

Exhibit C - SoFIE Experimental Space Station Communications Architecture

6/28/2026

The SoFIE Space Station (SS) is being developed at Saint Francis University in Loretto, Pennsylvania and is composed of a payload and spacecraft bus. The payload consists of a Raspberry Pi4 computer, power switch board, two optical cameras, an X-ray sensor, and an HF instrument. The HF instrument is a 3-30 MHz receiver and single frequency topside sounder. The spacecraft bus is composed of an electrical power system (solar panels, battery, etc), an Epiq Sidekick mission computer, magnetorquers, a UHF radio for telecommand uplink/downlink capability, and an S-band radio for science data downlink.

1. SS Identifying Information

a. Location:

Saint Francis University
132 Franciscan Way
Loretto, Pennsylvania 15940

b. Orbit

500 km altitude
97.4° inclination
Sun synchronous

c. Configuration: The SS RF elements include a single UHF dipole antenna and radio for telecommand uplink/downlink at 9600 bps, a single S-band patch antenna and radio for science downlink at 1 Mbps, and a single 5 m tip to tip dipole antenna and radio for 9.303 MHz topside sounding.

2. UHF Uplink/Downlink

a. Antenna: Ecuadorian Space Agency (dipole)

b. Quantity: 1

c. Single or Multibeam: Single

d. Traffic Type: Telemetry, Telecommand

e. Uplink definition

- i. Receive path: Antenna + low noise amplifier + EXA SST01 radio.
- ii. Center Frequency: 437 MHz
- iii. Data Rate: 9600 bps
- iv. Channel Bandwidth: 23.1 kHz
- v. Emission Designator: 23K1G1D
- vi. Modulation Type: BPSK
- vii. FEC Type: BCH
- viii. Polarization: Linear
- ix. Beamwidth: 156.2°
- x. Antenna Gain: 3.1 dBi

- xi. G/T: -25.3 dB/K
- f. Downlink definition
 - i. Transmit path: EXA SST01 + antenna
 - ii. Center Frequency: 437 MHz
 - iii. Data Rate: 9600 bps
 - iv. Channel Bandwidth: 23.1 kHz
 - v. Emission Designator: 23K1G1D
 - vi. Modulation Type: BPSK
 - vii. FEC Type: BCH
 - viii. Polarization: Linear
 - ix. Beamwidth: 156.2°
 - x. Antenna Gain: 3.1 dBi
 - xi. Max EIRP: 0.9 dBW
 - xii. Max EIRP Density per Carrier: -6.62 dBW/4KHz
- 3. S-band Downlink
 - a. Antenna: Ecuadorian Space Agency (SSA03 patch)
 - b. Quantity: 1
 - c. Single or Multibeam: Single
 - d. Traffic Type: Science Data
 - e. Downlink definition
 - i. Transmit path: ICEPS Epiq Z2 SDR + antenna
 - ii. Center Frequency: 2425 MHz
 - iii. Data Rate: 1 Mbps
 - iv. Channel Bandwidth: 0.840 MHz
 - v. Emission Designator: 840KG7D (0M84G7D)
 - vi. Modulation Type: QPSK
 - vii. FEC Type: BCH
 - viii. Down Polarization: RHCP
 - ix. Beamwidth: 60°
 - x. Antenna Gain: 7.34
 - xi. Max EIRP: 3.7 dBW
 - xii. Max EIRP Density per Carrier: -19.52 dBW/4KHz
- 4. Single Frequency Topside Sounder
 - a. Manufacturer: Saint Francis University (dipole)
 - b. Quantity: 1
 - c. Single or Multibeam: Single
 - d. Traffic Type: Linear Chirp Pulse
 - e. Transmit pulse definition
 - i. Transmit path: Direct digital synthesizer + power amplifier + antenna
 - ii. Center Frequency: 9.303 MHz
 - iii. Width: 500 us

- iv. Pulse Bandwidth: 125 kHz
 - v. Necessary bandwidth: 129 kHz (Necessary bandwidth is calculated using the dispersion formula ($BW = \Delta f + 2/\tau$) per ITU-R SM.1138 standards, as the time-bandwidth product exceeds 50.)
 - vi. Pulse Repetition Interval: 132 ms
 - vii. Emission Designator: 129KQ3N
 - viii. Modulation Type: Linear
 - ix. FEC Type: None
 - x. Polarization: Linear
 - xi. Beamwidth: 156.2°
 - xii. Max EIRP: 0 dBW
- f. Receive definition (SoFIE space station will detect return signal)
- i. Receive path: antenna + low noise amplifier + RSPDuo SDR
 - ii. Center Frequency: 9.303 MHz
 - iii. Reception: Continuous
 - iv. Bandwidth: 129 kHz
 - v. Emission Designator: 129KQ3N
 - vi. Polarization: Linear
 - vii. Beamwidth: 156.2°
 - viii. Antenna Gain: -0.5 dBi
 - ix. G/T: -28.7 dB/K

UHF, S-band, and Topside Sounder link budget analysis results may be found in Exhibits E, F and G, respectively.

An analysis of the power density and power spectral density of the Topside Sounder emission at the surface of the Earth may be found in Exhibit D.