23dBi Flat Panel Antenna Array
Wireless Outdoor Bridge
UNII-3, 5.8 GHz Band

EDCS-175754

Version 15.0

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1 Top Level Description

1.1 Introduction

The purpose of this document is to specify a flat panel, microstrip patch antenna array and its radome for use with a UNII-3 band outdoor bridge. This antenna/radome assembly will be mounted directly to the outdoor bridge transceiver housing to provide an integrated transceiver and antenna solution.

1.2 Functional Overview

The antenna provides an interface between the desired radiated signal, i.e. an electromagnetic wave in free space, and the RF Module of the Pegasus outdoor bridge. The radome provides an environmentally sealed enclosure for the antenna with minimal impact to the radiation characteristics of the antenna. The antenna ground plane also serves as the cover plate for the transceiver housing that is attached to the antenna.

1.3 Terminology and Abbreviations

This section lists and defines commonly used terms and abbreviations.

DB	decibels
DBc	decibels relative to peak of radiation pattern
DBi	decibels relative to an isotropic radiator
°	degrees
E-plane	Plane of the Electric Field
H-plane	Plane of the Magnetic Field
I/O	Input/Output
MHz	Megahertz
RH	Relative Humidity
RMS	Root Mean Square
T/R Switch	Transmit/Receive Switch
UNII	Unlicensed National Information Infrastructure
UV	ultraviolet
VSWR	Voltage Standing Wave Ratio
W	watts

2 Antenna Description

2.1 Microstrip Patch Antenna Array

The antenna shall be a flat panel, microstrip patch antenna array. The particular implementation of the microstrip array is not specified herein, e.g. the corporate feed network can be realized with a co-planar, aperture coupled or post fed structure. The implementation which yields the lowest cost antenna satisfying the requirements herein should be utilized.

The microstrip patch antenna array should be configured in a square patch array (see Figure 1) as opposed to a diamond patch array since the former configuration typically yields better aperture efficiency than the latter configuration, with the latter typically yielding better sidelobe rejection performance. The vendor shall state compliance with this configuration and subsequently not deviate from this configuration throughout the product life cycle.

The antenna will be linearly polarized. The orientation of the antenna will determine whether the polarization is vertical or horizontal. The beamwidths in both principal polarization planes of the antenna will be approximately equivalent so that the patterns will be functionally equivalent in both polarization orientations.

For the purposes of thermal dissipation, Cisco will utilize tapered cylindrical pin fins perpendicular to the rear vertical surface of the transceiver housing. Hence the cooling properties of the transceiver housing will not be affected by the physical orientation of the transceiver housing/antenna assembly when the antenna is physically rotated 90 degrees to achieve one of the two linear polarizations.

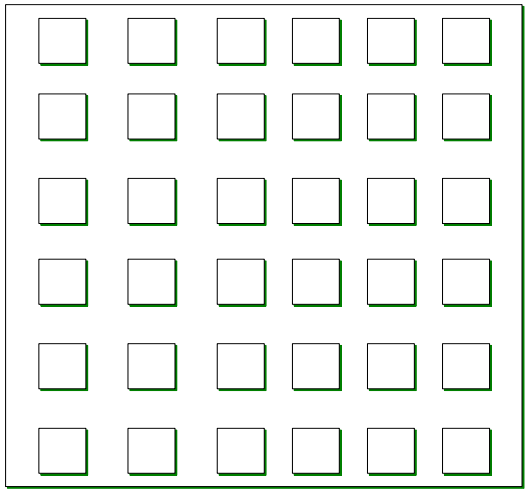

Figure 1: Depiction of a Square Microstrip Patch Antenna Array

2.2 Radome

The radome shall provide an environmentally sealed enclosure for the antenna with minimal impact to the radiation characteristics of the antenna. See Figure 2 for a front view of the radome. The transmissivity of the radome itself will not be specified herein because the gain and beamwidth specifications of the antenna are intended to include the effects of the radome, however it is expected that the radome material will have a low dielectric constant and low loss tangent, and a low material thickness in order to yield a minimal transmissivity loss. The vendor shall state that the antenna specifications are met with the radome in situ.

The radome and the antenna shall be provided together as a weatherproofed assembly. Hence the radome shall be fastened directly to the antenna ground plane and the resulting interface shall be sealed.

The radome shall be constructed either of high impact plastic and shall be UV stabilized in order to provide a minimum life expectancy of seven years.

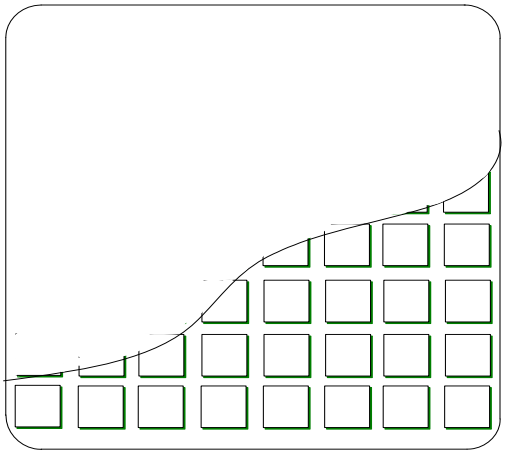

Figure 2: Front View of Radome with Cutaway View of Internal Antenna

2.3 Antenna Ground Plane

The ground plane shall be sized such that it fits within the overall antenna dimensions provided in section 3. Note that the ground plane will provide structural support and be utilized as the cover plate to the transceiver housing. Thus the ground plane thickness shall be 0.079” (2.0 mm). The outer conductor of the coaxial connector shall be electrically connected to the ground plane of the antenna. The flatness over the entire surface must be within 0.020” (0.5 mm).

The rear surface of the antenna ground plane shall provide the mechanical and electrical interfaces to the transceiver housing and transceiver’s antenna port, respectively. See Figure 3 for a rear view of the antenna ground plane. Sixteen mounting locations are shown around the perimeter of the backplate. These shall be stainless steel threaded standoffs, press-fit inserts into the rear of the antenna metallic ground plane. The thread size shall be 6-32 and the height above the ground plane when mounted shall be 0.234”. Two guide pin locations are shown. These shall be stainless steel guide pins, press-fit inserts into the rear of the antenna metallic ground plane. The guide pins shall protrude 0.671” above the ground plane when inserted from the radome/antenna side of the ground plane. Note the N female coaxial connection shown on the horizontal centerline and the vertical centerline of the antenna. The N connector shall protrude exactly 0.766” from the transceiver side of the antenna ground plane.

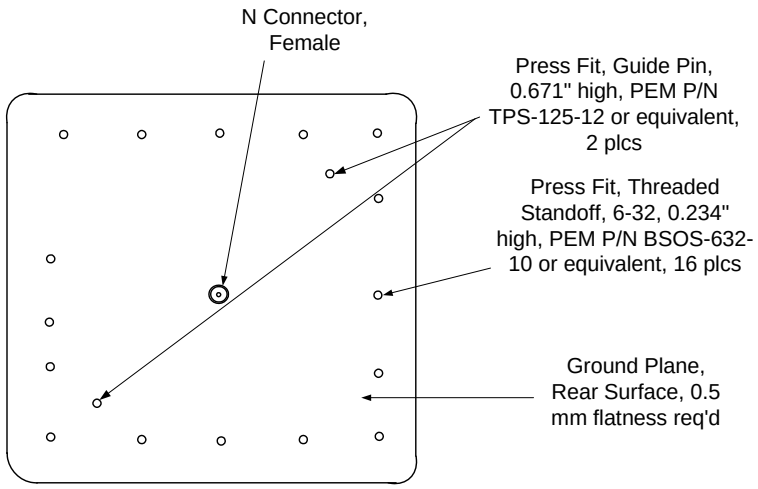

Figure 3: Rear View of Antenna Ground Plane

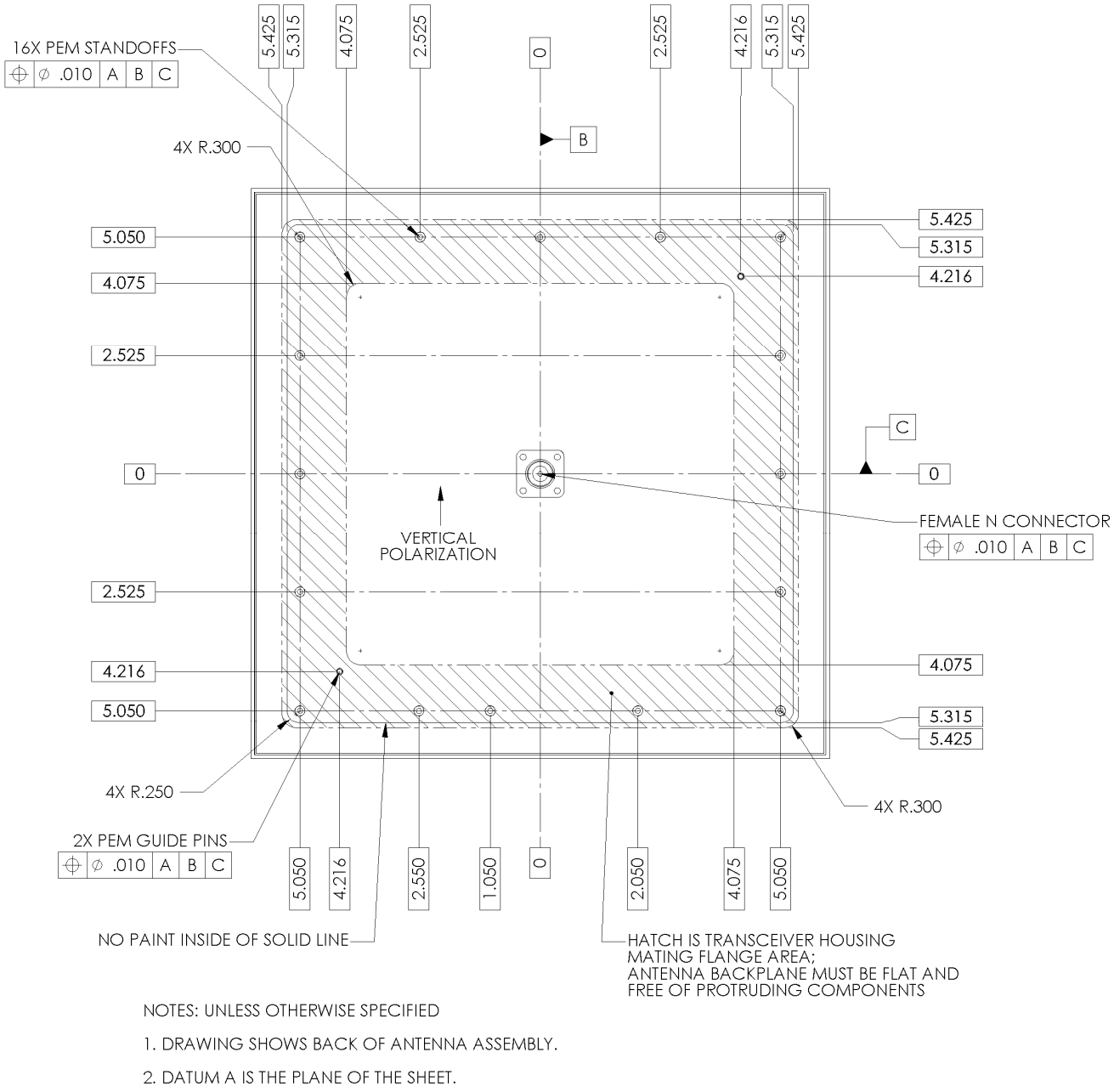

Figure 4: Exact Mounting Hole and Guide Pin Location

See Figure 4 for the exact hole pattern for the mounting standoffs, guide pins and antenna connector.

The transceiver housing shall mate to the antenna ground plane as shown in side view below in Figure 5.

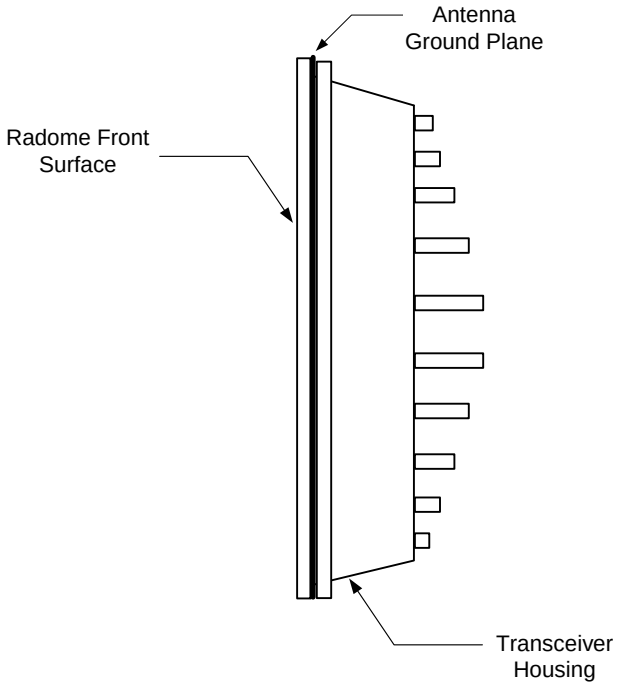

Figure 5: Side View of Antenna/Transceiver Assembly

2.4 Coaxial Connection to Transceiver

The antenna I/O port shall be a N, jack (female), flange mounted, coaxial connector to interface with the coaxial connection to the transceiver antenna port. Again, see Figures 3 and 4 for location of connector.

3 Specifications

The following table specifies electrical performance of the antenna. Notes:

- All parameters are over all operating and environmental conditions
- All parameters are inclusive of effects of antenna radome
- All parameters are inclusive of measurement error, unless specified as 'typical'

3.1 Electrical and Mechanical Specifications

Parameter	Value	Units
Frequency Range	5725 – 5825	MHz
Gain, In-band	22.0, min	dBi
Gain, In-band	23.5, max	dBi
VSWR	1.5:1, max	-
Gain, Out-of-band	7 @ 4.5 – 5.15 GHz, typ 15 @ 5.35 – 5.46 GHz, typ 3 @ 7.25 – 7.75 GHz, typ	dBi
H-plane half-power beamwidth	12.0, min	°
E-plane half-power beamwidth	10.0, min	°
Polarization options (linear)(1)	Hor/Vert	-
Cross-polarization discrimination over boresight ± 5°	20, min	dB
Radiation Pattern Envelope, H-Plane (see Figure 6)	-24, max, between -180° and -40° -14 + 0.25 * angle in degrees, max, between -40° and -24° -14 - 0.25 * angle in degrees, max, between 24° and -40° -24, max, between 40° and 180°	dBc
Radiation Pattern Envelope, E-Plane (see Figure 7)	-20, max, between -180° and -90° -2 + 0.2 * angle in degrees, max, between -90° and -80° -18, max, between -80° and -20°	dBc

	-18, max, between 20° and 56° -32 + 0.25 * angle in degrees, max, between 56° and 68° -15, max, between 68° and 80° 5 + 0.25 * angle in degrees, max, between 80° and 100° -20, max, between 100° and 180°	
Input RMS power	4.0, max	W
Size, including radome	13.5 x 13.5, max; 11.5 x 11.5, min	inches
Weight	3.3, max	Lbs.

Notes:

1. Polarization determined by orientation of antenna, i.e. physically rotate antenna 90° to obtain either horizontal or vertical polarization. Must be configurable during installation. Antenna and transceiver shall not require disassembly in order to change polarization.

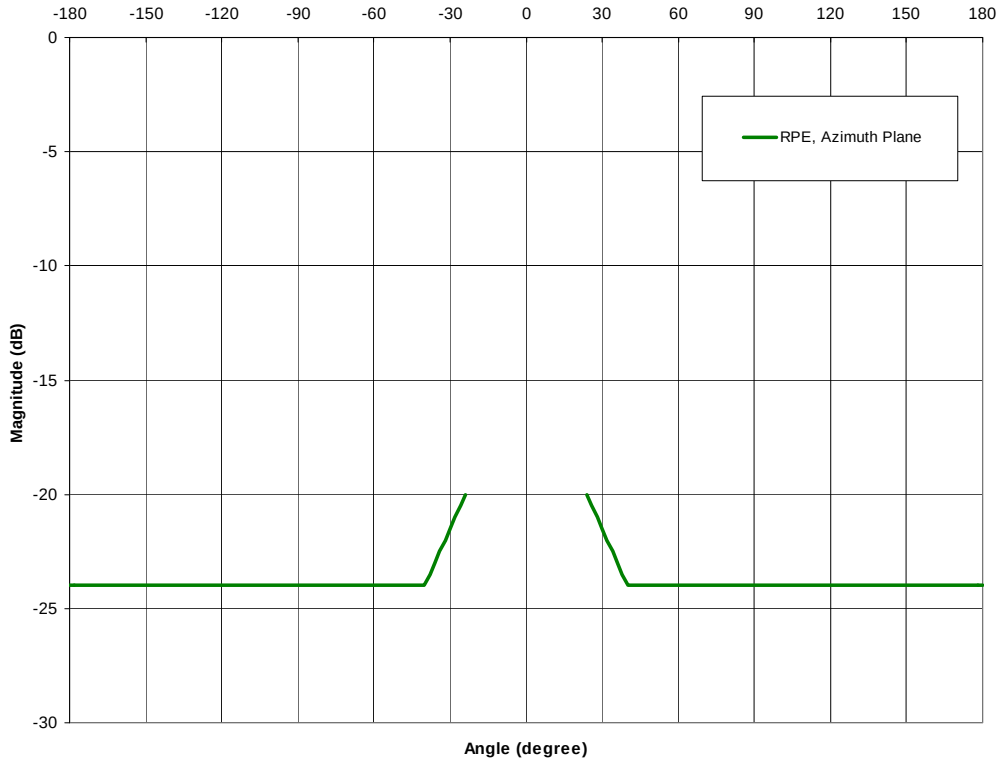

Figure 6: Radiation Pattern Envelope, Azimuth Plane

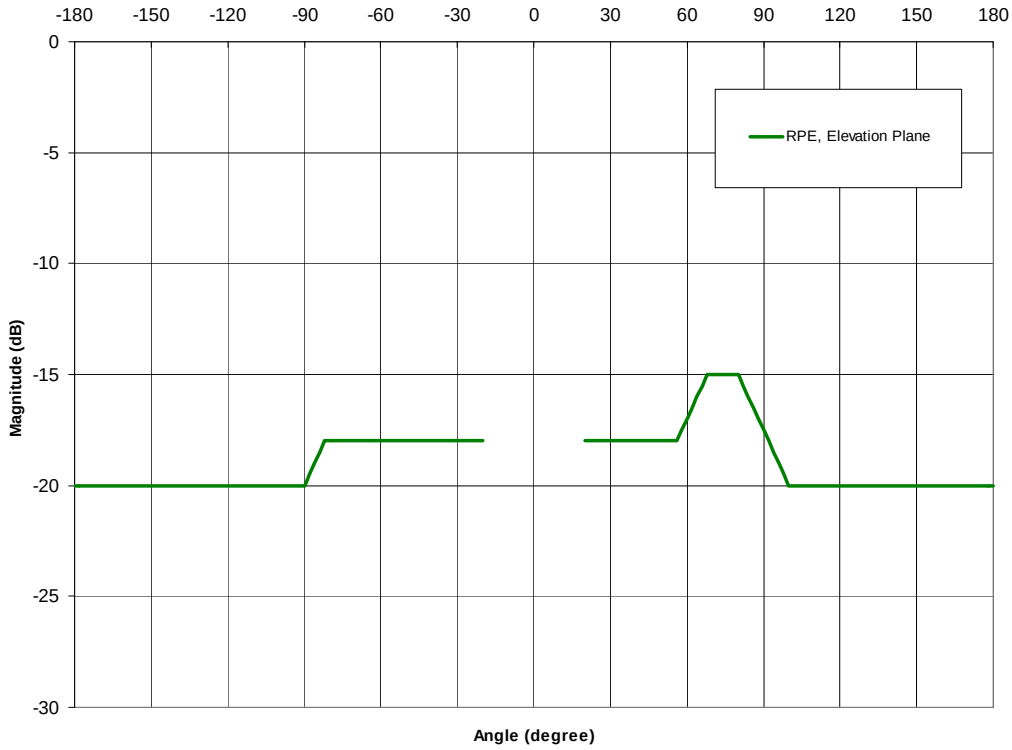

Figure 7: Radiation Pattern Envelope, Elevation Plane

3.2 Environmental Specifications

Environmental & Regulatory Requirements		
Temperature		
Operating	-30°C	Min
	+70°C	Max
Storage	-40°C	Min
	+85°C	Max
Altitude		
Operating	10000 feet	Max
Storage	16000 feet	Max
Flammability		
Antenna	UL94-HB	
Radome	UL94-HB	
Radome Color	Cisco Medium Gray	Cisco Specification 95-5818-01
Humidity	0 - 100% RH	Condensing
Watertight Enclosure	No water enters antenna after exposure to a stream of water for 3 minutes of 240 L/minute or greater	Per NEMA 250-1997, Type 4, paragraph 5.7, Hosedown Test, hose with nozzle having inside diameter of 25 mm, nozzle held from 3.0 to 3.5 m away from the antenna, and the spray directed at joint between radome and ground plane
Impact resistance	Survive 4.0" drop without damage, with 10 lbs. attached to backplate	Drop on one corner, one face, one edge each. Goal of 11.0" drop without damage.
Lightning Protection	Antenna Elements at DC Ground Potential	Preferred configuration, not hard requirement