Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
SPACE EXPLORATION HOLDINGS, LLC	)	Call Sign: S3069
Amendment to Application for the SpaceX Gen2 NGSO Satellite System	)	File No. SAT-AMD-_____

AMENDMENT

Earlier this month, the Commission granted in part the application of Space Exploration Holdings, LLC ("SpaceX") for its second-generation non-geostationary orbit ("NGSO") satellite system (the "Gen2 System").[1] In that authorization, the Commission deferred action with respect to the small safety-enhancing radiofrequency beacons SpaceX intends to put on Gen2 satellites to perform specialized telemetry, tracking and command ("TT&C") functions, pending further review.[2] These beacons will provide an extra measure of redundancy to ensure that SpaceX has highly accurate positional information on its Gen2 satellites at crucial periods of operation. For example, these beacons will enable SpaceX to track and maintain contact with Gen2 satellites during rare and highly unpredictable space weather events and during orbit raising. SpaceX has previously provided technical and other information about these beacons.[3] At the request of the International Bureau Staff it is submitting this amendment to more fully characterize their proposed operation.

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1 *See Space Exploration Holdings, LLC*, FCC 22-91 (rel. Dec. 1, 2022).

2 *See id.* ¶¶ 68-69.

3 *See, e.g.*, Letter from David Goldman to Marlene H. Dortch, IBFS File No. SAT-MOD-20200417-00037, Exhibit A (Oct. 4, 2022) ("SpaceX Oct. 4 Supplement") (providing radiofrequency beacon characteristics); Letter from David Goldman to Marlene H. Dortch, IBFS File No. SAT-MOD-20200417-00037, at 6 & n.17 (Aug. 19, 2022) (describing German licensing and DAS analysis).

As previously disclosed, the proposed beacons operate in very high frequency ("VHF") spectrum, transmitting in portions of the 137-138 MHz band (space-to-Earth) and receiving in portions of the 148-150.05 MHz band (Earth-to-space).[4] These are the same band segments currently licensed to and fully coordinated by SpaceX affiliate Swarm Technologies, Inc.[5] The beacons are designed to broadcast a telemetry tracking message with the Gen2 satellite's Global Navigation Satellite System ("GNSS")-derived location once every 100 seconds, on average.

SpaceX plans to operate these beacons during two phases of a satellite's lifetime: (1) during the launch and early operations phase ("LEOP"), which occurs between the injection of a Gen2 satellite at a lower-than-operational altitude through its orbit raising to its intended orbit; and, (2) in the event of an emergency after the satellite has reached its nominal altitude and begins operations. A satellite can spend several weeks in the orbit raising stage. Once the satellites reach their intended orbit, the beacons will be shut off, only to transmit again if commanded in the unlikely event of an emergency. Such capability will enable SpaceX to continue to lead the industry in space stewardship by formally including a redundant backup TT&C system on its already-advanced Gen2 satellites.

The number of beacons in operation at any given time will depend upon the launch cadence of the Falcon 9 and Starship rockets launching the Gen2 satellites. SpaceX intends to include a beacon on every Gen2 satellite going forward, consistent with the launch cadence SpaceX previously disclosed in an earlier voluntary supplement to its Gen2 application.[6] However, at no point would more than 450 beacons be operational across the entire Gen2 constellation (LEOP and on-station) at once.

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[4] Detailed technical information is provided in Exhibit A hereto and the Schedule S accompanying this application.

[5] *See Swarm Technologies, Inc*., 34 FCC Rcd. 9469 (IB 2019); Stamp Grant, Swarm Technologies, Inc., IBFS File Nos. SAT-MOD-20200501-00040, SAT-AMD-20200504-00041 (Jul. 1, 2021).

[6] *See* SpaceX Oct. 4 Supplement at 6.

These beacons were previously licensed for launch and operation through the German administration.[7] Although SpaceX originally did not intend to use them to communicate with any earth stations in the United States, it has now concluded that space station authority for U.S. operations would provide valuable additional resources for tracking Gen2 satellites, especially in case of emergency. Accordingly, to the extent necessary, SpaceX seeks U.S. authorization for beacon operations.

SpaceX has confirmed using NASA's Debris Assessment Software that these beacons do not change the already conservative analysis provided to the Commission for the Gen2 system. Thus, their deployment on Gen2 satellites will have no effect on the orbital debris mitigation characteristics previously approved by the Commission.

CONCLUSION

The proposed radiofrequency beacons will enhance the Gen2 system's already robust capabilities to operate safely and harmoniously in space, especially during periods of transit and emergency when the value of accurate positional information is at its highest. In addition, because relatively few beacons will operate at any given time and their small form factor does not affect the orbital debris profile of the satellites, they will have no material effect on other satellite systems. Accordingly, SpaceX requests that the Commission find that granting this amendment would serve the public interest, and issue such grant expeditiously.

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[7] *See* Assignment of Orbit and Frequency Usage Rights, No. 223-3 SWARM ASTROBIENE 20220615 (issued Jun. 15, 2022). The German administration has submitted the system for coordination with the International Telecommunication Union under the name ASTROBIENE.

Respectfully submitted,

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EXHIBIT A

GEN2 RADIOFREQUENCY BEACON CHARACTERISTICS

Operating Frequency Bands:

137.00-138.00 MHz Transmit (space-to-Earth)
148.00-150.05 MHz Receive (Earth-to-space)

Receiving Channel Characteristics			
Channel ID	Channel Bandwidth (MHz)	Center Frequency (MHz)	Type of Link
R001	0.03	148.2825	Service
R002	0.03	148.3125	Service
R003	0.03	148.3425	Service
R004	0.03	148.3725	Service
R005	0.03	148.4025	Service
R006	0.03	148.4325	Service
R007	0.03	148.4625	Service
R008	0.03	148.4925	Service
R009	0.03	148.5225	Service
R010	0.03	148.5525	Service
R011	0.03	148.6625	Service
R012	0.03	148.6925	Service
R013	0.03	148.7225	Service
R014	0.03	149.9250	Service

Receiving Beam Parameters	
Polarization	RHCP
Peak Gain	0.0 dBi
Antenna Pointing Error	2.0 degrees
Antenna Rotational Error	2.0 degrees
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
G/T at Max. Gain Point	-24.8 dB/K
Min. Saturation Flux Density	-154.2 dBW/m^2
Max. Saturation Flux Density	-125.2 dBW/m^2
Co- or Cross-Polar Mode	Co-Polar
Service Area	Global

Transmitting Channel Characteristics			
Channel ID	Channel Bandwidth (MHz)	Center Frequency (MHz)	Type of Link
T001	0.03	137.055	Service
T002	0.03	137.085	Service
T003	0.03	137.115	Service
T004	0.03	137.145	Service
T005	0.03	137.3513	Service
T006	0.03	137.5038	Service
T007	0.03	137.6175	Service
T008	0.03	137.8463	Service
T009	0.03	137.8763	Service
T010	0.03	137.9063	Service
T011	0.03	137.9363	Service
T012	0.03	137.9663	Service

Transmitting Beam Parameters	
Polarization	RHCP
Peak Gain	0.0 dBi
Antenna Pointing Error	2.0 degrees
Antenna Rotational Error	2.0 degrees
Polarization Alignment Relative to the Equatorial Plane	45.0 degrees
Max. Transmit EIRP Density	-41.4 dBW/Hz
Max. Transmit EIRP	1.76 dBW
Co- or Cross-Polar Mode	Co-Polar
Service Area	Global

Maximum Power Flux Density ($dBW/m^2/BW$)						
BW:	0°-5°	5°-10°	10°-15°	15°-20°	20°-25°	25°-90°
4.0 kHz	-129.4	-129.3	-129.2	-129.0	-128.8	-125.9