

ATTACHMENT 2

ANTENNA SPECIFICATIONS

AURA-LE Antenna Specification Sheet

The AURA-LE AES antenna is a mechanically steered phased array antenna using CoMPA™ (Coherent Multi Plate Antenna) technology. It is comprised of two dual-polarization panels with full receive and transmit bandwidth capability. The system is designed as two receive/transmit flat panels with appropriate provisions for coherent combining of the two flat panels to form effectively one larger elliptical narrow beam receive/transmit array with an elevation range of 0° to 90°.

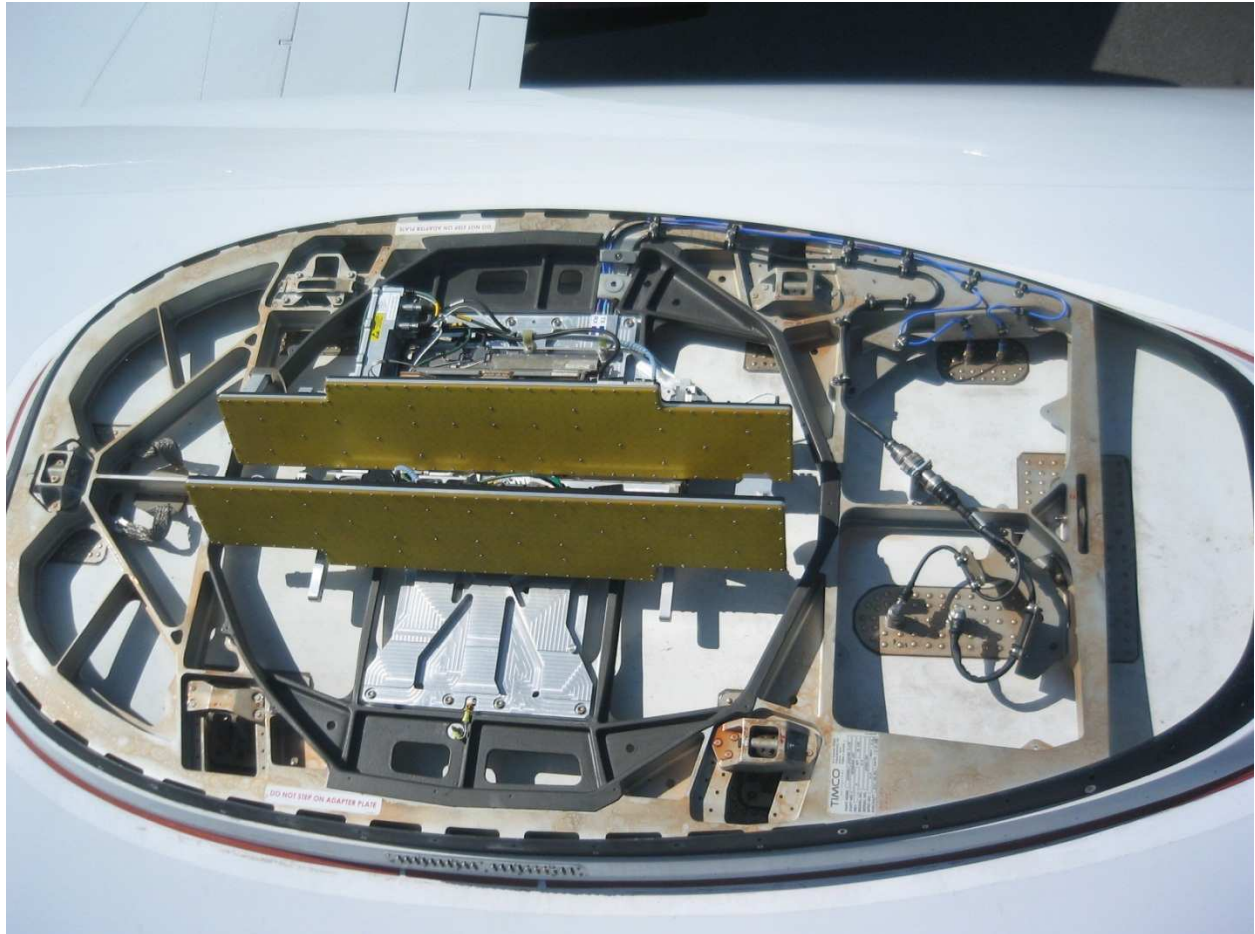


Figure 1. AURA-LE Antenna.

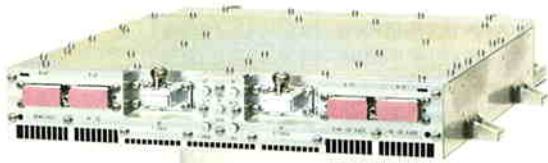
Table 1. Summary of AURA-LE Antenna Technical Parameters

MECHANICAL	
Swept Volume	8.120 x 36.650 inches
Type of Antenna	Dual panel waveguide fed planar array
Azimuth	continuous coverage over full 360°
Elevation	0 to 90° antenna elevation
Position accuracy	Meets FCC 47 CFR §25.222
Dynamic Tracking capability	AZ velocity 40°/Sec EL velocity 20°/Sec maximum AZ acceleration 40°/Sec ² EL acceleration 15°/Sec ² maximum
Weight	80 pounds, maximum
ENVIRONMENTAL	
Environmental	Meets RTCA/DO-160F
DC Power	28 VDC ± 10%
DC Power Consumption	315 Watts, maximum
TRANSMIT	
Frequency (GHz)	14.0 to 14.5 GHz
Rated SSPA Output Power	20 watts, effective
Transmit Gain	38 dBi
EIRP	48 dBW
Transmit Polarization	H, V
Transmit Azimuth Beamwidth	1.25 degrees
Transmit Elevation Beamwidth	4 degrees
Cross-pol isolation	20 dB, typical
RECEIVE	
Frequency (GHz)	10.7 to 12.75 GHz in five switched receive bands
G/T	9 dB, minimum 12 dB, typical
Receive Polarization	H, V, LHCP, RHCP
Receive Azimuth Beamwidth	1.6 degrees
Receive Elevation Beamwidth	5 degrees
Cross-pol isolation	15 dB, typical (wideband, 500 MHz) 20 dB, typical (narrowband, 36 MHz)

Ku-Band Aeronautical Mobile Satellite Tx/Rx Antenna



Antenna main unit



PCU : Polarization Control Unit

FEATURES:

- Ultra-low profile elliptical aperture dual reflector configuration mechanically scanned antenna
- Good RF performance with low additional aerodynamics drag down to low elevation looking angles
- Precise satellite and polarization tracking capabilities maintained in aeronautical dynamic environment
- Meets Aeronautical Mobile Satellite Services (AMSS) requirements under the Fixed Satellite Services (FSS) regulations
- State-of-the-arts component design
 - High efficiency 40 Watt SSPA
 - Ultra-thin broadband OMT

Note:

This antenna was initially designed for Connexion by BoeingSM (CbBSM) services and was produced between 2004 - 2006. Now MELCO seeks new applications for the antenna.

The Mitsubishi Electric Corporation (MELCO) Ku-band Aeronautical Mobile Satellite antenna is designed for AMSS applications. An EI over Az antenna mount is employed to lower the antenna profile. The antenna receives linearly polarized signals from a GEO satellite in the 11.2 - 12.8 GHz band, covering the Ku band frequency allocations in all ITU regions. The diplexer and LNA are installed behind the main reflector. Dual polarization signals can be received. Transmission to the satellite is linearly polarized in the 14.0 - 14.5GHz band. A 40 watt Solid State Power Amplifier (SSPA) having more than 21.9 % efficiency is employed for high data rate transmission with less heat dissipation. The up and down frequency converters are installed separately from the antenna main unit. The IF frequency is in the 950 - 1,450 MHz band. Az/EI angles of the antenna are controlled by an Antenna Control Unit (ACU) to track the satellite. The ACU determines the fuselage's attitude from an aircraft Inertia Reference Unit (IRU) and Az/EI estimates are provided by angular rate sensors in the ACU. Any drift of IRU and/or rate sensors can be compensated by periodical step tracking iterations.

To meet FSS requirement the polarization angle setting is precisely controlled. Given the angles toward a targeted satellite and the stored data of the transponder polarizations in the onboard equipment, the polarization angle is calculated in the ACU. The antenna transmit polarization angle is determined by the power ratio between two orthogonal linearly polarized components. The power ratio is controlled by the phase shifter of Variable Polarization Controllers (VPCs) of the Polarization Control Unit (PCU.) As a result of precise polarization control, low Cross Polarization Discrimination (XPD) can be achieved.



The antenna on the fuselage

Major Performance Specifications

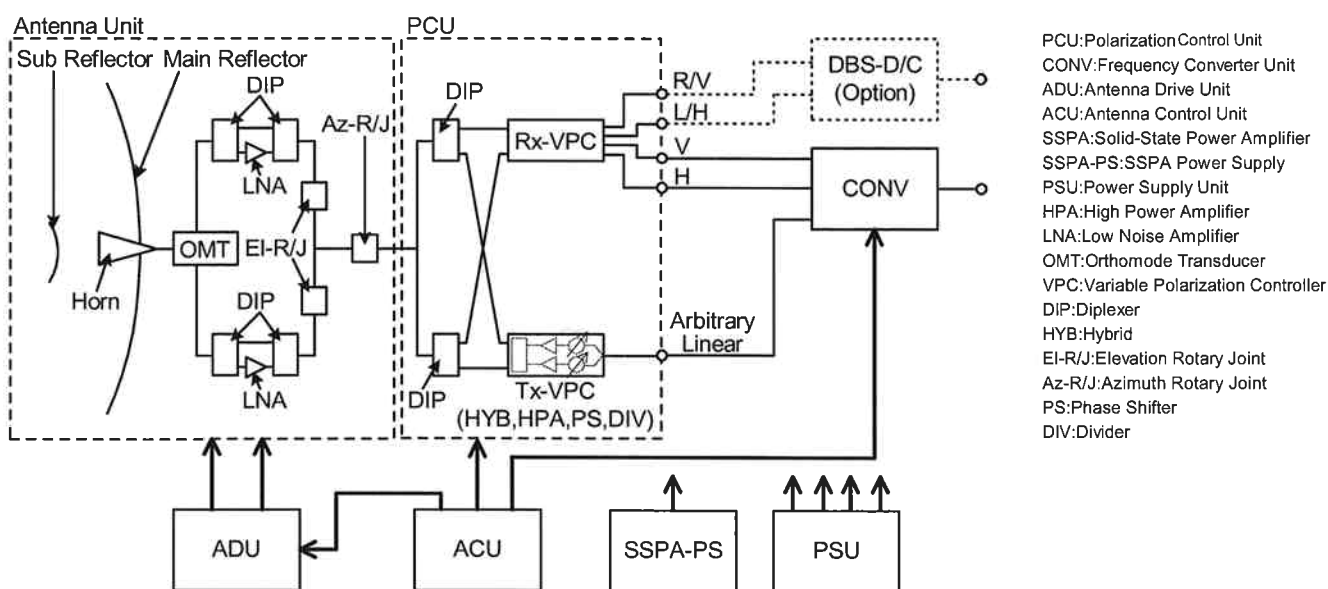
Antenna mechanics and satellite tracking performance:

Antenna Type	Dual Reflector Antenna with an elliptical aperture	
Antenna Mount	Azimuth - Elevation Mount	
Angular Tracking System	Navigation Track Mode & Step Track Mode	
Polarization Tracking System	Navigation Track Mode (Phase control by VPC)	
Pointing Accuracy	Azimuth	0.25 deg rms
	Elevation	0.60 deg rms
Angular Travel	Azimuth	360 deg continuous
	Elevation	0 - 90 deg
Driving Speed	Azimuth	>120 deg/ 5 sec
	Elevation	> 60 deg/ 5sec
Dimensions	Antenna	812mm(W) x 832mm(D) x 239mm(H)
	Reflector	684mm(W) x 198mm(H)
Weight	Antenna	41.5 kg

RF equipment performance:

Frequency	TX	14.0 - 14.5 GHz
	RX	11.2 - 12.8 GHz
Polarization	TX	Arbitrary Linear
	RX	Arbitrary Linear/Circular(RHCP/LHCP)
Antenna Gain	TX	32.2dBi
	RX	29.3dBi (11.2 GHz) 30.6dBi (11.9 - 12.8 GHz)
G/T	RX	8.0dB/K (EI = 90deg, 11.2 - 11.7 GHz)
		9.3dB/K (EI = 90deg, 11.9 - 12.8 GHz)
EIRP	TX	17.2 - 47.2 dBW (Dynamic range: 30dB)
EIRP Control	TX	<0.5 dBrms @EIRP=42.2 - 47.2 dBW <0.6 dBrms @EIRP=37.2 - 42.2 dBW <1.0 dBrms @EIRP=27.2 - 37.2 dBW <1.6 dBrms @EIRP=17.2 - 27.2 dBW
XPD	TX	<17dB
	RX	<15dB

Block Diagram



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