

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of	)	
	)	
Fleet Space Technologies Inc.	)	File No. SES- _____
	)	
Blanket Earth Station Authorization to	)	Call Sign: _____
Operate Mobile-Satellite Service User	)	
Terminals	)	

APPLICATION

Fleet Space¹ seeks blanket earth station authorization for 10,000 mobile-satellite service user terminals² to communicate with four Fleet Space satellites inside the United States starting January 2023.³ The user terminals would use the frequency bands 399.9-400.05 MHz (Earth-to-space), 400.15-401 MHz (space-to-Earth), and 2020-2025 MHz (Earth-to-space). Authorizing the user terminals would expand industrial internet-of-things (“IIoT”) connectivity for utilities, mining, and defense applications inside the United States consistent with the Commission’s mandate to “make available, so far as possible to all the people of the United States . . . rapid, efficient, Nation-wide and world-wide . . . radio communications service[s].”⁴

An earth station license applicant may certify compliance with a space station authorization to avoid submitting and prosecuting duplicative licensing information. In 2020, the Commission decided that “[a]n earth station applicant certifying that it will comply with the applicable terms and conditions of the authorization of any space station with which it

¹ Fleet Space Technologies Pty Ltd is a private company headquartered in Adelaide, South Australia, Australia with its U.S. subsidiary Fleet Space Technologies Inc. incorporated in Middletown, Delaware.

² No greater than thirty-two user terminals would operate simultaneously.

³ The companion satellite U.S. market access application remains pending. *See generally* Fleet Space, Application, File No. SAT-PDR-20220805-00077 (filed Aug. 5, 2022) (“Fleet Space Satellite Application”).

⁴ 47 U.S.C. § 151.

communicates need not provide technical demonstrations or other information that is duplicative or unnecessary due to the certification.”⁵ Fleet Space certifies that it will comply with the applicable terms and conditions of the forthcoming authorization for FCC call sign S3149 (Fleet Space’s Centauri 6, Centauri 7, Centauri 8, and Alpha 1 satellites). Fleet Space also submits further earth station specific information, as follows.

Non-voice, non-geostationary orbit mobile-satellite service licensing. A NVNG MSS earth station applicant shall provide its technical information, including power and duty cycle limits, to demonstrate the proposed operations would not cause unacceptable interference to other authorized users.⁶ To ensure compliance, Fleet Space’s user terminals would, among other things,

1. operate at -5 dBW to +9.5 dBW power level (never greater than 5 dBW in the 399.9-400.05 MHz band consistent with the international power limit),⁷ 0.05% duty cycle over any fifteen-minute period, and 300 millisecond burst duration;
2. transmit only when in line of sight of a Fleet Space satellite; and
3. use long-range (or LoRa) technology with proprietary chirp spread spectrum modulation techniques that adds inherent coordination flexibility for continued re-configuring of the transmit power, carrier frequency, bandwidth, spreading-factor, and coding rate through the payload’s software defined radio technology.

The low power, low duty cycle, and low burst duration, coupled with various interference-mitigation tools, reduce the theoretical potential for an interference event to occur and make

⁵ 47 C.F.R. § 25.115(a)(1)(ii). *See generally Further Streamlining Part 25 Rules Governing Satellite Services*, Report and Order, 35 FCC Rcd 13285 ¶¶ 37-42 (2020). The certification does not apply to fixed-satellite service operation in bands below 10 GHz or in bands subject to 47 C.F.R. § 25.136. Fleet Space does not propose FSS provision.

⁶ *See* 47 C.F.R. § 25.135(a).

⁷ *See* ITU Radio Regulations No. 5.260A.

coordination easier.⁸ Further, the Fleet Space user terminals employ batteries. The effective battery life is dependent on the user terminal's transmit power and duty cycle; therefore, Fleet Space is motivated to operate using the minimum technical parameters.

Radiation hazard report. An earth station applicant shall analyze whether the proposed transmitting earth stations satisfy limits on human exposure to radiofrequency energy.⁹ Fleet Space meets the limits and provides the supporting calculations in Attachment 1 with the accompanying technical certification in Attachment 2.

In light of the above certification, the user terminal information in the previously filed satellite U.S. market access application and contemporaneously filed in the present application, and ostensible benefits for satellite-based IIoT services, Fleet Space requests expedited processing for the proposed user terminals.

Respectfully submitted,

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October 14, 2022

⁸ The detailed ground segment plan, including spectrum sharing capabilities, appear in the Fleet Space Satellite Application, Legal Narrative §§ I.B, I.C.iv.

⁹ See 47 C.F.R. § 25.115(p) (“The licensee[s] and grantees shall ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate.”).

ATTACHMENT 1 (RADIATION HAZARD REPORT)

I. Introduction

This analysis demonstrates compliance with applicable radiation limits for Fleet Space’s user terminals. The calculations performed in this analysis comply with the methods described in Federal Communications Commission Office of Engineering & Technology Bulletin, Number 65 (Edition 97-01) (“OET Bulletin 65”) and demonstrate compliance with the Maximum Permissible Exposure (“MPE”) limits set forth in Section 1.1310 of the Commission’s rules.

II. Fleet Space’s User Terminals Description and Operating Parameters

Fleet Space’s user terminals fulfill the criteria for mobile devices set forth in Section 2.1091(b) of the minimum distance of 20 centimetres from the human body. The installation and operating manuals for the user terminals will specify a minimum 20-centimeter separation distance between any person, including the user, and the earth station antenna while operating the device.

Section 1.1310 of the Commission’s rules and OET Bulletin 65 specify radiation limits for two different scenarios: (1) occupational/controlled exposures and (2) general population/uncontrolled exposures.

- (1) The limits for occupational/controlled exposure apply when persons are exposed as a consequence of their employment, provided those persons are fully aware of the potential for exposure and can exercise control over their exposure.
- (2) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Fleet Space’s user terminals will be deployed in a wide variety of commercial and industrial applications. Therefore, the analysis below reflects the more restrictive general population/uncontrolled exposure limits to demonstrate compliance in all potential deployment environments and scenarios. As Fleet Space’s user terminals will be operating in both the UHF-band¹ and S-band,² two separate calculations will be performed. The applicable MPE limits for general population/uncontrolled exposure for Fleet Space’s user terminals are shown in Table 1.

¹ UHF band refers to the Earth-to-space service links in the 399.9-400.05 MHz band.

² S-band refers to the Earth-to-space service links in the 2020-2025 MHz band.

	Frequency Range (MHz)	Power Density (S)$\left(\frac{mW}{cm^2}\right)$	Averaging Time (minutes)
Fleet Space’s User Terminal to Alpha 1 Satellite (Operating in UHF- band)	300 – 1 500	0.2666	30
Fleet Space’s User Terminal to C6, C7, C8, and Alpha 1 Satellites (Operating in S-band)	1 500 – 100 000	1	30

Table 1: MPE limits for general population/uncontrolled exposure for Fleet Space’s user terminals.³

Under Section 2.1091 of the Commission’s rules, mobile devices intended for use in general population or uncontrolled environments are permitted to use “source-based” time-averaging based on the duty-cycle of a device.⁴ The maximum duty cycle of a Fleet Space user terminal is 0.05% over any fifteen-minute period. The maximum duty cycle over the averaging time of thirty minutes specified in Table 1 is also 0.05%, and the radiation hazard analysis below accounts for this maximum duty cycle value.

III. Analysis

The exposure power density is derived from equation (3) in OET Bulletin 65 and adjusted for the duty cycle of the Fleet Space user device:⁵

$$S = \frac{P G}{4\pi R^2}$$

Where:

S = power density

³ See 47 C.F.R. § 1.1310(e); Federal Communications Commission Office of Engineering & Technology Bulletin, Number 65 (Edition 97-01) (“OET Bulletin 65”).

⁴ See 47 C.F.R. § 2.1091(d)(2); OET Bulletin 65.

⁵ See OET Bulletin 65 at 19 (“These equations are generally accurate in the far-field of an antenna but will over-predict power density in the near field, where they could be used for making a ‘worst case’ or conservative prediction.”).

$P = \text{power input}$

$G = \text{antenna gain}$

$R = \text{distance to the center of radiation of the antenna}$

Parameter	UHF-band	S-band	Units
Power Input (P)	1500	2000	mW
Antenna Gain (G)	2.5	6.5	dBi
Distance (R)	20	20	cm

Table 2: Parameters for Determining Power Density Levels for Fleet Space's User Terminals

For evaluation of compliance with the time-averaged power density requirement over thirty minutes (see Table 1), the maximum power density level was multiplied by the maximum duty cycle of 0.05%.

Maximum power density level for Fleet Space's user terminals operating in UHF-band:

$$S = (0.0005) \times \frac{(1500) (1.778)}{4\pi(20)^2}$$

$$S = 0.000265 \frac{mW}{cm^2}$$

Maximum power density level for Fleet Space's user terminals operating in S-band:

$$S = (0.0005) \times \frac{(2000) (4.467)}{4\pi(20)^2}$$

$$S = 0.000889 \frac{mW}{cm^2}$$

As shown, Fleet Space's user terminals utilising frequencies in the UHF-band operate with a maximum power density of $0.000265 \frac{mW}{cm^2}$ over the applicable averaging time and therefore do not exceed the MPE limit of $0.2666 \frac{mW}{cm^2}$ averaged over a thirty-minute period. Similarly, Fleet Space's user terminals utilising frequencies in the S-band operate with a maximum power density of $0.000889 \frac{mW}{cm^2}$ over the applicable averaging time and therefore do not exceed the MPE limit of $1 \frac{mW}{cm^2}$ averaged over a thirty-minute period.

IV. Conclusion

As demonstrated in the analysis above, operation of Fleet Space's user terminals will not result in exposure levels exceeding the applicable radiation hazard limits.

ATTACHMENT 2
(TECHNICAL CERTIFICATION)

I, Ian Partis, hereby certify, under penalty of perjury, that I am the technically qualified person responsible for the preparation of the engineering information contained in the technical portions of the foregoing application and the related attachments, that I am familiar with Part 25 of the Commission's rules, and that the technical information is complete and accurate to the best of my knowledge and belief.

/s/ Ian Partis

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