Narrative
USN LEOP Support for Firefly
Blue Ghost Mission (BGM-1) from Hawaii

Firefly Aerospace Blue Ghost is a lunar lander designed to deliver small payloads to the surface of the Moon. The first Blue Ghost mission is planned to launch in Jan. 2025.
Blue Ghost Mission 1 'BGM1' lunar lander. BGM1 is a participant of the NASA Commercial Lunar Payload Services program, delivering payloads to and performing exploration of the surface of the Moon.
In 2018, NASA solicited bids from nine companies, including Firefly Aerospace, for the Commercial Lunar Payload Services (CLPS) program which is part of the NASA Artemis program; one of the long-term goals of Artemis is establishing a permanent crewed base on the Moon.
The Blue Ghost Mission 1 (BGM1) will launch on a Falcon 9 from Kennedy Space Center in January 2025. It will perform multiple Earth orbits for initial commissioning checkouts and to perform the Trans-Lunar Injection (TLI). The lander will tune the lunar capture time using thrust correction maneuvers.

Further and as cooperation between SSC and Firefly, Swedish Space Corporation (SSC) and U.S. space transportation company Firefly Aerospace signed a collaborative agreement to jointly launch satellites with Firefly's Alpha rocket from the newly inaugurated spaceport at Esrange Space Center in Sweden, starting in 2026, supporting commercial, civil, and defense customers.
This collaboration strengthens the transatlantic link between Sweden and the U.S. whilst offering unique space capabilities for the Swedish NATO membership (https://sscspace.com/ssc-and-firefly-to-launch-satellites-from-esrange).

Requested start date of this application is March 11th 2025. This is an extension of previous 30-day STA request, file no. SES-STA-20241111-02376

The frequency coordination report will be sent as soon as it is ready.

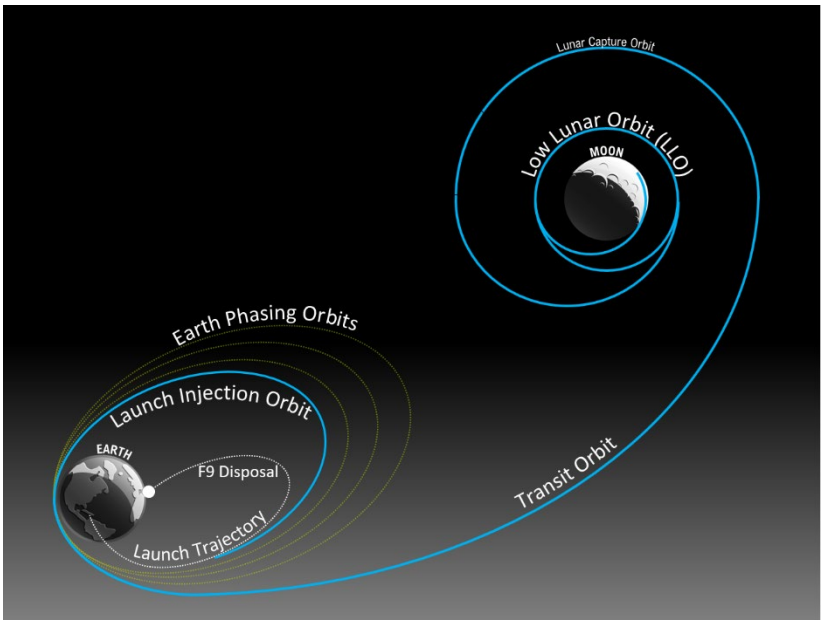

Figure Error! No text of specified style in document.**-1: Blue Ghost Mission 1 Trajectory**

S/C	**Downlink** (MHz)	**Uplink** (MHz)
BGM1	2251.114080 2251.114080 8493.2000000	2072.900882 2072.900882

Orbit Segment	S2B2	Pre-A1M	Post-A1M	P1M	P2M	P3M/TLI
Inclination (deg)	35.002	39.077	39.076	37.473	38.315	38.487
Apogee Altitude (km)	324849	335630	335630	337374	336378	384751
Perigee Altitude (km)	190	1783	3483	6991	5373	5675

Table Error! No text of specified style in document.**-2: Orbital Parameters between S2B2 and TLI in the Earth True of Date inertial frame for launch window**

Maneuver	Description	Start Time (T+)
S2B2	Launch Vehicle Second Stage Burn Two	0 days 0 hrs 48 mins
A1M	Engine checkout and raise perigee	4 days 13 hrs 52 mins
P1M	Adjust apogee to correct timing error (negative for anti-velocity)	8 days 21 hrs 48 mins
P2M	Correct burn dispersions	17 days 13 hrs 47 mins
P3M / TLI	Raise apogee to intercept the Moon for a 150 km perilune	26 days 6 hrs 27 mins
TCM1	Correct burn dispersions 24 hrs after P3M	27 days 6 hrs 27 mins
TCM2	Correct burn dispersions 24 hrs before LOI1	29 days 14 hrs 17 mins
LOI1	Capture into an 8-hr lunar orbit	30 days 14 hrs 20 mins
LOI2	Drop apolune through circular to 100 km perilune	33 days 12 hrs 58 mins
LOI3	Circularize in 100 km Low Lunar Orbit	39 days 14 hrs 32 mins
DOI	Descent Orbit Insertion to lower perilune to 15 km	47 days 10 hrs 20 mins

Table Error! No text of specified style in document.**-3: BGM1 Trajectory Maneuvers**

Flux Density impinging on the ground in Hawaii from BGM-1

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 BGM-1 spacecraft is 12.27 dBW (S-band) and 39.05 (X-band). The closest distance to earth (Table 2-2 above) is 190 km.

Converting 12.27 dBW to scalar watts = 16.86 Watts transmitted at 2251.989080 MHz.
Converting 39.05 dBW to scalar watts = 8035 Watts transmitted at 8493.2000 MHz.

Therefore:
$flux\ density = 16.86/(4\pi(190000)^2)$ for S-band and $8035/(4\pi(190000)^2)$ for X-band

Flux density = 3.72×10^{-11} Watts/meter² for S-band and **1.77×10^{-8} for X-band**

Flux density = 3.72×10^{-12} mW/cm² for S-band and likewise
Flux density = 1.77×10^{-9} mW/cm² for X-band

Inclination: 34,989°
Apogee, Perigee: Please see figure 2-1 & Table 2-2 above for more details

Number of Orbital Planes: 1

Waiver
Exhibit C
PETITION FOR WAIVER OF SECTION 25.137 AND 25.114 AND OF THE U.S. TABLE OF FREQUENCY ALLOCATIONS

I. TO THE EXTENT THEY APPLY, GOOD CAUSE EXISTS FOR A WAIVER OF CERTAIN PORTIONS OF SECTIONS 25.137 AND 25.114

Universal Space Network, Inc. (USN) is provided limited legal and technical information for the Firefly Blue Ghost Mission-1 (BGM-1) Lunar-lander mission.[1] Pursuant to Section 25.137 of the Federal Communications Commission's ("Commission" or "FCC") rules, the same technical information required by Section 25.114 for U.S.-licensed space station"[2]

USN seeks authority to support LEOP critical event for bgm-1 Lunar lander mission, and not commercial service to the United States, and thus believes that Section 25.137 does not apply.

To the extent the Commission determines, however, that USN's request for authority to provide critical spacecraft support on a special temporary basis is a request to serve the United States with a U.S-licensed satellite, USN respectfully requests a waiver of Sections 25.137 and 25.114 of the Commission's rules, to the extent that USN has not herein provided the information required by these rules. [3] The Commission may grant a waiver for good cause shown.[4] A waiver is therefore appropriate if special circumstances warrant a deviation from the general rule, and such a deviation will serve the public interest. The US public interest is supported by the collected data with the BGM-1 mission.

In this case, good cause for a waiver of portions of Section 25.114 exists. USN seeks authority to conduct LEOP support for BGM-1. Thus, any information sought by Section 25.114 that is not relevant to the critical support – e.g., antenna patterns, energy and propulsion and orbital debris - USN does not have. In addition, USN would not easily be able to obtain such information because USN is not the operator of the BGM-1 spacecraft, nor is USN in contractual privity with that operator. Rather, USN has contracted with Swedish Space Corporation, Solna Sweden (SSC) to support the BGM-1 lunar-lander mission.

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[1] FCC Form 312 Section B

[2] 47 C.F.R. § 25.137(a)

[3] 47 C.F.R. §§25.137 and 25.114

[4] 47 C.F.R. §1.3

Because it is not relevant to the service for which USN seeks authorization, and because obtaining the information would be a hardship, USN seeks a waiver of all the technical and legal information required by Section 25.114, to the extent it is not provided herein. As noted above, USN has provided the required information to the extent that it is relevant to the testing service for which USN seeks authorization.

Good cause also exists to waive portions of Section 25.137, to the extent the information required is not herein provided. Section 25.137 is designed to ensure that "U.S.-licensed satellite systems have effective competitive opportunities to provide analogous services" in other countries. Here, there is no commercial service being provided by the satellite; USN is providing LEOP support for the BGM-1 mission. Thus, the purpose of the information required by Section 25.137 is not implicated here. For example, Section 25.137(d) requires earth station applicants requesting authority to operate with a non-U.S.-licensed space station that is not in orbit and operating to post a bond. [5] The BGM-1 is a US-licensed satellite and underlying purpose in having to post a bond – i.e., to prevent warehousing of orbital locations by operators seeking to serve the United States – would not be served by requiring USN to post a bond in order to conduct the 60 days critical support of the BGM-1 spacecraft.

It is USN's understanding that Firefly BGM-1 is licensed by the country of USA. BGM-1 is spacecraft meant to serve the USA, with data shared in preparation for future lunar bases by the US. Thus, the purpose of Section 25.137 – to ensure that U.S. satellite operators enjoy "effective competitive opportunities" to serve foreign markets and to prevent warehousing of orbital locations service the United States – will not be undermined by grant of this waiver request.

Finally, USN notes that it expects to communicate with the BGM-1 satellite using its U.S. earth station for a period of 60 days. Requiring USN to obtain technical and legal information from an unrelated party, where there is no risk of interference. Given these particular facts, the waiver sought herein is appropriate.

II. GOOD CAUSE EXISTS FOR A WAIVER OF THE UNITED STATES TABLE OF FREQUENCY ALLOCATIONS

USN further requests a waiver of the United States Table of Frequency Allocations ("U.S. Table") as described in section 2.106 of the rules for the frequency bands 2025 – 2110 MHz (Earth-to-Space), 2200 – 2290 and 8000-8400 MHz (Space-to-Earth).[6] Section footnote US96 allow for non-federal Government use of these bands in the United States on a case-by-case non-interference basis. Such use by USN necessitates a waiver of the U.S. Table.

Good cause exists to grant USN a limited waiver of the U.S. Table to allow critical support for the Firefly BGM-1 satellite. In considering request for case-by-case spectrum uses, the Commission has indicated that it would generally grant such waivers "where there is little potential for interference into any service authorized under the Table of Frequency Allocations and when the case-by-case operator accepts any interference from authorized services." [7] USN will coordinate with other parties operating communication systems in compliance with the Table of Frequency Allocations to ensure that no harmful interference is caused. USN seeks to operate only pursuant to special temporary authorization and thus agrees to accept any interference from authorized services. In summary, USN's

operation on a non-interference, non-protected basis support waiver of the U.S. Table.

[5] 47 C.F.R. §25.137(d)(4)

[6] 47 C.F.R. §2.106

[7] Previously approved STA's for Universal Space Network SES-STA-20020725-01174; SES-STA-20021112-02008; SES-STA-20040315-00475; SES-STA-20220512-00477

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: LEOP Support of BGM-1

Start Date: STARTDATE March 11th 2025 **End Date: April 10th 2025**

Site Location: Naalehu, HI

Latitude: 19 deg 00' 50.056" N (NAD-83)
Longitude: 155 deg 39' 47.884" W (NAD-83)

Transmit frequency: 2072.900882 MHz
Polarization: LHCP
Antenna manufacturer: Datron
Antenna Size in meter: 13m
Antenna model: 1453

Antenna Gain Transmit: 45.9 dBi @ 2072.900882 MHz

For frequency bands, emissions, Max EiRP (dBW) and Max EiRP Density (4dBW/4 kHz) please refer to FCC Form 312

Satellite: Blue Ghost Mission 1 (BGM1)