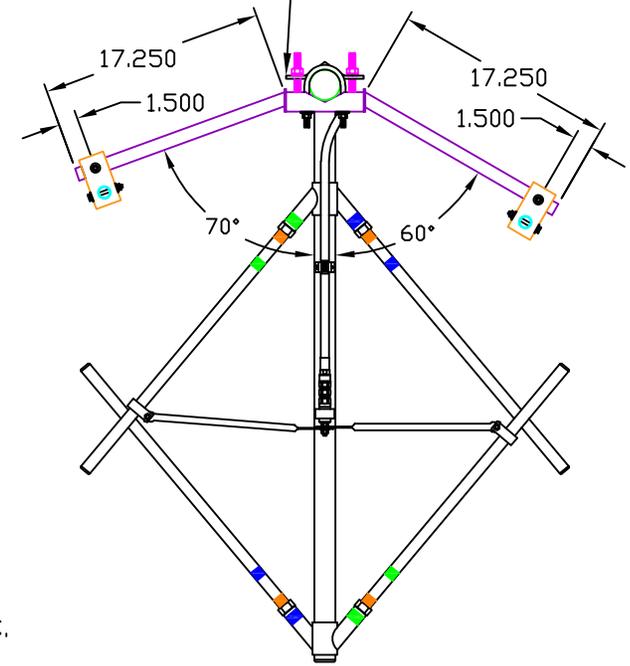
DRAWING NUMBER: 2304D01

NOTE:

THE POLY BLOCKS, VERTICAL & HORIZONTAL PARASITICS ARE FACTORY DRILLED AND LABELED MATCH EACH CORRESPONDING LABELED PART DURING INSTALLATION.



0987A15  
 DUAL UNIVERSAL SADDLE W/  
 (4) 1/2-13 X 4.00" H.H.C.S.  
 (4) 1/2" FLAT WASHERS  
 (4) 1/2" LOCK WASHERS  
 (4) 1/2-13 HEX HEAD NUTS  
 (FOR MOUNTING ANTENNA)

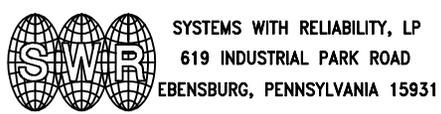


2304D10  
 HORIZONTAL PARASITIC  
 (1) 3/8-16 X 2.50" U-BOLT  
 (2) 3/8" FLAT WASHERS  
 (2) 3/8" LOCK WASHERS  
 (2) 3/8-16 HEX HEAD NUTS  
 TYP. 2 PLACES

1627D10  
 POLY BLOCK W/  
 (2) 1/4-20 X 2.50" H.H.C.S.  
 (4) 1/4" FLAT WASHERS  
 (4) 1/4" LOCK WASHERS  
 (4) 1/4-20 HEX HEAD NUTS  
 PER POLY BLOCK  
 TYP. 4 PLACES

TOP VIEW

REVISION RECORD		
REV	APPROVAL	DATE



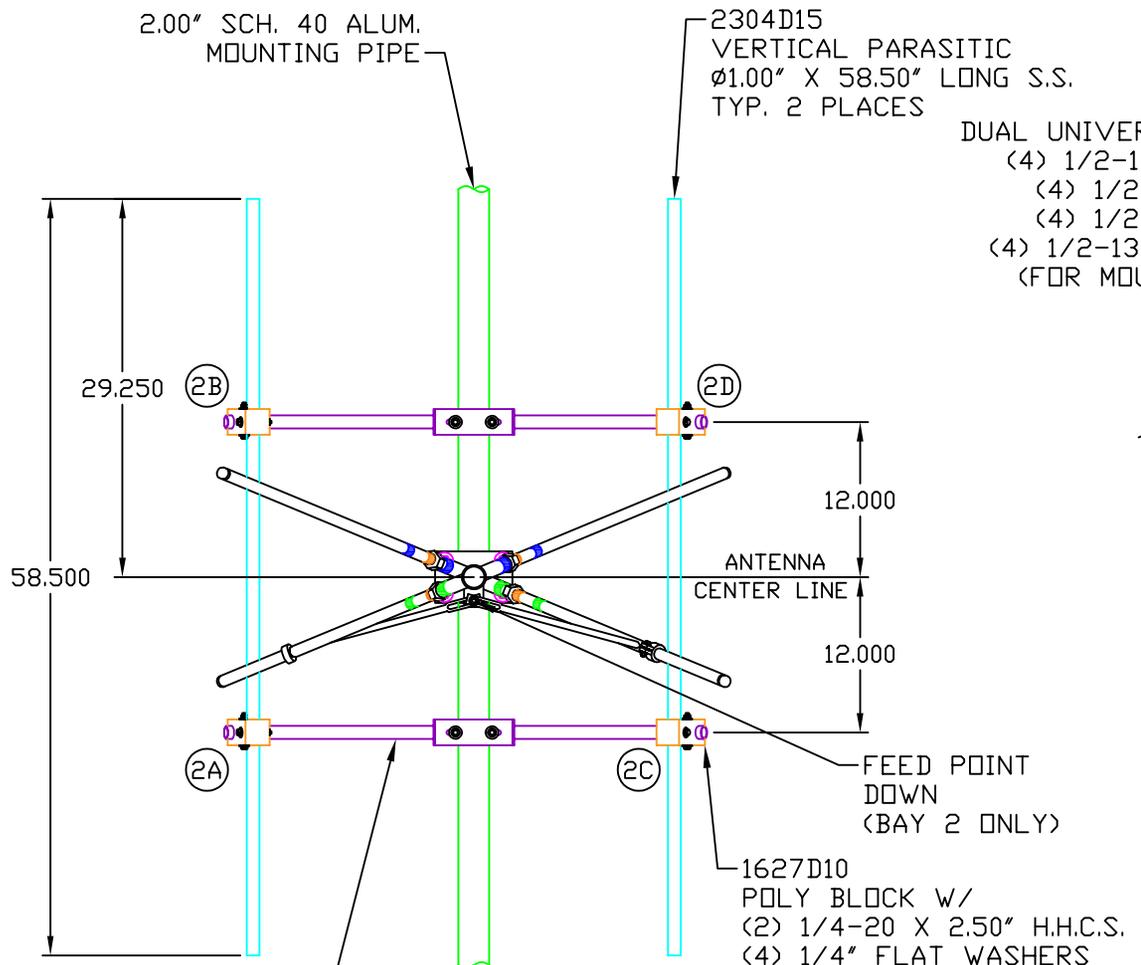
TITLE: FMEC/3-PLUS-HWS-DA, FREQ. 99.5  
 KAKS, GOSHEN, AR  
 BAY 1  
 PARASITIC PLACEMENT

SIZE: A  
 PARTS MADE BY THIS DRAWING  
 SCALE: NTS NAME: BJH DATE: 3/2/22

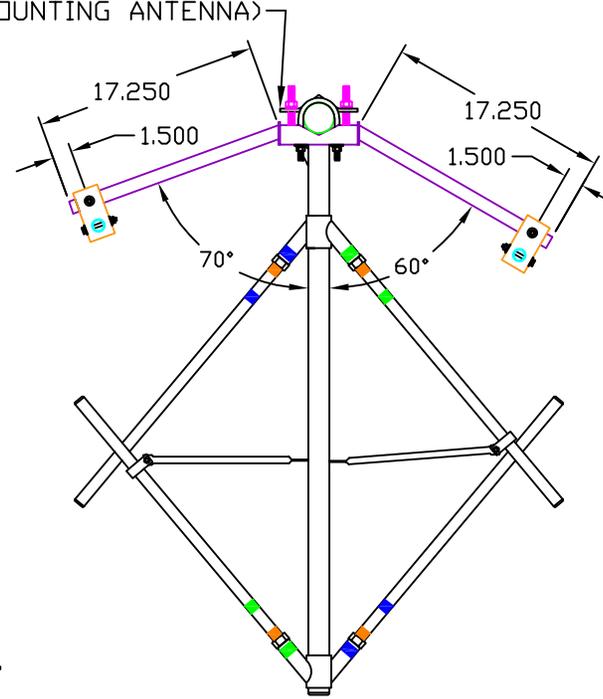
DRAWING NUMBER: 2304D02  
 SHEET 1 OF 1

NOTE:

THE POLY BLOCKS, VERTICAL & HORIZONTAL PARASITICS ARE FACTORY DRILLED AND LABELED MATCH EACH CORRESPONDING LABELED PART DURING INSTALLATION.



- 0987A15  
 DUAL UNIVERSAL SADDLE W/  
 (4) 1/2-13 X 4.00" H.C.S.  
 (4) 1/2" FLAT WASHERS  
 (4) 1/2" LOCK WASHERS  
 (4) 1/2-13 HEX HEAD NUTS  
 (FOR MOUNTING ANTENNA)



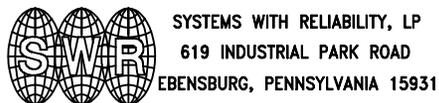
- 2304D10  
 HORIZONTAL PARASITIC  
 (1) 3/8-16 X 2.50" U-BOLT  
 (2) 3/8" FLAT WASHERS  
 (2) 3/8" LOCK WASHERS  
 (2) 3/8-16 HEX HEAD NUTS  
 TYP. 2 PLACES

- 1627D10  
 POLY BLOCK W/  
 (2) 1/4-20 X 2.50" H.C.S.  
 (4) 1/4" FLAT WASHERS  
 (4) 1/4" LOCK WASHERS  
 (4) 1/4-20 HEX HEAD NUTS  
 PER POLY BLOCK  
 TYP. 4 PLACES

FRONT VIEW

TOP VIEW

REVISION RECORD		
REV	APPROVAL	DATE



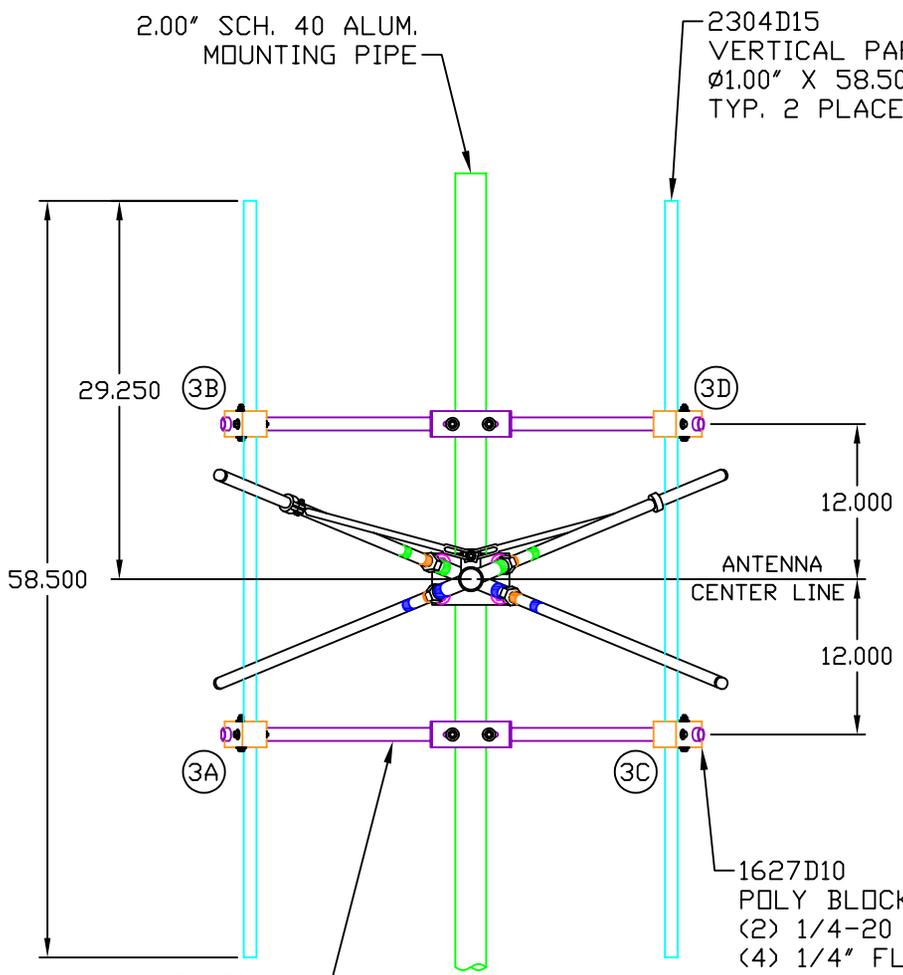
TITLE: FMEC/3-PLUS-HWS-DA, FREQ. 99.5  
 KAKS, GOSHEN, AR  
 BAY 2  
 PARASITIC PLACEMENT

SIZE: A  
 PARTS MADE BY THIS DRAWING  
 SCALE: NTS NAME: BJH DATE: 3/2/22

DRAWING NUMBER: 2304D03  
 SHEET 1 OF 1

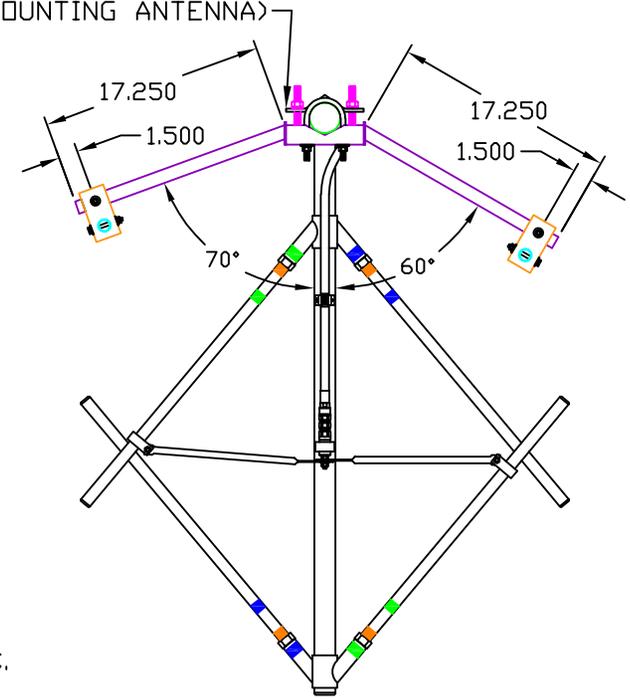
NOTE:

THE POLY BLOCKS, VERTICAL & HORIZONTAL PARASITICS ARE FACTORY DRILLED AND LABELED  
MATCH EACH CORRESPONDING LABELED PART DURING INSTALLATION.



FRONT VIEW

- 0987A15  
DUAL UNIVERSAL SADDLE W/  
(4) 1/2-13 X 4.00" H.H.C.S.  
(4) 1/2" FLAT WASHERS  
(4) 1/2" LOCK WASHERS  
(4) 1/2-13 HEX HEAD NUTS  
(FOR MOUNTING ANTENNA)

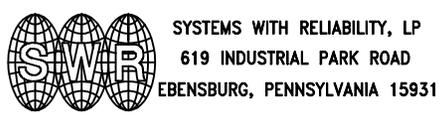


TOP VIEW

- 2304D10  
HORIZONTAL PARASITIC  
(1) 3/8-16 X 2.50" U-BOLT  
(2) 3/8" FLAT WASHERS  
(2) 3/8" LOCK WASHERS  
(2) 3/8-16 HEX HEAD NUTS  
TYP. 2 PLACES

- 1627D10  
POLY BLOCK W/  
(2) 1/4-20 X 2.50" H.H.C.S.  
(4) 1/4" FLAT WASHERS  
(4) 1/4" LOCK WASHERS  
(4) 1/4-20 HEX HEAD NUTS  
PER POLY BLOCK  
TYP. 4 PLACES

REVISION RECORD		
REV	APPROVAL	DATE

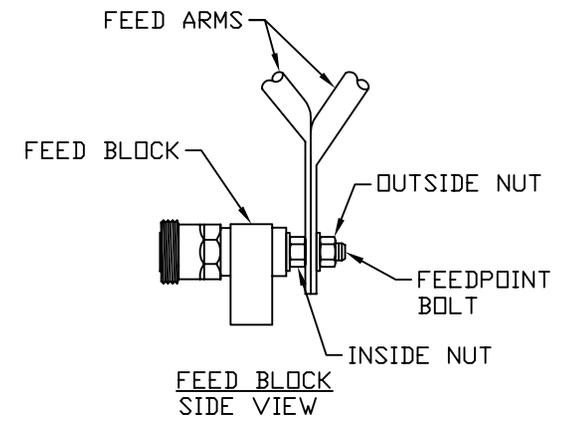
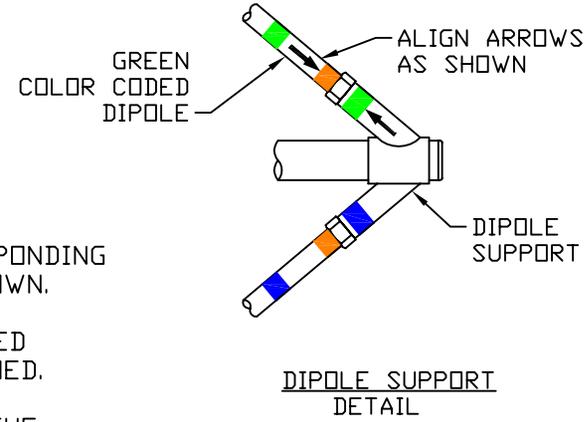
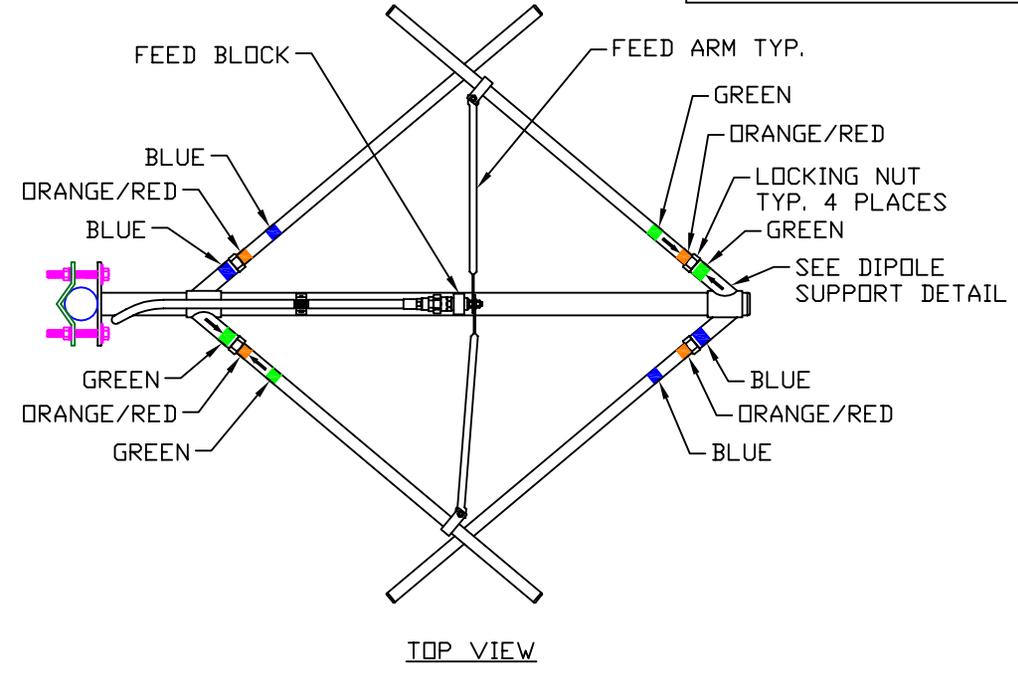
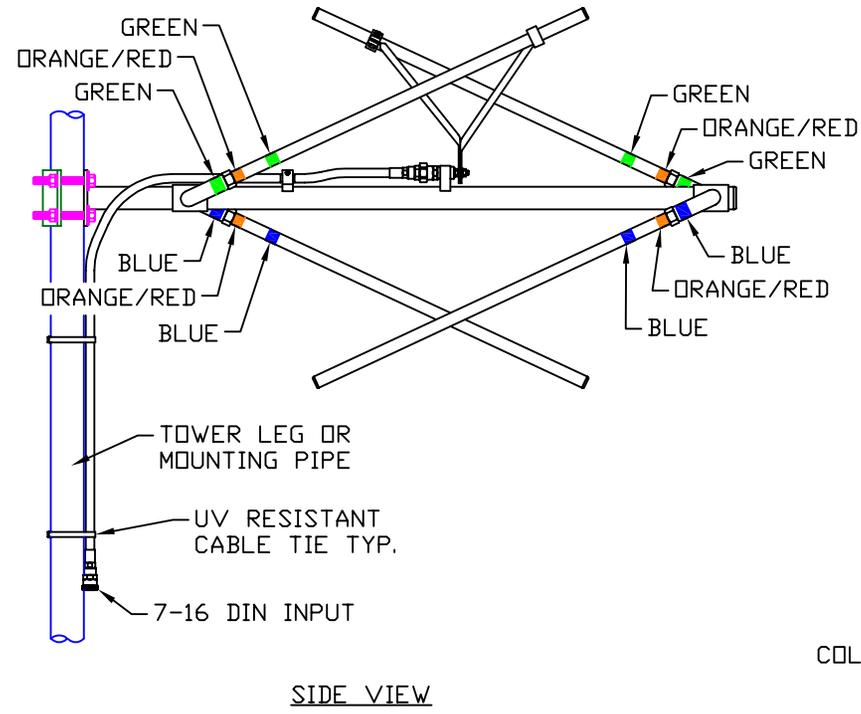


TITLE: FMEC/3-PLUS-HWS-DA, FREQ. 99.5  
KAKS, GOSHEN, AR  
BAY 3  
PARASITIC PLACEMENT

SIZE: A  
PARTS MADE BY THIS DRAWING  
SCALE: NTS NAME: BJH DATE: 3/2/22 SHEET 1 OF 1

DRAWING NUMBER: 2304D04

NOTE:

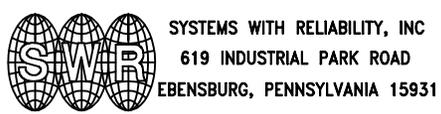


BAY ASSEMBLY PROCESS

1. INSERT THE COLOR CODED DIPOLES INTO THE CORRESPONDING DIPOLE SUPPORTS WITH THE ARROWS ALIGNED AS SHOWN. (SEE DIPOLE SUPPORT DETAIL)
2. THE EDGE OF THE ORANGE/RED TAPE MUST BE ALIGNED WITH THE EDGE OF THE LOCKING NUTS WHEN TIGHTENED.
3. ATTACH THE FEED ARMS ON THE GREEN COLOR CODED DIPOLES TO THE FEEDPOINT BOLT. CAREFULLY SNUG THE OUTSIDE NUT WHILE HOLDING THE INSIDE NUT. (SEE FEED BLOCK SIDE VIEW)

**NOTES:**  
DO NOT TWIST OR OVER-TIGHTEN THE FEEDPOINT BOLT. TWISTING OR OVER-TIGHTENING CAN CAUSE INTERNAL DAMAGE TO THE FEEDPOINT.

TOLERANCES		REVISION RECORD		
REV	APPROVAL	DATE		
.X	± .015			
.XX	± .005			
.XXX	± .002			
X/X	± 1/32			
DEG.	± 1/2			
UNLESS OTHERWISE SPECIFIED				
2		10/10/17		
1		9/1/15		



TITLE: FMEC PLUS ASSEMBLY (BREAKDOWN VERSION)

MATERIAL:

SIZE  
A

PARTS MADE BY THIS DRAWING

SCALE: NTS NAME: RAC DATE: 6/13/11 SHEET 1 OF 1

DRAWING NUMBER: 0887D15

NOTE:

DRAWING NUMBER: 0887D16

1/2" WRENCH ON INSIDE NUT

FEEDPOINT BLOCK



1/2" WRENCH ON OUTSIDE NUT

FEED ARM TYP.

FEEDPOINT BOLT

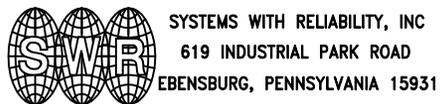
NOTES:

1. INSTALL THE FEED ARMS ON THE FEEDPOINT BOLT AS SHOWN.
2. USE (1) 1/2" WRENCH TO HOLD THE INSIDE NUT IN PLACE WHILE SNUGGING THE OUTSIDE NUT WITH ANOTHER 1/2" WRENCH.

CAUTION:

DO NOT TWIST OR OVER-TIGHTEN THE FEEDPOINT BOLT. OVER-TIGHTENING CAN CAUSE INTERNAL DAMAGE.

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



TITLE: FMEC FEEDPOINT INSTALLATION

MATERIAL:

SIZE  
A

PARTS MADE BY THIS DRAWING

DRAWING NUMBER: 0887D16

SCALE: NTS NAME: RAC DATE: 7/27/11 SHEET 1 OF 1