USN TT&C Support for Astrolab FLIP from its Hawaii South Point Station (antennas USHI01 & USHI02)

USN support Astrolab FLIP´s mission´ S-band TT&C communication and X-band downlink. Planned support from SSC is for a period of 180 days commencing December 28th, 2026. Astrolab FLIP is a US registered satellite, its ITU name is USASAT-LUNAR-4. The authorization letter and the frequency coordination report are attached. This is an extension of SES-STA-20260127-00627. Launch window is now updated to last week of November 2026.

Mission Description:

The FLIP rover is a lunar surface technology demonstration mission that will be delivered to the Moon aboard Astrobotic's Griffin lander on a direct trans-lunar injection trajectory no earlier than (NET) July 2026. Following launch, FLIP will remain powered down for most of the approximately 10-day transit, with a brief in-space S-band checkout conducted during lunar transfer to verify avionics, communications, and critical subsystems. The landing location will be on the rim of the Nobile Crater near the lunar south pole at approximately -85.4° latitude, 31.5° longitude. Astrobotic is targeting a landing area of 100 meters in diameter. After landing, FLIP will remain mounted on the lander for initial checkouts, deploy its solar array, antennas, and diagnostic camera, and then execute a mission-critical egress sequence lasting approximately 8 to 24 hours. During this period, continuous S- and X-band communications will be maintained, supplemented by a short-range 2.4 GHz space-to-space link with the lander to support safe release and descent to the lunar surface.
Once on the surface, FLIP will transition to nominal operations, conducting mobility checks, health monitoring, and hosted payload activities while maintaining regular Earth communications.

During transit between lunar surface sites, the rover will maintain communication with Earth to assess system performance and ensure mission progress. Astrolab FLIP will attempt to maintain 24/7 contact with the rover over this approximately 15-day main period until lunar nightfall. After lunar nightfall, the rover will enter a hibernation mode for roughly 15 days with periodic S-band health check-ins. Upon completion of lunar night, FLIP will resume full S- and X-band operations to assess post-hibernation performance and environmental conditions, followed by an extended mission phase of up to 90 days if conditions permit. FLIP hosts thirteen payloads, including science instruments from four NASA centers as well as commercial and outreach payloads, supporting investigations of lunar dust, surface environments, perception, and regolith properties. FLIP also serves as the on-orbit technology demonstration for Astrolab FLIP´s larger FLEX rover, which is being developed to support lunar logistics, construction, data services, scientific investigation, exploration, resource utilization, and other activities critical to a sustained presence on the Moon.

Affiliation with a U.S. Federal Agency

The FLIP mission is a technology demonstration led by Venturi Astrolab, Inc. and will be delivered to the lunar surface aboard Astrobotic's Griffin-1 lander under NASA´s Commercial Lunar Payload Services ("CLPS") initiative. FLIP also serves as a precursor demonstration for Astrolab´s larger FLEX rover product line, which is being developed in support of NASA´s Artemis program, including Astrolab´s selection as a provider under NASA´s Lunar Terrain Vehicle ("LTV") initiative. Additionally, FLIP will carry multiple NASA-sponsored payloads. Astrolab is filing this FCC application to support mission communications, including S-band TT&C.

News Articles:

- FLIP Mission Website
- Businesswire – Astrolab Awarded NASA Contract Worth up to $1.9 Billion to Support the Development of Artemis Campaign's Lunar Terrain Vehicle
- NASA Ames FLIP Payload

Trajectory Description

The launch vehicle carrying the FLIP rover will be launched into a direct trans-lunar injection ("TLI") trajectory with no intermediate Earth orbits. FLIP will remain powered down throughout the early phase and the majority of transit, except for a brief, approximately one-hour S-band checkout during the lunar transit period. Trajectory and state information will be provided via an OEM tracking file supplied by Astrobotic, which includes in-space trajectory data and the post-landing surface location, with additional details described in Astrobotic's FCC Narrative and Astrolab´s FCC Narrative documents. Orbital Description (Pulled from Astrobotic's FCC Narrative Filing SAT-LOA-20250407-00094):

The spacecraft (carrying FLIP) will initially be placed into a trans-lunar injection by a SpaceX Falcon 9 Heavy launch vehicle and inject into lunar orbit for eventual landing on the Moon with no return to Earth. Once at lunar distance, GM1 will perform a lunar orbit injection maneuver to capture into the moon's orbit. From there, GM1 will maneuver through a series of three distinct lunar orbits before landing on the lunar surface. An initial trajectory correction maneuver is planned for approximately 18 hours into flight to correct for launch vehicle dispersions. This will be the first planned firing of the spacecraft's main engines. Approximately 5 days into the mission, Griffin's flight team will upload and perform the main lunar orbit injection maneuver to place Griffin in orbit around the moon.

Following this maneuver, additional injection maneuvers will be executed to place Griffin in successively smaller lunar orbits prior to landing on the lunar surface. The spacecraft will dwell in Lunar Orbit 2 for a minimum of 48 hours, but can remain in this orbit for up to 12 days depending on exact day of launch.

▪ Lunar Orbit 1 (LO1): Initial Lunar Orbit, 4100km x 100km, 6 hour orbit period
▪ Lunar Orbit 2 (LO2): Instrument checkout and parking orbit, 800km x 100km, 2.5 hour orbit period

▪ Lunar Orbit 3 (LO3): Final circular 100km x 100km orbit, 2 hour orbit period.

Space-to-earth

Polarization[1] and Frequencies[2] (*C6a*)					
Beam Designation	**Polarization**	**Center Freq. [MHz]**	**Min Freq. [MHz]**	**Max Freq. [MHz]**	**Occupied BW [kHz]**
SDA	CR	2247.024869	2245.174869	2248.874869	3700
XD	CR	8455	8452.5	8457.5	5000
SDB	CR	2247.024869	2245.174869	2248.874869	3700

Earth-to-space

Beam Designation	**Polarization**	**Center Freq. [MHz]**	**Min Freq. [MHz]**	**Max Freq. [MHz]**	**Occupied BW [kHz]**
SUA	CR	2069.135	2067.285	2070.985	3700
SUB	CR	2069.135	2067.285	2070.985	3700

Flux Density impinging on the ground in Hawaii from Astrolab

Max. Downlink EiRP = 10 dBW (S-band) and 12 dBW (X-band)

Since this is a lunar mission, the distance from the spacecraft to the ground (RSE) is 384,400 km

The Flux density is calculated as:

$$flux\ density = EIRP/(4\pi RSE^2)$$

where RSE is the distance from spacecraft to the ground,
and EIRP is the Effective Isotropic Radiated Power of the spacecraft.

Data from the spacecraft vendor indicates that the nominal EIRP of the Astrolab spacecraft is 10 dBW (S-band) and 12 dBW (X-band). Distance to earth during an overhead pass is = 384,400 km.

Converting 10 dBW to scalar watts = 10 watts transmitted at 2247 MHz.

Therefore:

$flux\ density = 10\ \ /(4\pi(384400000)^2)$

Flux density = 5.38×10^{-18} Watts/meter^2

Or

Flux density = 5.38×10^{-19} mW/cm^2 S-band
Flux density = 8.53×10^{-19} mW/cm^2 X-band

Inclination: 0 degrees
Apogee: 384400 km
Perigee: 384400 km
Number of Orbital Planes: 1

Waiver Request

Astrolab FLIP is a U.S.-registered satellite

With respect to Space Launch Services
Pursuant to Section 1.3 of the Commission's rules (47 CFR § 1.3), USN respectfully requests a waiver of certain provisions of Part 25 and Part 26 of the Commission´s rules to permit the licensing and operation of a satellite earth station using the 2025–2110 MHz and 2200–2290 MHz frequency bands for Part 25, telemetry, tracking, and command (TTC) for supporting Astrolab.
Under 47 CFR § 1.3, the Commission may waive its rules for good cause shown. USN submits that:

The proposed earth station will support Astrolab FLIP lunar mission TT&C communication, which cannot be accommodated in other bands due to technical/operational constraints, they are also technically suitable due to their propagation characteristics and compatibility with existing ground infrastructure.

The bands have been partially reallocated to space launch services under Part 26.
As per 47 CFR § 25 section 2.106, this application would not comply without a waiver due to limitations on non-federal use or non-space launch service in these bands which currently restrict or limit the use of the referenced bands due to the reallocation referenced above.

USN believe this is in the public interest, technically feasible, non-disruptive to existing services, enhancing lunar missions and supporting scientific research.
It is also consistent with the FCC´s goals of promoting innovation, efficient use of spectrum and being in line with FCC orders and rulemakings that support flexible use of these bands (e.g., the FCC´s 2023 Report and Order on commercial space launch operations 1).

This request is also consistent with prior FCC-authorized STAs, including:

- Lynk Global, Inc. (File No. SES-STA-20220512-00477), which was granted temporary authority for TT&C in both bands;

- Space Telecommunications, Inc. (CTC-0 CubeSat, File Number: 1082-EX-ST-2024) which was granted temporary authority for TT&C in both bands.
- Geometric Energy Corporation, which received STA for TT&C in these bands for a lunar mission via a UK-based earth station

These precedents demonstrate the FCC´s established practice of granting temporary, coordinated use of these bands for TT&C under appropriate conditions.

USN request a waiver to permit temporary earth station operations of the referenced bands for Part 25 TT&C satellite communications. A waiver is necessary due to the relocation of these bands.

Summary of Technical Information
For Coordination with NTIA/FAS/IRAC

Applicant: Universal Space Network, Inc.

File No.: _____
Call Sign: No Call Sign
Special Temporary Authority ("STA")

Purpose of operation: Supporting Astrolab FLIP Lunar mission TT&C Operations.

Start Date: Dec. 28th 2026 **End Date: June 26th 2027**

Site Location: Naalehu, HI

Latitude: 19 deg 00' 50.056" N (NAD-83)
Longitude: 155 deg 39' 47.884" W (NAD-83)
Transmit frequency: 2069.135 MHz
Polarization: CR
Antenna manufacturer: Datron
Antenna Size in meter: 13m
Antenna model: 1453
Antenna Gain Transmit: 46.3 dBi @ 2069.135 MHz

Frequency Band (MHz)	Emissions	Max. EIRP (dBW)	Max.EIRP Density (dBW/4KHz)
2067.285 - 2070.985	3M70G1D	68	38,3

Satellite: Astrolab FLIP