

GRANT
Muon Space Inc.
ICFS File No. SAT-MOD-20260519-00204

 GRANTED* Space Bureau	File # SAT-MOD-20260519-00204 Call Sign: <u>S3173</u> (or other identifier) Grant Date: <u>07/15/2026</u> From: <u>July 15, 2026</u> To: <u>March 6, 2029</u> Approved: <u>Carelyn A. Mahoney</u> Acting Division Chief Satellite Programs and Policy Division
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*with conditions

ICFS File No(s):	SAT-MOD-20260519-00204 ¹	GRANTED – With Conditions  Space Bureau Satellite Programs and Policy Division
Licensee/Grantee:	Muon Space Inc.	
Call Sign:	S3173	
Satellite Name:	MuSat-2, MuSat-3, MuSat-4	
Orbital Location: (required station-keeping tolerance)	Non-geostationary satellite orbit (NGSO). MuSat-2: 575 km (±25 km) operational altitude, 97.5 degrees (± 0.5 degree) inclination; Local Time of Ascending Node (LTAN) of 13:30.² MuSat-3: 550 km (±25 km) operational altitude, 97.5 degrees (± 0.5 degree) inclination; LTAN of 13:30.³ MuSat-4: 595 km (±10 km) operational altitude, 97.5 degrees (± 0.5 degree) inclination; LTAN of 10:30.⁴	
Administration:	United States of America	
Nature of Service:	Earth Exploration Satellite Service (EESS)	
Scope of Grant:	Authority to increase the operational altitude of MuSat-3 from 525 km (± 25 km) to 550 km (± 25 km). ⁵	
Previous Grant(s):	Authority to construct, deploy, and operate two NGSO satellites.⁶ Authority to construct, deploy and operate one additional NGSO satellite and to operate in accordance with an updated orbital debris mitigation plan.⁷	

¹ Application of Muon Space Inc. to Modify NGSO/EESS Launch and Operating Authority, ICFS File No. SAT-MOD-20260519-00204 (filed Jun. 3, 2026) (Application). This Application was placed on public notice on June 12, 2026. *Satellite Licensing Division and Satellite Programs and Policy Division Information, Space Station Applications Accepted for Filing*, Public Notice, Report No. SAT-02007 (rel. Jun. 12, 2026). No comments were filed.

² See SAT-LOA-20230504-00103 (granted Jan. 30, 2024, reissued Feb. 29, 2024) (*Muon Space Feb. 2024 Authorization*). On March 6, 2024, Muon Space informed the Commission that MuSat-2 had been deployed and was operating at an altitude of 592 km and an inclination of 97.745 degrees. See Letter from Paul Caritj, Counsel, Muon Space, to Marlene H. Dortch, Secretary, FCC, ICFS File No. SAT-LOA-20230504-00103 (dated Mar. 6, 2024) (MuSat-2 Deployment Notice).

³ See *Muon Space Feb. 2024 Authorization*. On June 30, 2025, Muon Space informed the Commission that MuSat-3 had been deployed and was operating at an apogee of 593.3 km, perigee of 587.6 km, and an inclination of 97.7 degrees. See Letter from Paul Caritj, Counsel for Muon Space Inc., to Satellite Programs and Policy Division, Space Bureau, FCC (dated June 30, 2025) (MuSat-3 Deployment Notice).

⁴ See ICFS File Nos. SAT-MOD-20240614-00133, SAT-AMD-20240927-00207 (granted-in-part, deferred-in-part Jan. 17, 2025) (*Muon Space Jan. 2025 Authorization*). On March 20, 2025, Muon Space informed the Commission that MuSat-4 had been deployed and was operating at an apogee of 589.7 km, a perigee of 587.4 km, and an inclination of 97.7 degrees. The altitude range specified is smaller than what was requested to correspond to the range coordinated with Federal spectrum users, but may be updated through further grant-in-part or license modification based on complete additional coordination. See Letter from Paul Caritj, Counsel, Muon Space, to Marlene Dortch, Secretary, FCC, ICFS File No. SAT-MOD-20240614-00133 (filed Mar. 20, 2025) (MuSat-4 Deployment Notice).

⁵ See Application, Narrative at 1-2, Schedule S.

⁶ See *Muon Space Feb. 2024 Authorization*.

⁷ See *Muon Space Jan. 2025 Authorization*.

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	Specification of certain Global Positioning System (GPS) and Galileo Radionavigation Satellite-Service (RNSS) signals to support position, navigation, and timekeeping (PNT) capabilities for the MuSat-4 space station.⁸ Specification of certain GPS and Galileo RNSS signals to support PNT, radio occultation, and radio reflectometry capabilities for the MuSat-2, MuSat-3, and MuSat-4 space stations.⁹ Authority to (1) reduce the minimum operational altitude of MuSat-3 from 550 km to 500 km and (2) implement an alternate channel plan for the MuSat-2, -3, and -4 high-speed downlink that lowers the center frequency and reduces the channel bandwidth where possible.¹⁰
Service Area(s):	Global, subject to limitations in specific frequency bands. ¹¹
Frequencies:	<u>EESS</u>:¹² 8025-8400 MHz (space-to-Earth) (center frequency 8205.0 MHz, bandwidth 85 MHz (MuSat-2 HSD1a); center frequency 8205.0 MHz, bandwidth 250 MHz (MuSat-3 HSD1b, MuSat-4 HSD1b)) 8025-8400 MHz (space-to-Earth) (center frequency 8105.0 MHz, bandwidth 85 MHz (MuSat-2 HSD2a); center frequency 8105.0 MHz, bandwidth 160 MHz (MuSat-3 HSD2b, MuSat-4 HSD2b)).

⁸ See ICFS File Nos. SAT-MOD-20240614-00133; SAT-AMD-20240927-00207 (granted-in-part, deferred-in-part Mar. 3, 2025).

⁹ See ICFS File Nos. SAT-MOD-20240614-00133; SAT-AMD-20240927-00207; SAT-AMD-20250304-00062 (granted-in-part, deferred-in-part Apr. 15, 2025) (*Muon Space April 2025 Authorization*).

¹⁰ See ICFS File No. SAT-MOD-20240924-00300 (granted May 1, 2026; reissued May 19, 2026) (*Muon Space May 2026 Authorization*).

¹¹ See *id.* at Appendix.

¹² Each of Muon Space's uplink channels in the 2025-2110 MHz band may be used for tasking, sensor configuration, and other functions in support to each satellite's remote-sensing missions and for other forms of spacecraft TT&C. See ICFS File No. SAT-AMD-20240927-00207, Narrative at 1-2. No further Commission action related to S-band uplink is needed, and Muon Space's initial grant encapsulates full requested S-band uplink operations of Muon Space. *Muon Space April 2025 Authorization* at n. 9. See also *Muon Space May 2026 Authorization* at 2, n. 7 (authorizing the alternate channel plan for the MuSat-2, -3, and -4 high speed downlink).

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	<u>Telemetry, Tracking and Command (TT&C):</u> 8025-8400 MHz (space-to-Earth) (center frequency 8385.0 MHz, bandwidth 2.8 MHz; center frequency 8390.0 MHz, bandwidth 2.8 MHz).¹³ 2025-2110 MHz (Earth-to-space) (center frequency 2062.5 MHz, bandwidths 280 kHz and 620 kHz (MuSat-2); center frequency 2061.5 MHz, bandwidth 280 kHz (MuSat-3, MuSat-4); center frequency 2062.5 MHz, bandwidth 980 kHz (MuSat-3, MuSat-4)). <u>Receive center frequencies of RNSS signals for radio occultation and radio reflectometry only:</u>¹⁴ 1575.42 MHz (GPS L1CA, GPS L1C, Galileo E1), 1227.60 MHz (GPS L2C), 1176.45 MHz (GPS L5, Galileo E5a), 1207.14 MHz (Galileo E5b) (MuSat-2, MuSat-3, MuSat-4). <u>Receive center frequencies of RNSS signals for PNT:</u>¹⁵ 1575.42 MHz (GPS L1CA, GPS L1C, Galileo E1), 1227.60 MHz (GPS L2P, GPS L2C), 1176.45 MHz (GPS L5, Galileo E5a), and 1207.14 MHz (Galileo E5b) (MuSat-2, MuSat-3, MuSat-4).
Unless otherwise specified herein, operations under this grant must comport with the legal and technical specifications and commitments set forth by the applicant or petitioner and with the Federal Communications Commission’s rules not waived herein. This grant is also subject to the following conditions: 1. Space-to-Earth and Earth-to-space operations must be strictly limited to durations when the MuSat space stations are visible to the corresponding earth station locations listed in the Appendix of this Grant, noting any additional restrictions within this grant.¹⁶ The only permissible exception to this condition is during temporary Safe Mode operations resulting from an anomalous event. 2. Earth station transmissions to the MuSat-2, MuSat-3, and MuSat-4 satellites in the 2025-2110 MHz band must be coordinated with fixed and mobile stations in the 2025-2110 MHz band (e.g., via the Society of Broadcast Engineers (SBE)). 3. We previously granted, on our own motion, waiver of the U.S. Table of Frequency Allocations (U.S. Table), 47 CFR § 2.106(a), (c)(258), for Muon Space’s TT&C operations in the 8025-8400 MHz band to the extent that authorizations are subject to a case-by-case analysis.¹⁷ Muon Space’s transmissions in the 8025-8400 MHz band are authorized on an unprotected and non-interference basis and may only be with specific frequencies and earth stations coordinated with the National Aeronautics and Space Administration (NASA), the Air Force Spectrum Management Office (AFSMO), Department of Commerce (DOC)/National Oceanic and Atmospheric Administration (NOAA), and the Department of the Navy	

¹³ The MuSat fleet includes a “Safe Mode,” where whenever a spacecraft enters Safe Mode (due to an anomalous event), a short transmission burst with satellite status data is sent periodically, at a rate of approximately 0.25s of transmission activity every 30s (< 1% of duty-cycle). This beaconing operation is not active in nominal satellite operation and is not expected to be a frequent occurrence, but can happen at any orbital location. The transmission waveform parameters of the beacon (carrier frequencies, power levels, and bandwidths) are the same as the nominal TT&C X-band downlink, and the beacon feature can be disabled from mission control. See ICFS File No. SAT-LOA-20251119-00332, Application, Technical Attachment at 8.

¹⁴ See *Muon Space April 2025 Authorization*. The Bureau deferred Muon Space’s request for additional signals for the collection of radio occultation and radio reflectometry data. See *id.* at Condition 9. That request remains deferred.

¹⁵ See *id.*

¹⁶ See Appendix.

¹⁷ See, e.g., *Muon Space April 2025 Authorization* at Condition 3.

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(DON). A list of coordinated earth stations is attached in the Appendix to this Grant.¹⁸ Muon Space must provide the FCC with an updated list of coordinated non-Federal earth stations within ten business days following any changes to this list.

4. No satellite authorized under this license may transmit on both sets high speed downlink channels authorized in the 8025-8400 MHz band simultaneously.
5. Muon Space must immediately cease transmissions to/from earth stations upon any notification of interference to U.S. Federal systems.
6. In the 8025-8400 MHz band, use of Federal government-sponsored earth stations must be coordinated by Muon Space's Federal government customers with AFSMO (jimmy.nguyen@us.af.mil), NASA (hq-satcoord@mail.nasa.gov), and DOC/NOAA (spectrum.coordinator@noaa.gov).
7. In the 8025-8400 MHz (space-to-Earth) band, Muon Space must ensure that spacecraft transmissions are ceased and no earth station receive operations are permitted when any of the following occur:
 - a. the conjunction angle formed by the location 64° 53' 00" N 147° 30' 00" W (angle vertex), the MuSat spacecraft, and any of the following spacecraft is less than or equal to 5 degrees:
 - Aura (NORAD ID: 28376)
 - Aqua (NORAD ID: 27424)
 - ICESat-2 (NORAD ID: 43613)
 - Landsat-8 (NORAD ID: 39084)
 - Landsat-9 (NORAD ID: 49260)
 - OCO-2 (NORAD ID: 40059)
 - SMAP (NORAD ID: 40376)
 - Terra (NORAD ID: 25994)
 - b. the conjunction angle formed by the location 78° 13' 50" N 015° 24' 20" E (angle vertex), the MuSat spacecraft, and any of the following spacecraft is less than or equal to 5 degrees:
 - Aqua (NORAD ID: 27424)
 - ICESat-2 (NORAD ID: 43613)
 - Landsat-8 (NORAD ID: 39084)
 - Landsat-9 (NORAD ID: 49260)
 - OCO-2 (NORAD ID: 40059)
 - Terra (NORAD ID: 25994)
 - Suomi-NPP (NORAD ID: 37849)
 - c. the conjunction angle formed by the location 25° 53' 16" S 027° 41' 10" E (angle vertex), the MuSat spacecraft, and any of the following spacecraft is less than or equal to 5 degrees.
 - SWOT (NORAD ID: 54754)
 - INCUS (NORAD ID: TBD)

¹⁸ See Appendix.

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- d. the conjunction angle formed by the location 61° 09' 24" N 149° 59' 07" W (angle vertex), the MuSat spacecraft, and any of the following spacecraft is less than or equal to 5 degrees.
 - Aura (NORAD ID: 28376)
 - Aqua (NORAD ID: 27424)
- e. the conjunction angle formed by the location 21° 17' 54" N 157° 48' 59" W (angle vertex), the MuSat spacecraft, and any of the following spacecraft is less than or equal to 5 degrees.
 - Aura (NORAD ID: 28376)
 - Aqua (NORAD ID: 27424)
- f. the conjunction angle formed by the location 38° 40' 21" N 004° 09' 46" W (angle vertex), the MuSat spacecraft, and any of the following spacecraft is less than or equal to 5 degrees while any MuSat spacecraft is using a downlink frequency of 8205 MHz with an emission bandwidth of 250 MHz.
 - INCUS (NORAD ID: TBD)
- g. the conjunction angle formed by the location 29° 00' 37" S 115° 20' 28" E (angle vertex), the MuSat spacecraft, and any of the following spacecraft is less than or equal to 5 degrees while any MuSat spacecraft is using a downlink frequency of 8205 MHz with an emission bandwidth of 250 MHz.
 - INCUS (NORAD ID: TBD)
- h. the conjunction angle formed by the location 64° 58' 21" N 147° 30' 04" W (angle vertex), the MuSat spacecraft, and any of the following spacecraft is less than or equal to 5 degrees.
 - Suomi-NPP (NORAD ID: 37849)
 - Oceansat-3/EOS-6 (NORAD ID: 54361)
8. Power flux-density (PFD) levels at the geostationary-satellite orbit and at the surface of the earth from Muon Space's operations in the 8025-8400 MHz band must not exceed the respective limits in No. 22.5 and Table 21-4 of the ITU Radio Regulations, must meet the limits/protection criteria in Recommendation ITU-R SA.1157-1, and must follow the guidelines in Recommendation ITU-R SA.1810. Muon Space's MuSat satellites' out of band emissions, with 85 MHz (MuSat-2) and 250 MHz (MuSat-3, MuSat-4) bandwidths, exceed the deep space protection criteria in ITU-R SA.1157-1. Therefore, Muon Space must cease MuSat space-to-Earth transmissions centered at 8205.0 MHz when the MuSat spacecraft are within radio line-of-sight of the earth station locations listed in Table 3 of Recommendation ITU-R SA.1014-4 (or current in-force SA.1014), unless an alternative mitigation technique is established as specified in this condition. Any alternative mitigation techniques to achieve the deep space interference protection criteria must be successfully coordinated with NASA prior to departure from the radio line of sight restriction. Muon Space must provide the FCC, with copy to NASA, the specific alternative mitigation technique(s) to protect the deep space stations within ten business days of the conclusion of the coordination with NASA.
9. We previously granted Muon Space's request for waiver of the U.S. Table, 47 CFR § 2.106(a), for Muon Space to collect radio occultation and radio reflectometry data utilizing RNSS signals specified herein.¹⁹ Muon Space's request for waiver to utilize additional RNSS signals to collect radio occultation or radio reflectometry data remains deferred.²⁰ Muon Space states that it will collect data from certain publicly

¹⁹ See *Muon Space April 2025 Authorization* at Condition 9.

²⁰ See *id.*; see, e.g., *Muon Space May 2026 Authorization* at Condition 9.

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available global navigation satellite service (GNSS) signals.²¹ Muon Space's reception of RNSS signals for radio occultation and radio reflectometry purposes is on a non-conforming, non-harmful interference, and unprotected basis. Muon Space may not claim protection from any authorized users of the band operating consistent with the allocation, and must immediately terminate non-conforming operations upon notification of harmful interference.

10. In the event changes to the LTAN are required, Muon Space must complete coordination with DOC/NOAA (spectrum.coordinator@noaa.gov), AFSMO (jimmy.nguyen@us.af.mil), and NASA (hq-satcoord@mail.nasa.gov) before making any changes to the LTAN and notify the FCC of the update within five business days of making the change.

11. Muon Space's request for waiver, to the extent necessary, of section 25.114, regarding certain technical limitations of the Schedule S is DISMISSED as moot.²²

12. All satellites covered by this authorization are launched and operating.²³ Accordingly, Muon Space has satisfied its milestone obligations under the Commission's rules.²⁴

Licensee/grantee is afforded thirty (30) days from the date of release of this action to decline the grant as conditioned. Failure to respond within this period will constitute formal acceptance of the grant as conditioned.

This action is taken pursuant to Section 0.261 of the Commission's rules on delegated authority, 47 CFR § 0.261, and is effective upon release.

Station licenses are subject to the conditions specified in Section 309(h) of the Communications Act of 1934, as amended, 47 U.S.C. § 309(h).

Action Date:	July 15, 2026	
Term Dates	From: July 15, 2026	To: March 6, 2029

Approved:

Carolyn A. Mahoney
Acting Division Chief, Satellite Programs and Policy Division
Space Bureau

²¹ See, e.g., Letter from Paul Caritj, Counsel to Muon Space Inc., to Marlene H. Dortch, Secretary, FCC, ICFS File Nos. SAT-MOD-20240614-00133, SAT-AMD-20240927 (filed Jan. 14, 2025).

²² 47 CFR § 25.114; see Application, Waiver Request at 1-2. Muon Space included the correct associated orbital plane values in its request for waiver. Accordingly, we determine that a waiver of section 25.114 is not necessary.

²³ See *MuSat-2 Deployment Notice*, *MuSat-3 Deployment Notice*, and *MuSat-4 Deployment Notice*.

²⁴ 47 CFR § 25.164.

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Appendix:
Earth Station Locations²⁵
Coordinated with Federal Agencies

Location		Frequency Band	Lat	Long
Fairbanks	US	S-band Uplink and X-band Downlink	64.82	-147.72
Svalbard	Norway	S-band Uplink and X-band Downlink	78.23	15.41
Punta Arenas	Chile	S-band Uplink and X-band Downlink	-52.94	-70.87
Hartebeesthoek	South Africa	S-band Uplink and X-band Downlink	-25.89	27.71
Awarua	New Zealand	S-band Uplink and X-band Downlink	-46.53	168.38
Santa Maria	Azores	S-band Uplink and X-band Downlink	37.00	-25.14
Awarua	New Zealand	S-band Uplink and X-band Downlink	-46.53	168.38
Sofia	Bulgaria	S-band Uplink and X-band Downlink	42.48	23.45
Unst	UK	S-band Uplink and X-band Downlink	60.75	-0.86
Anchorage	US	S-band Uplink and X-band Downlink	62.33	-150.03
Peterborough	Australia	S-band Uplink and X-band Downlink	-32.96	138.85
Nangetty	Australia	S-band Uplink and X-band Downlink	-29.01	115.34
Keflavik	Iceland	S-band Uplink and X-band Downlink	65.65	-20.25
Baku	Azerbaijan	S-band Uplink and X-band Downlink	40.47	49.49
Ripailles	Mauritius	S-band Uplink and X-band Downlink	-20.14	57.69
Jeju	South Korea	S-band Uplink and X-band Downlink	33.39	126.32
BoschKop	South Africa	S-band Uplink and X-band Downlink	-25.86	28.45
La Paz	Mexico	S-band Uplink and X-band Downlink	24.11	-110.37
Punta Arenas	Chile	S-band Uplink and X-band Downlink	-53.04	-70.85
Hawaii	US	S-band Uplink and X-band Downlink	20.82	-156.45
Jeju	South Korea	S-band Uplink and X-band Downlink	33.39	126.32
Mingenew	Australia	S-band Uplink and X-band Downlink	-29.01	115.34
Puertollano	Spain	S-band Uplink and X-band Downlink	38.67	-4.16

²⁵ Additional operations at these locations may be added subject to coordination with Federal spectrum users. *See also* ICFS File No. SAT-MOD-20240614-00133, Tech Annex at 10-11.