Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
	)	Call Sign:
Intuitive Machines, LLC	)	
	)	File No. SAT-LOA-
Application for Authority to Launch and Operate NOVA-C Lunar Lander	)	
	)	
	)	

Application of Intuitive Machines, LLC

Intuitive Machines, LLC ("Intuitive Machines"), hereby requests authority under Section 25.123 of the Federal Communications Commission's ("Commission") streamlined small spacecraft rules[1] to launch and operate the NOVA-C Lunar Lander ("NOVA-C") for a period of up to 60 days (38 nominal),[2] using spectrum in the 2025-2110 MHz and 2200-2290 MHz bands (the "IM-3 Mission").

The IM-3 Mission is part of the Commercial Lunar Payload Services ("CLPS") program sponsored by the National Aeronautics and Space Administration ("NASA") to explore the surface of the Moon. The NOVA-C is the third in a series of lunar landers that will deliver important payloads to the lunar surface, including operations that will advance U.S. commercial, government, and scientific interests. The NOVA-C will launch on board a SpaceX Falcon 9 rocket.

[1] *See* 47 C.F.R. § 25.123 ("This section shall ... apply to applicants for space stations that will operate beyond Earth's orbit and that are able to certify compliance with the certifications ... of this section").

[2] Due to limitations in the Schedule S software, the smallest time entry for estimated spacecraft lifetime is 1 year. This narrative clarifies that the requested license is for 60 days.

Accordingly, the IM-3 Mission is critical to furthering the national space policy objectives of the United States and grant of this license would strongly serve the public interest.

I. BACKGROUND

Under Space Policy Directive 1 ("SPD-1"), the President announced that it is the goal of the U.S. government to return human beings to the Moon for the first time in a half-century. SPD-1 established the mission of the National Aeronautics and Space Administration to:

> "Lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities. Beginning with missions beyond low-Earth orbit, *the United States will lead the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations*[.]"[3]

A critical component of this mission to return human beings to the Moon, dubbed the Artemis Program,[4] begins with the CLPS effort to enlist commercial partners to quickly land scientific instruments and technology demonstrations on the Moon. These science and technology payloads lay the foundation for human missions to the lunar surface later this decade.

Intuitive Machines, founded in 2013, is leading an effort to develop a commercial Lunar Payload and Data Service ("LPDS") which provides transit to lunar orbit, intact payload delivery to the lunar surface, data communications, and power services to assets both in lunar orbit and on the surface. Intuitive Machines has been selected by NASA as part of its CLPS program to send robotic landers, rovers, and other payloads to the Moon, beginning in 2024. Intuitive Machines'

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[3] Space Policy Directive 1: Reinvigorating America's Human Space Exploration Program (Dec. 11, 2017) ("SPD-1") (emphasis added), available at https://www.whitehouse.gov/presidential-actions/presidential-memorandum-reinvigorating-americas-human-space-exploration-program/.

[4] Artemis is the twin sister of Apollo, and the Goddess of the Moon. *See* NASA, *The Artemis Plan: NASA's Lunar Exploration Program Overview* (Sept. 2020) ("*Artemis Plan*"), *available at* https://www.nasa.gov/sites/default/files/atoms/files/artemis plan-20200921.pdf.

first lunar mission ("IM-1"), carried out in February 2024, was the first commercial lunar lander to have successfully soft-landed on the Moon, and carried payloads developed by NASA and commercial and educational customers.[5] Intuitive Machines' second lunar mission ("IM-2"), concluded in March 2025, further advanced lunar exploration, achieving the southernmost lunar landing ever, completing several program and payload milestones, for which the data is still being analyzed.[6]

The IM-3 Mission will cover end-to-end commercial payload delivery, including payload integration, mission operations, launch from Earth and culminating with landing the NOVA-C on the surface of the Moon. Launch of the NOVA-C is currently planned for Q1 2026. The NOVA-C, the third of Intuitive Machines' wholly private lunar landers, will deliver commercial and NASA payloads to the lunar surface, conducting scientific research and technology demonstrations. More specifically, and as further described below, the IM-3 NOVA-C will carry four NASA payloads to the Reiner Gamma region of the Moon, as well as a rover, and several commercial payloads. Scientific objectives include research and evaluation of the Reiner Gamma swirl mini-magnetosphere region and its magnetic and plasma properties.

Accordingly, Intuitive Machines respectfully requests that the Commission grant this application expeditiously to allow Intuitive Machines to prepare launch, transit, and landing operations of the NOVA-C.

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[5] *See* Intuitive Machines, SAT-LOA-20210423-00055 (Call Sign S3084) ("*IM-1 Application*"); Intuitive Machines Historic IM-1 Mission Success: American Ingenuity Never Gives Up, Press Release (Feb. 29. 2024), *available at* https://investors.intuitivemachines.com/news-releases/news-release-details/intuitive-machines-historic-im-1-mission-success-american (last visited May 4, 2024).

[6] *See* Intuitive Machines, SAT-LOA-20240524-00112 (Call Sign S3201) ("*IM-2 Application*"); Intuitive Machines Executes Southernmost Lunar Landing and Operates Payloads, Press Release (Mar. 23, 2025), *available at* https://www.intuitivemachines.com/im-2 (last visited Mar. 23, 2025).

II. IM-3 MISSION DESCRIPTION

A. Mission Phase Overview

Similar to Intuitive Machines' first two missions, the IM-3 Mission will consist of four phases: launch, transit, lunar orbit, and lunar surface. Nominal mission duration is approximately 38 days, including a 4- to 8-day transit from Earth, 1 day in low-lunar orbit, and at most a 14-day operational period on the lunar surface (during lunar daylight). Approximately one lunar day after landing (the equivalent of about 29 Earth days), Intuitive Machines will attempt to make additional spacecraft contacts to see if the NOVA-C survived the harsh lunar night. Each phase of the mission is briefly described below.

1. Launch Phase

The NOVA-C will launch aboard a SpaceX Falcon 9 rocket in Q1 2026.[7] In launch phase, NOVA control in Houston will begin tracking the NOVA-C upon launch vehicle separation. Separation occurs just after the Trans-Lunar Injection ("TLI") burn provided by the Falcon 9.

2. Transit Phase

During transit, communication will be via two Thales Alenia ("Thales") transceivers in conjunction with six low-gain (5.6 dBi) hemispherical ("hemi") antennas. Both transceivers will be active for receiving, using independent antennas, while only the primary transceiver will be active on transmission. The NOVA-C will also be equipped with two, 25 Watt Quasonix transmitters, primarily for data download from the lunar surface. However, the NOVA-C may also

[7] The Intuitive Machines' first Near Space Network Services satellite is tentatively planned to launch concurrently on the same launch vehicle.

intermittently use one of the 25 Watt Quasonix transmitters in conjunction with a high-gain (15.6 dBi) axial mode helical antenna with reflector during transit to the Moon.

3. Lunar Orbit Phase

Both the Thales transceivers and the Quasonix transmitters will be used during lunar orbit phase, covering 1-3 days of loiter before landing. During each orbit of the Moon, NOVA Ground Control ("NOVA Control") will lose contact with NOVA-C when it goes behind the Moon and the Lunar Tracking Telemetry and Command network ("LTN") will need to re-acquire the NOVA-C when in line-of-sight.

4. Lunar Surface Phase

The lunar surface phase of the mission is designed to take advantage of lunar daylight, lasting approximately 14 days. During the lunar surface phase, the Quasonix transmitters will relay science data and continue to conduct Telemetry, Tracking and Command ("TT&C") operations. These radio operations are described more fully below and in the accompanying Technical Appendix and Schedule S. At the end of 14 days, the NOVA-C enters lunar night. Intuitive Machines will attempt to make additional spacecraft contacts to determine if it survived the harsh conditions after the sunrise concludes the lunar night. Intuitive Machines will then decommission the radio systems if the equipment survives the lunar night after a brief diagnostic evaluation of spacecraft. Intuitive Machines will request appropriate authority in the event that subsequent operations are needed beyond the expiration of this 60-day authorization.

B. Payloads[8]

1. Cooperative Autonomous Distributed Robotic Exploration (CADRE)

The CADRE payload consists of a suite of components: three rovers, a base station, and a Situational Awareness Camera Assembly (SACA). This suite will create a network that will work together to explore the Moon in an experiment to demonstrate new technology. Communicating via the L band (1718-1722 MHz) mesh network radios with each other and a base station aboard the NOVA-C, the rovers will be largely autonomous, making decisions and acting without the need for human intervention. The SACA will continually monitor the progress of the rovers by rotating around the lander through a motorized gimbal.

2. Lunar Surface Environment Monitor (LuSEM)

The LuSEM payload consists of two pairs of solid-state telescopes designed to detect high-energy particles, such as solar energetic protons and secondary radiation, as well as materials in the geomagnetic tail on the lunar surface. Each pair consists of a nadir-viewing and zenith-viewing telescope that will take measurements of incoming and reflected high-energy particles at the same time.

[8] For avoidance of doubt, Intuitive Machines notes that the payloads for IM-3 are distinct from the payloads on IM-1 and IM-2.

3. Vertex Camera Array (VCA)

The VCA payload consists of nine cameras in the aggregate, comprising three separate camera clusters containing three cameras each. These cameras will survey the site geology and take images used to assess the photometric character of the lunar surface. This will contribute to an understanding of the cause of the blast-zone optical modification observed from orbit and texture related properties of the lunar swirls. The LVx-VCA will also obtain images of the LVx-Rover when it is close to the lander and later at greater distances on its traverse route.

4. Vector Magnetometer- Lander (VML)

The VML payload is composed of a fixed mast with a dual ring-core fluxgate sensor on the tip and four Commercial Off The Shelf (COTS) mini magnetometers arrayed near the base of the mast. VML will measure magnetic fields smaller than 1 nanoTesla (nT) during the lander descent phase and on the surface.

5. Magnetic Anomaly Plasma Spectrometer (MAPS)

The MAPS payload is an ion- and electron electrostatic analyzer used to characterize incident ions and electrons at the lunar surface. The primary objective of the MAPS payload is to study the interaction of the solar wind with surface materials on the Moon, aiming to understand the origin of the sinuous patterns of bright and dark soil, known as lunar swirls, that correspond with anomalous regions of magnetic rocks.

6. Lunar Vertex (LVx) Rover

The LVx Rover payload is used to provide mobility to two smaller payloads: the Vector Magnetometer Rover (VMR) and the Rover Multispectral Microscope (RMM). These payloads will characterize the magnetic field experienced around the lander and capture images of the lunar surface. The Nova-C lander has a dedicated S-Band radio that will alternate between 2411

MHz and 2472 MHz with a 4 MHz bandwidth to communicate with the Lunar Vertex (LVx) Rover's primary and secondary radios. Communication will happen during lunar surface operations to transfer scientific data and rover telemetry between the rover and lander. The data is then relayed through the lander's S band communication system back to Earth.

7. Moon Laser Instrumentation for General relativity/geophysics High-accuracy Tests (MoonLIGHT)

The MoonLIGHT payload is a 3" fused silica laser reflector that will reflect laser measurements back to Earth. It will also serve as a fiducial marker for the lander on the lunar surface and for improving navigation of future orbiters and landers.

8. Virtual Reality Camera System (VRCS)

The VRCS payload consists of a six-camera system that will capture high-definition images and video to create an immersive virtual reality experience from lunar orbit and on the lunar surface.

9. Space Science & Technology Evaluation Facility – First Flight (SSTEF-1)

The Aegis Aerospace SSTEF-1 payload consists of multiple Technology Demonstration Experiments (TDEs). The TDEs are an implementation of hardware, electronics and software that will operate in the lunar environment and achieve a technology and/or science objective. The payload includes an enclosed housing that contains two 3D-printed antennas that will communicate via Ku band between approximately 14-15 GHz.

10. Australian Lunar Experiment Promoting Horticulture (ALEPH-1)

The ALEPH-1 payload will demonstrate the growth of a rapeseed seedling on the lunar surface. The ALEPH-1 payload will house the seedling and a camera to monitor its growth to help understand plant growth on the lunar surface.

11. Public Affairs Office (PAO) Cameras

There are a total of seven PAO cameras for the IM-3 Mission that will provide a 360-degree view of the NOVA-C at critical points of the IM-3 Mission for IM public affairs. These cameras will also monitor the deployment of both the CADRE and LVx Rovers.

12. LaserReflector for Insight (LaRRI)

The LRA payload is used to reflect laser light from orbiting spacecrafts to identify the exact location of the NOVA-C lander. This will assist in creating a geodetic network of the Moon.

C. NOVA-C Lunar Lander

1. Spacecraft Description

The IM-3 NOVA-C spacecraft reflects an evolution of the design employed for the IM-1 and IM-2 spacecrafts, with dimensions of 4.3m x 4.0m x 4.8m high (including landing gear). The spacecraft will have a total of five solar panels - three body-mounted solar panels and two top deck panels. All solar panels are fixed. The main propulsion system consists of liquid methane ("LCH4") fuel and a liquid oxygen oxidizer ("LOX"), with cold gas helium for pressurization and reaction control systems ("RCS"). The attitude determination and control are achieved with redundant inertial measurement units ("IMU"), star trackers, and the RCS. The NOVA-C lander will be launched aboard a SpaceX Falcon 9 booster, separated via a RUAG zero-debris deployment

system. Two views of the IM-3 NOVA-C lander are provided in Figure 1 below, including panels ABC on the left and panels DEF on the right.

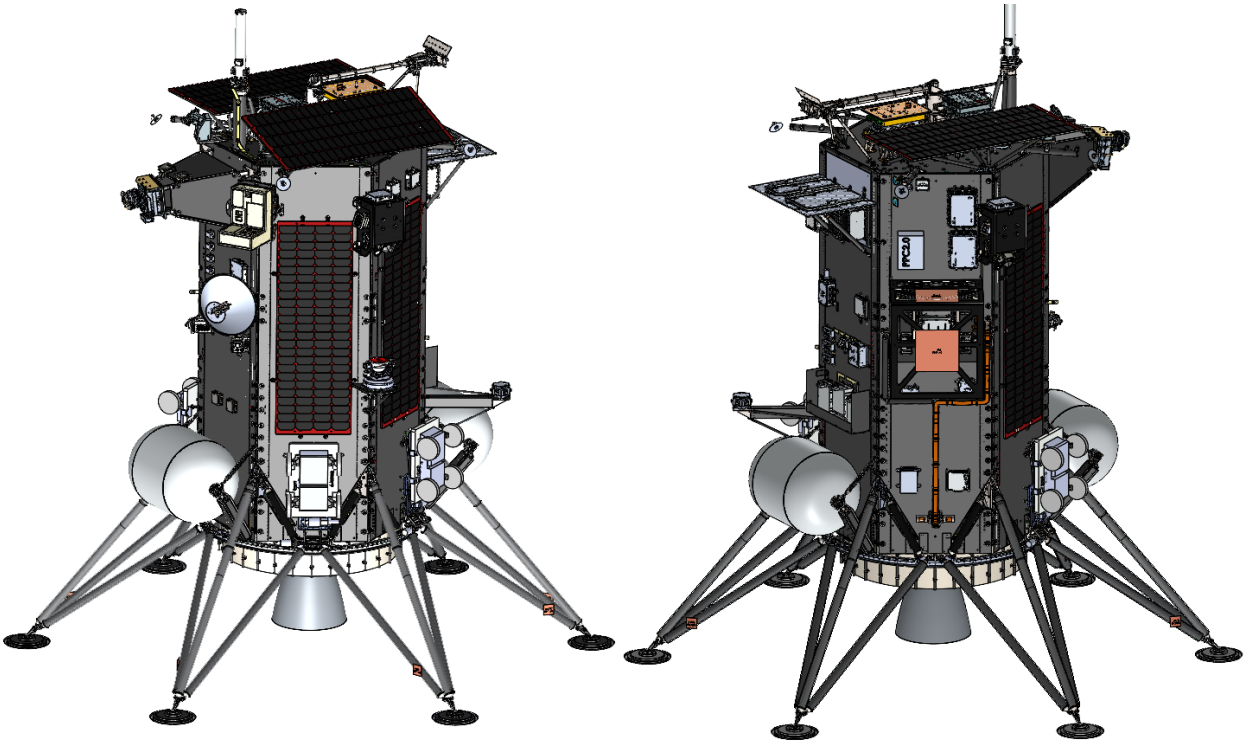

Figure 1: NOVA-C Lunar Lander

The main power system aboard the NOVA-C consists of three battery boxes each featuring 72 P20 lithium-ion batteries (216 cells total in the spacecraft). The batteries are charged by accompanying solar panels, generating an average power of 600 W, stored in Li-ion batteries, with a total energy capacity of 1554 Watt-hours, and an unregulated 28 volts direct current ("VDC") bus voltage.

The NOVA-C has six (6) low-gain antennas for TT&C, and one (1) high-gain antenna that can be used for both TT&C and data downlink. RF switching allows for contingency use of the high-gain antenna for telemetry downlink, as well as the low-gain antennas for data downlink.

The following table lists NOVA-C mass contributions:

Table 1: NOVA-C Mass Contributions

Mass Component	Mass (kg)
Spacecraft Dry Mass with payload	813
Pressurant and Propellant	1435
Total (Wet) Spacecraft Mass	2248

Residual LOX and liquid methane propellant will be vented approximately 30 minutes after landing. Prior to the end of the IM-3 Mission, stored helium will also be vented to passivate the RCS and propellant pressurization system. The batteries will be fully discharged approximately nine (9) hours after commencement of lunar night (14 days after landing).

The NOVA-C will be operational for the 14-day lunar daylight mission, after which the solar panels will no longer be able to charge the batteries during lunar night. The estimated spacecraft lifetime is 38 days. It is possible that the batteries may be re-charged via the panels during subsequent lunar days. However, it is likely that the NOVA-C will not survive. Intuitive Machines will request appropriate authority in the event that subsequent operations are possible and desired beyond the expiration of this 60-day authorization.

2. Spectrum Usage

The NOVA-C will operate in accordance with NASA's LunaNet Interoperability Frequency Plan and with Space Frequency Coordination Group Recommendation SFCG 32-2R5.[9] Table 1 of the SFCG Recommendation delineates the frequency bands to be used for lunar communication links. S band frequencies will be used for all transmissions to and from Earth. Specifically, (i) 2025-2110 MHz band (Earth-to-space) and (ii) 2200-2290 MHz band (space-to-Earth).[10] Surface operations will consist of two-way S band communication with the Lunar Vertex (LVx) rover under Section 4.4 of the ITU-R Radio Regulations.

a) 2025-2110 MHz Band (Uplink)

The United States Table of Frequency Allocations ("Table of Allocations"), Section 2.106 of the Commission's rules, provides that the 2025-2110 MHz band is allocated to Federal space research and other Federal uses on a co-primary basis with fixed and mobile non-Federal uses.[11] A footnote to that allocation provides that non-Federal, Earth-to-space transmissions may be authorized in the space research and Earth exploration-satellite services in the band "subject to such conditions as may be applied on a case-by-case basis."[12] NOVA-C uplink transmissions will not cause harmful interference to Federal or non-Federal stations operating in accordance with the Table of Allocations.

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[9] *See NASA LunaNet Interoperability Specification*, Version 5 (Jan. 29, 2025); available at: https://www.nasa.gov/wp-content/uploads/2025/02/lunanet-interoperability-specification-v5-baseline.pdf?emrc=606f95 (last visited May 29, 2025).

[10] *See* Attach. A, Technical Exhibit.

[11] *See* 47 C.F.R. § 2.106.

[12] *See id.*, n.US347.

Intuitive Machines is coordinating with NASA and other Federal agencies to ensure that spacecraft uplinks will not interfere with U.S. government operations and will operate such uplinks consistent with the outcome of this coordination. As described below, Intuitive Machines requests a waiver of the Table of Allocations to permit NOVA-C uplink operations in this band, which are necessary to the success of the IM-3 Mission.

b) 2200-2290 MHz Band (Downlink)

The Table of Allocations allocates the 2200-2290 MHz band to various Federal uses on a primary basis, including space operation, Earth exploration-satellite service, fixed, mobile, and space research uses.[13] The band is not currently allocated to non-Federal uses.[14] As detailed below, Intuitive Machines requests a waiver of the Table of Allocations to the extent necessary to downlink critical telemetry data from the NOVA-C, as well as payload data from Federal government and commercial payloads.

c) 2400-2417 MHz and 2450-2483.5 MHz Bands (surface links)

The Table of Allocations allocates the 2400-2417 MHz band on a primary basis for non-federal amateur use, and the 2450-2483.5 MHz band is allocated on primary basis for non-federal fixed and mobile use.[15] Neither band has federal allocations, and in aggregate with the 2417-2450 MHz band form the 2.4 GHz Industrial, Scientific and Medical ("2.4 GHz ISM") band, which supports a diverse range of Wi-Fi, Bluetooth and other devices authorized without individual licenses under Part 15 and Part 18 of the Commission's rules,[16] and for which voluntary standard

[13] *See* 47 C.F.R. § 2.106.

[14] *Id.*

[15] *Id.*

[16] Part 15 regulates "intentional, unintentional, or incidental radiator [that] may be operated without an individual license." 47 C.F.R. § 15.1. Part 18 regulates

setting bodies such as the Institute of Electrical and Electronics Engineers ("IEEE") have established protocols for popular short-range wireless devices (*e.g.*, 802.11 WiFi devices) that are manufactured en masse and used globally.[17]

3. Small Spacecraft Licensing Criteria

Intuitive Machines hereby provides information pursuant to the Commission's streamlining small satellite licensing order[18] to ensure the Commission has a comprehensive understanding of the IM-3 Mission and the NOVA-C. Section 25.123 of the Commission's Rules states that applicants filing under the streamlined rules must certify that they meet certain criteria.[19] Table 2 identifies the streamlined rules criteria and certifies that Intuitive Machines meets the criteria or otherwise requests a waiver. Intuitive Machines performed an orbital debris assessment using the latest version (3.2.6) of NASA's Debris Assessment Software (DAS). Applicable results are provided in the table below.

Table 2: Small Spacecraft License Criteria

47 C.F.R § 25.123(b) Criteria	Compliance
(1) The space station(s) will operate and be disposed of beyond Earth's orbit	The NOVA-C will be deployed into a trans lunar orbit, land and remain on the lunar surface post-mission.

[17] The Wi-Fi Alliance estimates that over 19.5 billion Wi-Fi enabled devices are active globally as of 2023, and anticipates upwards of 3.8 billion devices enter the market per annum. *See* https://wifinowglobal.com/news-and-blog/momentum-builds-19-5-billion-wi-fi-devices-will-be-in-use-this-year-wi-fi-alliance-says/ (last visited June 15, 2025).

[18] *See Streamlining Licensing Procedures for Small Satellites*, Report and Order, IB Docket No. 18-86, ¶ 65 (rel. Aug. 2, 2019) ("*Smallsat Order*") (noting that it is adopting its proposal "to allow small spacecraft with planned non-Earth orbiting missions, *such as commercial lunar missions*, to file under the streamlined process.") (emphasis added).

[19] *See* 47 C.F.R. § 25.123.

47 C.F.R § 25.123(b) Criteria	Compliance
(2) The total lifetime from deployment to spacecraft end-of-life for any individual space station will be six years or less	The NOVA-C lifetime will last approx. 38 days, including a 7-day transit from Earth, followed by a 14 day stay on the lunar surface. Operation during the subsequent lunar day up to day 60 is possible if the NOVA-C's batteries survive the lunar night.
(3) Each space station will be identifiable by a unique signal-based telemetry marker distinguishing it from other space stations or space objects	Intuitive Machines certifies that the NOVA-C will be uniquely identified by the proper telemetry signal.[20]
(4) The space station(s) will release no operational debris	Intuitive Machines certifies that the NOVA-C and its payloads will not release any operational debris.[21]
(5) No debris will be generated in an accidental explosion resulting from the conversion of energy sources on board the space station(s) into energy that fragments the spacecraft	Intuitive Machines certifies that the NOVA-C and payload design features mitigate the likelihood of such accidental explosions well below the 0.001 probability requirement per NASA-STD-8719.14B as described in the Technical Appendix.[22]
(6) The probability of a collision between each space station and any other large object (10 centimeters or larger) during the lifetime of the space station is 0.001 or less as calculated using current NASA software or higher fidelity models	Intuitive Machines certifies that the probability of a collision sufficient to prevent compliance with the disposal plan is well below the required value of 0.001.
(7) Operation of the space station(s) will be compatible with existing operations in the authorized frequency band(s). Operations will not materially constrain future space station entrants from using the authorized frequency band(s)	Intuitive Machines will coordinate with NASA and other government agencies and seek a waiver of the Table of Allocations for non-interfering use of the 2025-2110 MHz band, as well as the 2200-2290 MHz band. Use of these bands is for an extremely limited duration and will not constrain current or future users of the band.

[20] *See* Attachment A, Technical Appendix, § A.15.

[21] *See id.*, § A.17.2.

[22] *See id.*, § A.17.3.

47 C.F.R § 25.123(b) Criteria	Compliance
(8) The space station(s) can be commanded by command originating from the ground to immediately cease transmissions and the licensee will have the capability to eliminate harmful interference when required under the terms of the license or other applicable regulations	Intuitive Machines has complete command capability from its control center in Houston to cease transmissions to the NOVA-C.[23]
(9) Each space station is 10 cm or larger in its smallest dimension	Intuitive Machines certifies the NOVA-C is larger than 10 cm in its smallest dimension.[24]
(10) Each space station will have a mass of 500 kg or less, including any propellant	The NOVA-C's wet mass is approximately 2248 kg; therefore, Intuitive Machines is requesting a waiver of this provision.[25]
(11) Upon receipt of a space situational awareness conjunction warning, the operator will review and take all possible steps to assess the collision risk, and will mitigate the collision risk if necessary. As appropriate, steps to assess and mitigate the collision risk should include, but are not limited to: Contacting the operator of any active spacecraft involved in such a warning; sharing ephemeris data and other appropriate operational information with any such operator; and modifying space station attitude and/or operations.[26]	Intuitive Machines will review conjunction warnings, coordinate physical operations of the NOVA-C with any operator using similar orbits, and, if necessary, mitigate collision risks to minimize operational impacts.[27]

[23] *See* Attachment A, Technical Appendix, § A.12.

[24] *See id.*, § A.3.

[25] Intuitive Machines was previously granted a waiver of §25.123(b)(10) for its IM-1 and IM-2 missions with NOVA-C wet mass calculations of approximately 1900 kg and 2143 kg, respectively. *See* Call Signs S 3084 and S3201.

[26] *See* Applications for streamlined small spacecraft authorization, 85 Fed. Reg. 52452 (Aug. 25, 2020) (amending 47 C.F.R. § 123(b)). Out of an abundance of caution, Intuitive Machines certifies compliance with the amended regulation adding sec. 11, when effective.

[27] *See* Attachment A, Technical Appendix, § A.17.4.

Small spacecraft operating under the streamlined rules are exempt from the Part 25 processing round and default service requirements.[28] In lieu of the processing round rules, the Commission requires applicants to "(a) certify that operations of its satellites will not interfere with those of existing operators, (b) certify that it will not materially constrain future operators from using the assigned frequency band(s), and (c) provide a brief narrative description illustrating the methods by which both current and future operators will not be materially constrained."[29] Intuitive Machines certifies that the operations of the NOVA-C will not interfere with existing operators and that it will not materially constrain future operators from using the requested frequency bands.

In the Streamlined Processing Order, the Commission provided examples of applications that may satisfy the required description requirement. Potentially acceptable scenarios include those where the satellite operator possesses "a limited number of earth stations and downlinks during relatively short periods of time, with the ability to effectively schedule transmissions such that future satellite entrants can be accommodated."[30] As detailed in this application, the NOVA-C's limited operational time on discrete frequencies with a handful of earth stations mitigates the risk of interference. Moreover, Intuitive Machines will operate on an unprotected, non-interference basis with respect to other authorized operators in the relevant bands. Intuitive Machines is also pursuing appropriate coordination with relevant stakeholders to ensure that no harmful interference to such operations will occur.

[28] *Smallsat Order*, ¶ 80.

[29] *Id.*, ¶ 81.

[30] *Id.*

D. Ground segment

Communications to and from the NOVA-C will be conducted primarily by the Lunar Tracking, Telemetry, & Communications Network (LTN), consisting of multiple dish antennas across the globe, including the 21-meter dish at Morehead State University Space Sciences Center in Kentucky.[31] Morehead State University will separately apply for Commission authorization to operate its earth station. IM-3 NOVA-C may also employ NASA's Deep Space Network (DSN) antennas at Goldstone, California, Madrid, Spain, and Canberra, Australia as necessary.

Reception of uplink (Earth-to-space) command and ranging transmissions by the NOVA-C will be via the Thales transceivers using low-gain antennas. Variable bandwidths encompass ranging-on and ranging-off modes as shown in the accompanying Schedule S.

Downlink (space-to-Earth) operations from the NOVA-C to the LTN include telemetry and data. Telemetry will be transmitted via the Quasonix transmitters primarily on low-gain antennas, with a contingency use of the high-gain antenna. Data will be transmitted via the Quasonix transmitters in various bandwidths primarily using the high-gain antenna, with a contingency use of the low-gain hemi antennas.

III. PUBLIC INTEREST STATEMENT

The IM-3 Mission, which supports the NASA Artemis lunar initiative, represents one of the first missions in a new era of space exploration, and will pioneer operations at the lunar south pole critical for United States' interests in space. As former NASA administrator Jim Bridenstine recognized, the Artemis lunar program will enable "humanity ... [to] explore regions of the Moon

[31] *See* Attachment A, Technical Appendix, § A.10.1.

never visited before, uniting people around the unknown, the never seen, and the once impossible."[32] The program will bring humans back to the surface of the Moon, including the first woman and person of color, within 4 years, and enable a long-term human presence on the Moon by the end of the decade.[33]

A key enabler of this mission is the development of a regular commercial supply of materials and experiments to the Moon through the CLPS program. NASA selected Intuitive Machines to provide this service on behalf of NASA and other commercial payload operators. The payloads for this mission are essential for scientific reconnaissance prior to landings by crewed spacecraft, both on the Moon and beyond.

Grant of this application is fully consistent with the public interest by allowing Intuitive Machines to fulfill the objectives of the NASA CLPS program, providing unique and valuable scientific and engineering payloads to the lunar surface in the first half of 2026. The IM-3 Mission will demonstrate complete lunar mission capabilities of science, exploration, and commercial development. These accomplishments and follow-on missions enabled by the IM-3 Mission will pave the way for humans returning to the Moon in the latter part of this decade and subsequent long-term settlement.

[32] *See Artemis Plan.*

[33] *Id.*

IV. OTHER MATTERS

A. Waiver Requests

The Commission may waive any of its rules if there is "good cause" to do so.[34] In general, waiver is appropriate if (i) special circumstances warrant a deviation from the general rule; and (ii) such deviation would better serve the public interest than would strict adherence to the rule.[35] Generally, the Commission will grant a waiver of its rules in a particular case if the relief requested would not undermine the policy objective of the rule in question and would otherwise serve the public interest.[36] Good cause exists to waive the following rules under the special circumstances presented in this application.

1. U.S. Table of Frequency Allocations

a) 2025-2110 MHz

The 2025-2110 MHz band is allocated to Federal space research and other Federal uses on a co-primary basis with fixed and mobile commercial uses.[37] This band may be allocated to non-Federal Earth-to-space transmission in the space research service subject to such conditions as may be applied on a case by case basis, and the limitation that any use may not cause harmful interference to authorized Federal and non-Federal operations.[38] Intuitive Machines will coordinate with NASA and other Federal and non-Federal operators in this band to ensure the

[34] *See* 47 C.F.R. § 1.3; *Northeast Cellular Tel. Co. v. FCC*, 897 F.2d 1164 (D.C. Cir. 1990) ("*Northeast Cellular*"); *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969) ("*WAIT Radio*").

[35] *See Northeast Cellular*, 897 F.2d at 1166.

[36] *See WAIT Radio*, 418 F.2d at 1157.

[37] *See* 47 C.F.R. § 2.106.

[38] *See id.*, § 2.106, n.US347.

NOVA-C's operations will not cause harmful interference, consistent with the Commission's prior authorization of TT&C uplinks in this band.[39]

To the extent the Commission does not consider the NOVA-C's TT&C uplink operations to be permissible under the Federal space research allocation, Intuitive Machines hereby requests a waiver of the Table of Allocations to operate TT&C uplinks in this band. The use of the band is extremely limited (with a nominal mission lifetime of 38 days) and is intended for TT&C uplink operations only. Good cause exists to grant the requested waiver, and deviation from the rule would not undermine the contemplated protections to authorized users of the band.

b) 2200-2290 MHz

Good cause exists to grant waiver to authorize TT&C and data downlink in the 2200-2290 MHz frequency band. This band is allocated to the space research service for Federal licensees,[40] and is allocated to space operations (space-to-Earth) and EESS (space-to-Earth) on a co-primary basis across all ITU regions. There is no current allocation for non-Federal users in the United States, and the NOVA-C will not be transmitting to TDRS systems.[41] Nevertheless, Intuitive Machines is providing services on behalf of a government agency and is supported through Federal funding. Intuitive Machines will coordinate its proposed use with applicable Federal operators prior to use. The limited duration of the IM-3 Mission further mitigates the possibility of interference with Federal users. Additionally, Intuitive Machines will conduct its TT&C and data downlink operations in the 2200-2290 MHz band in the United States only on a non-

[39] *See, e.g.,* BlackSky Global LLC, File No. SAT-LOA-20180320-00023 (granted October 3, 2018) (granting application to operate in the 2025-2110 MHz band so long as such operations do not "cause harmful interference to stations operating in the 2025-2110 MHz band in accordance with the U.S. Table of Frequency Allocations.").

[40] *See* 47 C.F.R. §§ 2.102(a), 2.106.

[41] *See id.*, n.US303.

interference/non-protection basis and only at earth stations in Morehead, KY[42] and Goldstone, CA. All other downlink operations will occur outside the United States. Therefore, good cause exists to grant a waiver of the U.S. Table of Frequency Allocations in the event the Commission concludes that NOVA-C operations in the band are not permissible under the Federal space research allocation.

c) 2400-2417 MHz and 2450-2483.5 MHz

Similarly, the proposed operations in the 2400-2417 MHz and 2450-2483.5 MHz will not harm or prejudice any third party, and good cause exists to allow use of these bands for intra-lunar communications on a short-term, non-interfering and non-protected basis. First, energy from the low-power operations proposed for these bands will not reach the Earth, and will not interfere with any other authorized use of spectrum. As described in the complementary Attachment A – Technical Appendix and Schedule S submission, the proposed use of the 2.5 GHz ISM band will involve intra-lunar communications at short distances between the NOVA-C lander and a small rover. Such operations will involve output and effective radiated power levels consistent with Part 15 terrestrial operations, and should be undetectable beyond the immediate proximity of the lander's location on the lunar surface. The rover itself will collect information concerning magnetic fields present on the lunar surface, which will help facilitate further U.S. lunar missions and activity.

[42] The 21-meter antenna also supported the IM-1 and IM-2 missions. *See, e.g.,* Experimental License Call Sign WW9XBA.

2. Waiver of Section 25.202(g)(1) for TT&C Operations in the 2025-2110 MHz band

Section 25.202(g)(1) anticipates that satellite systems will conduct TT&C operations using spectrum at the edge of or within their assigned bands.[43] Intuitive Machines proposes to conduct uplink (Earth-to-space) command and ranging transmissions centered at 2035.59416 MHz – spectrum in which non-Federal transmissions may be authorized on a case-by-case basis and on a non-harmful interference basis.[44] Intuitive Machines intends to operate on this basis and will use the spectrum command and ranging uplinks to the NOVA-C for a limited period of time. Waiver of this rule is appropriate due to the time-limited, pre-coordinated, unprotected, non-interfering operations of the NOVA-C. Accordingly, such a waiver would serve the public interest.

3. 47 C.F.R. § 25.123(b)(10)

Intuitive Machines also requests a waiver of the requirement that the wet mass of the NOVA-C will not exceed 500 kg. The wet mass of the NOVA-C will be 2248 kg and the dry mass is 813 kg. Waiver is appropriate and necessary in this case given extremely short-term use of the NOVA-C and the fact that it is non-Earth orbiting commercial lunar mission. Waiver in this instance will also support the availability of a regulatory pathway for authorizing smaller, non-Earth orbiting spacecraft and specifically U.S.-sponsored lunar missions.[45]

Although the Commission adopted a 500 kg "wet" mass limit, the figure has limited applicability to non-Earth orbiting spacecraft.[46] Indeed, the Commission acknowledged that it

[43] *See* 47 C.F.R. § 25.202(g)(1).

[44] *See id.*, § 2.106, n.US347.

[45] *See Smallsat Order*, ¶ 65 ("We adopt the *NPRM* proposal to allow small spacecraft with planned non-Earth orbiting missions, such as commercial lunar missions, to file under the streamlined process").

[46] Given the limited sample size of non-earth orbiting spacecraft applications, it is not clear that 500 kg is an appropriate metric for determining if a given spacecraft is "small" in the first instance. *See id.*, ¶ 66 (providing only

would consider revisiting certain restrictions on spacecraft applying under the streamlined process "in the future once we have additional experience authorizing these missions."[47]

The particular facts of the IM-3 mission make strict compliance inconsistent with the public interest.[48] The NOVA-C represents one of the first lunar missions seeking to use this regulatory pathway, and it is critical that the Commission recognize the need for licensing provisions that accurately reflect the legitimate mass requirements of non-Earth orbiting systems, especially given propellant requirements. A waiver of the mass requirement in this instance is necessary to fulfill the significant public interest objectives of the IM-3 Mission and the larger Artemis project. Finally, the FCC already determined that a waiver of § 25.123(b)(10) was appropriate for the IM-1 and IM-2 missions, which involved landers with similar mass and form factor.[49]

Considering these special circumstances and the public interest benefits of the IM-3 Mission, deviation from the Commission's small spacecraft mass limitation is necessary and appropriate to grant Intuitive Machines authority to operate the NOVA-C.[50]

B. NOAA Authorization

The NOVA-C has cameras onboard that may point towards the Earth, including (i) public affairs cameras that will be used at various times (ii) Micro-Nova "hopper" cameras; (iii) Lunar

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that the FCC "modify the mass certification to specify a maximum mass for these spacecraft, including fuel, of 500 kilograms. ... consistent with the comments we received suggesting that we adopt a higher mass limit for non-Earth-orbiting small spacecraft systems."). Nevertheless, while Commenters suggested the 500 kg limit as being better than the 180 kg limit proposed for Earth-orbiting satellites, commenters also noted that commercial lunar spacecraft generally include significant amounts of fuel which should not count towards any mass limit. Moreover, each commenter suggests 500 kg without providing any basis for why it is an appropriate limit. *See generally* Commercial Spaceflight Federation Comments at 9*,* Moon Express Comments at 2; and CSSMA Comments at 14-15.

[47] *Smallsat Order*, ¶ 67.

[48] *See Northeast Cellular*, 897 F.2d at 1166.

[49] *See IM-1 Application*, FCC Grant of Authority at 4.; *IM-2 Application*, FCC Grant of Authority at 4.

[50] *See id.*; *see also WAIT Radio*, 418 F.2d at 1159.

Outpost rover cameras (iv) and additional cameras for press releases. Intuitive Machines is engaged with the Commercial Remote Sensing Regulatory Affairs ("CRSRA") office at the National Oceanic and Atmospheric Administration ("NOAA") regarding these remote sensing applications. Intuitive Machines recognizes that grant of a NOAA authorization to operate a commercial remote sensing system may be required to authorize the NOVA-C and commits to work with NOAA and other U.S. Government stakeholders as needed to ensure that the NOVA-C complies with U.S. commercial remote sensing requirements.

FCC and NOAA licensing authorities overlap with respect to operation of remote sensing instruments. NOAA has authority to authorize operation of a commercial (private) remote sensing system under the National and Commercial Space Programs Act.[51] However, the Commission retains authority to authorize the launch and operation of the satellite system and the use of spectrum. Intuitive Machines acknowledges that implementation of NOVA-C will be contingent on successful conclusion of the FCC and NOAA processes.

C. Amended Small Spacecraft Rules

Out of an abundance of caution, Intuitive Machines is also providing a statement consistent with the Commission's amended small spacecraft rules. In particular, Sections 25.122(d)(4) and (d)(6) are relevant to NOVA-C operations.[52] Section 25.122(d)(4) requires a description of design and operational strategies used to minimize the risk of collision with inhabitable spacecraft if the mission transits through the inhabited spacecraft's orbit. Although orbital parameters are very different, the NOVA-C will cross the altitudes of several satellites, including the ISS on its way to

[51] 51 U.S.C. § 60121 *et seq.*

[52] *See* Applications for streamlined small spacecraft authorization, 85 Fed. Reg. 52452 (Aug. 25, 2020) (amending 47 C.F.R. § 122(d) which is made applicable to small spacecraft through 47 C.F.R. § 25.122(c)).

the Moon. Launch clearing analysis through Geostationary Orbit (GEO) will be performed by the launch provider and this window will just be a few hours long. For any issues in cislunar space, NOVA-C has propulsive capability which will enable it to avoid such inhabitable spacecraft.

Likewise, the NOVA-C is fully compliant with amended Section 25.122(d)(6). As certified above, the NOVA-C will be uniquely identified by the proper telemetry signal.[53] Moreover, Intuitive Machines is registered with Space Track via the 18th SPCS for reporting of orbit data. Thus, even under the Commission's small spacecraft rules, the IM-3 Mission is compliant.

D. ITU Compliance

Intuitive Machines will prepare and file with the International Telecommunication Union ("ITU") Advance Publication Information for its proposed system and will provide this information to the Commission under separate cover. Consistent with Section 25.111(d) and (e) of the Commission's rules, Intuitive Machines is also providing a declaration of unconditional acceptance of all consequent ITU cost-recovery charges to the Commission.[54]

V. CONCLUSION

For the foregoing reasons, and for the reasons set forth in the accompanying materials, Intuitive Machines requests that the Commission expeditiously grant Intuitive Machines operating authority for the IM-3 Mission, including the NOVA-C and its payloads, consistent with the public interest.

[53] *See* Attachment A, Technical Appendix, § A.15.

[54] *See* Attachment C, ITU Cost Recovery Letter; *see also* 47 C.F.R. § 25.111(d)-(e).