

Exhibit 2: Satellite Cesium Nightingale Ka-band + S-band Radio

This exhibit provides a detailed overview of the technical characteristics for the Cesium Astro Ka-band Nightingale radio with additional S-band transceiver capabilities. The Nightingale is a DVB-S2 ETSI EN 302 307 transmitter that consists of five major components: a Ka-band Active Phased Array (APA), a Software-Defined Radio (SDR), a Single-Board Computer (SBC), a Power Conditioning Unit (PCU) and an Up/Down Converter. The S-band portion of the transceiver will be used to uplink and downlink communications for TT&C operations, and is designed to work in accordance with the CCSDS standard.

Figure 1 provides a rendering of the Nightingale I with the Ka-band phased array mounted on top.

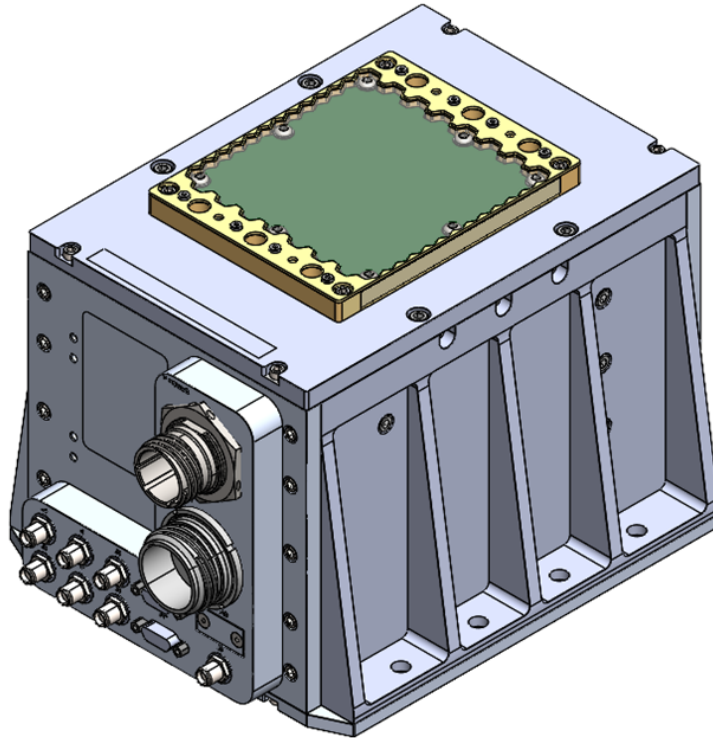


Figure 1: Cesium Astro Nightingale I

Ka-band Transceiver Specifications:

- Frequency Range: 25.5 - 27.0 GHz
- Number of Elements: 1 tile (186 elements)
- Single or Multi-beams: Single
- Gain: 27 dBi
- Maximum Steering Angle: 60 deg

- Polarization: RHCP
- Maximum Bandwidth: 120 MHz per channel
- Modulation: QPSK, 8-APSK, 16-APSK, 32-APSK
- Tx Parameters
 - EIRP: 30 dBW
 - Maximum Data Rate: 500 Mbps per channel

Cesium Nightingale 1 APA / Mobile Single-Tile Ka-Band Ground Station Antenna Patterns

These antenna patterns characterize the Nightingale 1 APA payload antenna and the mobile Ka-band Single-Tile ground station antennas for transmit and receive, boresight to max steering.

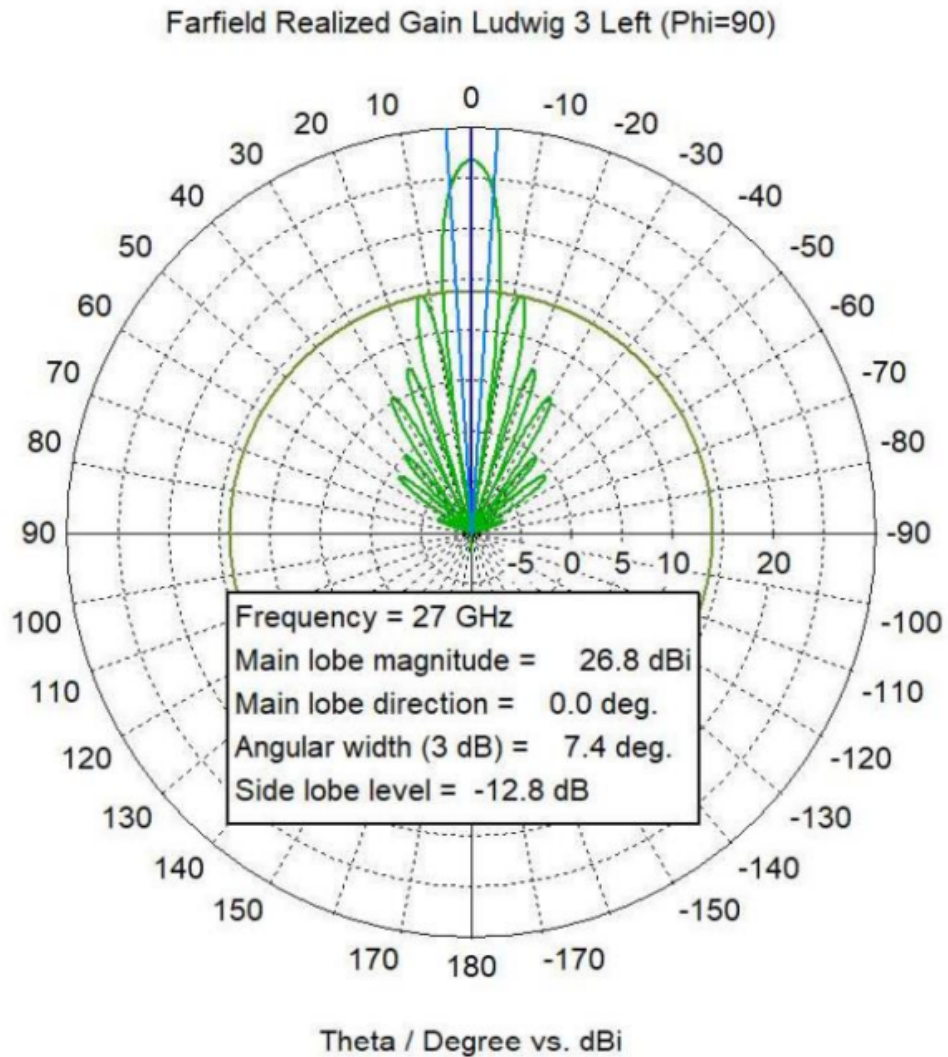
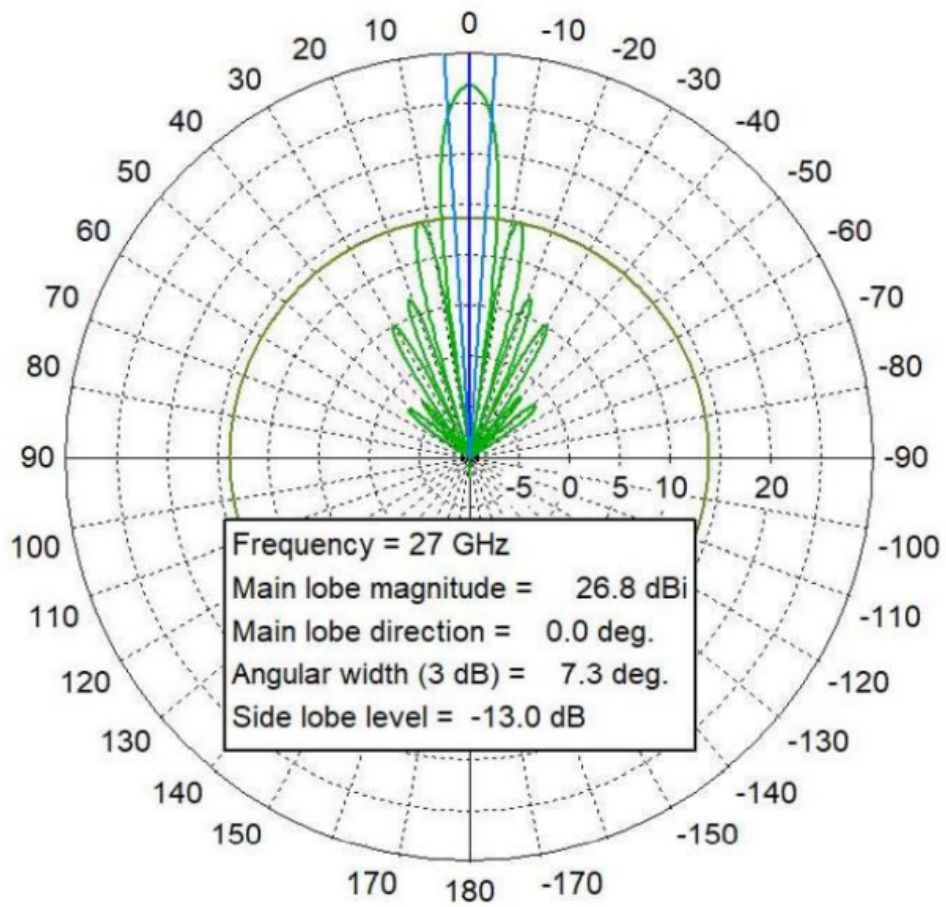


Figure 2: Ka-band Phased Array Pattern

Farfield Realized Gain Ludwig 3 Left (Phi=0)



Theta / Degree vs. dBi

Figure 3: Ka-band Phased Array Pattern

Farfield Realized Gain Ludwig 3 Left (Phi=0)

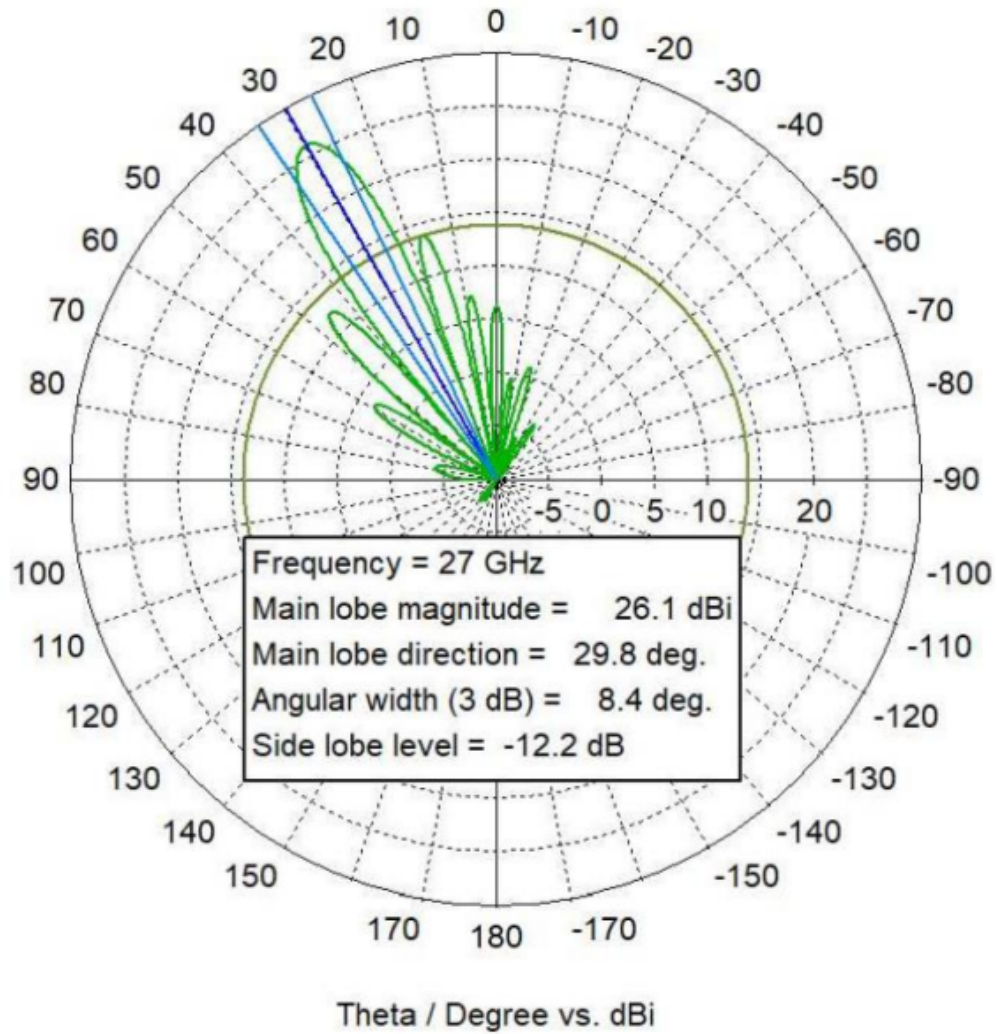


Figure 4: Ka-band Phased Array Pattern

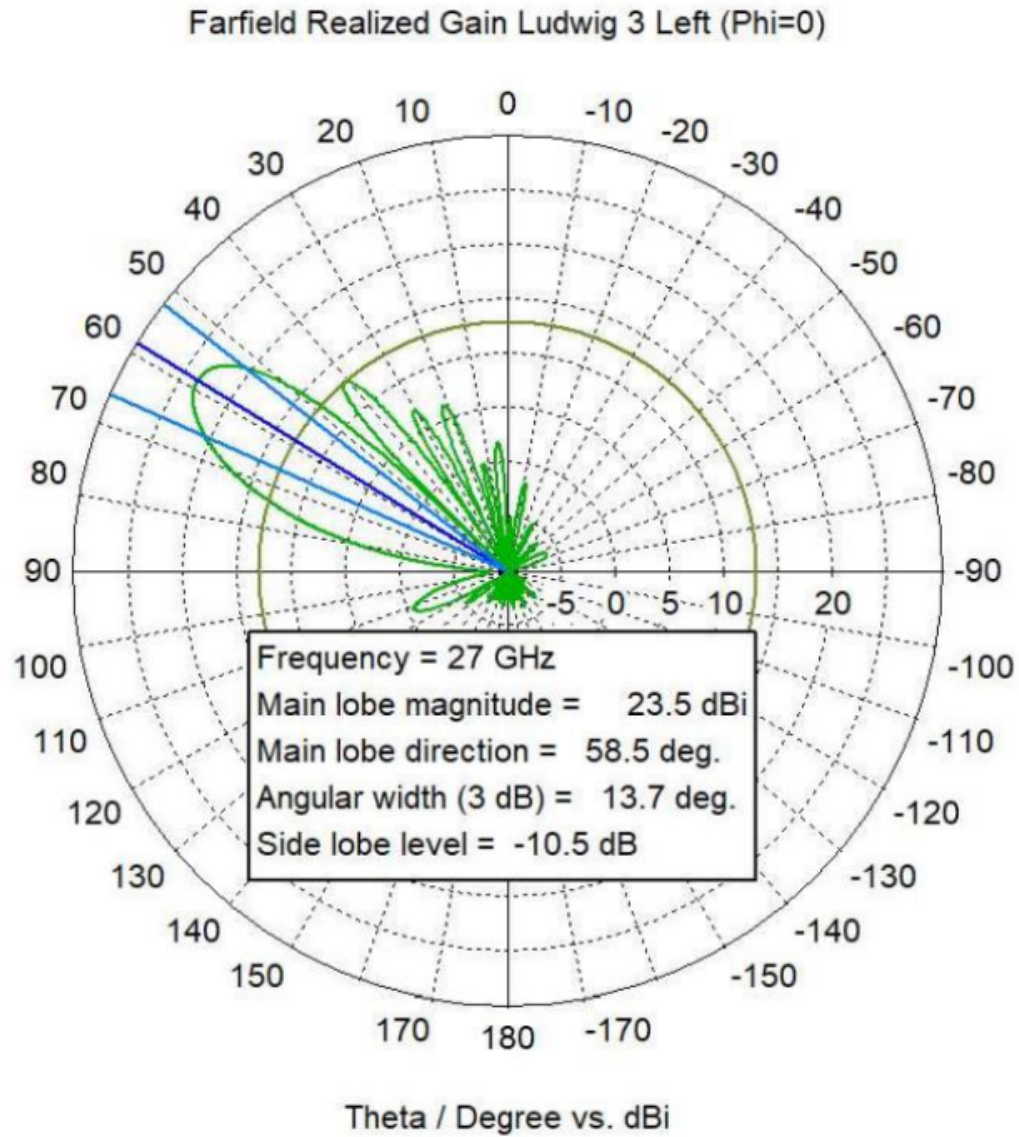


Figure 5: Ka-band Phased Array Pattern

Figure 6 provides a rendering of the two S-band patch antenna that will support TT&C operations.

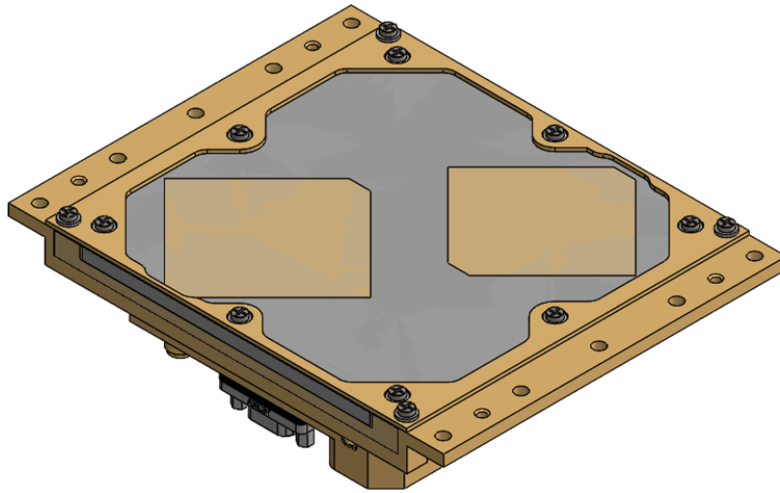


Figure 6: Cesium Astro Nightingale I S-band Patch Antenna

Cesium Astro S-band Transceiver: Technical Specifications:

- Frequency Range: 2025 - 2100 MHz (Rx) and 2200 - 2290 MHz (Tx)
- Polarization: RHCP
- Modulation: QPSK (Rx) and QPSK (Tx)
- Mass: 6700 g
- Tx Parameters
 - RF Power: -3 dBW
 - Tx Gain: 4 dBi
 - EIRP: 1 dBW
 - Symbol Rate: 0.300 Msym/s
 - Spurious Emissions: -60 dBc
- Rx Parameters
 - Rx Gain: 6.5 dBi
 - Noise Figure: 2.6 dB
 - Symbol Rate: 0.300 Msym/s
 - Power Consumption: 30 W

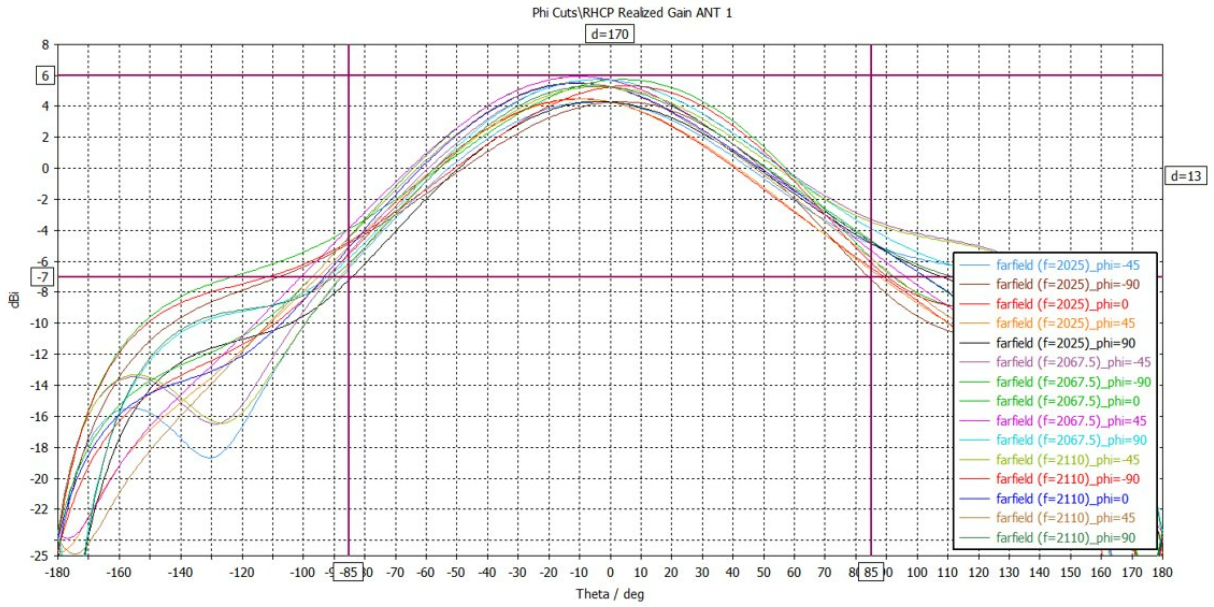


Figure 7: S-band Patch Antenna Rx Pattern

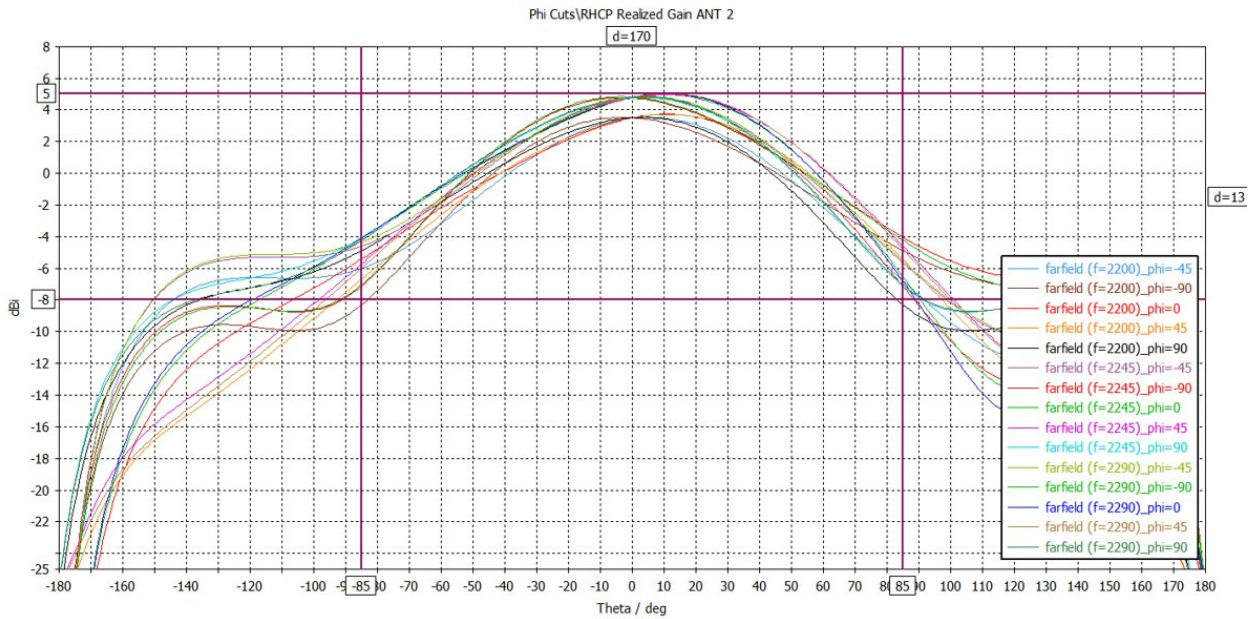


Figure 8: S-band Patch Antenna Tx Pattern