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April 7, 2021

Marlene H. Dortch
Secretary, Federal Communications Commission
45 L Street NE
Washington, DC 20554

Swarm Technologies, Inc., IBFS File Nos. SAT-LOA-20181221-00094, SAT-MOD-20200501-00040 & SAT-AMD-20200504-00041, Call Sign S3041.

Dear Ms. Dortch:

Swarm Technologies, Inc. ("Swarm") hereby seeks expedited action on its pending request for a limited waiver of footnote US323 to the U.S. Table of Frequency Allocations to the extent the request applies to frequencies currently licensed to Swarm. Grant of this narrow request pending full consideration of the applications referenced above will enable Swarm to unleash services in high demand from U.S. government and commercial clients in the non-voice, non-geostationary ("NVNG") very-high frequency ("VHF") bands.

I. Background

In the Earth-to-space direction, Swarm is currently authorized to operate its NVNG VHF system within specific frequency segments (148.2500–148.5850 MHz, 148.6350–148.7500 MHz, and 149.9000–149.9500 MHz) that do not overlap with the frequencies assigned to the sole commercial incumbent, ORBCOMM License Corp. ("ORBCOMM"). To protect terrestrial government users,[1] footnote US323 to the U.S. Table of Frequency Allocations restricts uplink transmissions from individual mobile earth stations operating in the 148.0–149.9 MHz band. Assuming the mobile earth station avoids frequencies in active use by terrestrial systems (as Swarm's terminals do), the footnote requires the station to observe (1) a duty cycle of 1% within any 15-minute period, (2) a wait time of 15 seconds between consecutive transmissions on the same frequency, and (3) a maximum transmission duration of 450ms.[2]

[1] *See Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum to the Fixed-Satellite Service and the Mobile-Satellite Service for Low-Earth Orbit Satellites*, Report and Order, 8 FCC Rcd. 1812 ¶¶ 16, 20 (1993).
[2] *See* 47 C.F.R. § 2.106 at footnote US323.

In an application Amendment filed last year, Swarm requested authority to operate across the entire NVNG VHF uplink (and downlink) bands and to expand the size of its VHF constellation.[3] Swarm also sought a limited waiver that would permit its terminals to transmit in the 148.0-149.9 MHz band for up to 1700ms without a minimum wait time rather than the 450ms maximum with a minimum wait time as specified by US323, while continuing to observe the 1% duty cycle required by the footnote.[4] ORBCOMM, the sole commercial incumbent, objected to the US323 waiver request, speculating that it might increase the risk of harmful interference into its own system to the extent Swarm and ORBCOMM's operations overlapped.[5] Myriota, the other VHF processing round participant, did not oppose the waiver request.[6] At the time that Swarm filed the Amendment, it had conducted preliminary outreach to the National Telecommunications and Information Administration ("NTIA") and federal users concerning the waiver. Swarm indicated that it would update the Commission on such discussions as appropriate.[7]

In this filing, Swarm now seeks action on the limited US323 waiver to the extent it applies to frequencies presently assigned to Swarm. Swarm thus seeks authority to transmit for up to 1700ms without a minimum wait time in the 148.2500–148.5850 MHz and 148.6350–148.7500 MHz sub-bands, rather than across the full 148.0–149.9 MHz band governed by the footnote, pending consideration of the remainder of Swarm's application.[8] Swarm has continued to engage NTIA and federal stakeholders regarding the waiver, and no interference is predicted as a result of the relief requested, which is summarized in the following table:

Current US323 Footnote	**Proposed Waiver**
In 148.0–149.9 MHz, assuming active frequency avoidance, uplink transmissions from any individual mobile earth station must observe a 1% duty cycle during any 15-minute period; a 450ms maximum duration; and wait time of 15s. *Summary*: In 148.0–149.9 MHz: - active frequency avoidance - 1% duty cycle in 15-min period - 450ms TX - wait 15s between TX	In 148.0–149.9 MHz, assuming active frequency avoidance, uplink transmissions from any individual mobile earth station must observe a 1% duty cycle during any 15-minute period and a 1700ms maximum duration. *Summary*: In 148.0–149.9 MHz**: ✓ active frequency avoidance ✓ 1% duty cycle in 15-min period → 1700ms TX ✗ ~~wait 15s between TX~~ ** Only in frequencies currently licensed to Swarm (148.250–148.585 MHz and 148.635–148.750 MHz)

[3] Amendment to Application for Modification of Swarm Technologies, Inc., IBFS File No. SAT-AMD-20200504-0041 (filed May 4, 2021) ("Amendment") at Narrative p.4.
[4] *Id.* at 4, 36-39.
[5] Petition to Deny of ORBCOMM License Corp., IBFS File Nos. SAT-MOD-20200501-00040 & SAT-AMD-20200504-00041, at 13-14 (filed Aug. 17, 2020) ("ORBCOMM Petition").
[6] *See* Comments of Myriota Pty. Ltd., IBFS File Nos. SAT-MOD-20200501-00040 & SAT-AMD-20200504-00041 (filed Aug. 17, 2020)
[7] Amendment at Narrative, p.38.
[8] Swarm is also licensed to operate in 149.90–149.95 MHz, which falls outside of the 148.0–149.9 MHz band subject to footnote US323.

II. Grant of the narrowed request will serve the public interest.

If granted by the Commission, Swarm's request will unleash new services for commercial and federal customers without any impact on existing federal uses of the band.

With a limited waiver, Swarm will be able to expand the low-cost IoT, M2M, and messaging services supported by its NVNG system. As explained in the Amendment, footnote US323 significantly limits the features and applications that may be deployed in the 148.0–149.9 MHz band.[9] A key example lies in encryption, which can expand the size of a communicated message. Depending on the type of encryption chosen or required in many applications, the transmission of an encrypted payload would be hamstrung by a 450ms duration limit. Other services and applications are similarly constrained by the US323 limits—indeed, at throughputs achievable in VHF, header and routing data alone can consume a significant portion of a 450ms transmission, leaving little leftover for the necessary payload data itself. Increasing the duration limit to 1700ms and waiving the wait-time requirement would address many of these concerns and allow Swarm to support encryption and other features and applications sought by its customers, including U.S. government customers. Because Swarm is seeing urgent demand for such services now, expedited action on the waiver request, as it applies to Swarm's existing assignments, would be appropriate.

Grant of the waiver will not affect federal terrestrial systems. Under the modified parameters proposed by Swarm, the footnote would continue to provide sufficient—and indeed, redundant—protection to federal incumbents.

First, Swarm would fully comply with the footnote's core mechanisms for preventing interference by employing active frequency avoidance and continuing to observe a maximum duty cycle of 1% in any 15-minute period. The parameters that Swarm seeks to change—the transmission duration limit and wait time requirement—serve to reduce the extent of link unavailability should interference actually occur. But Swarm proposes no change to the very low duty cycle and active frequency avoidance specified in the footnote, which are intended to prevent interference events from occurring in the first place. Put simply, because Swarm will continue to comply with the footnote's core requirements, no interference is expected as a result of a grant.

Second, if anything, the waiver would *reduce* the risk—however theoretical—that federal systems will experience harmful interference. Under the proposal, Swarm would transmit for longer durations (1700ms) while still observing a 1% duty cycle. As a result, its terminals would actually transmit *less often* than they would under the footnote as currently written.

Third, the footnote would continue to provide redundant protection should interference actually occur. Swarm has not proposed to eliminate the transmission duration limit. Rather, the proposed waiver would extend the limit from 450ms to 1700ms. As a result, in the exceedingly

[9] *See* Amendment at Narrative p.37.

unlikely scenario government users experience detectable interference, their communications would be only minimally disrupted. And again, Swarm's mobile earth stations will continue to employ a listen-before-talk active frequency avoidance technique along with the 1% duty cycle limit as required in the footnote, which makes potentially interfering nearby co-frequency operations highly improbable.

***Fourth*,** to offer further assurances, Swarm commits to having a representative on call 24/7 to cease transmissions under the waiver and revert to the original US323 limits should any interference ever be detected, or concerns from the NTIA or other US government users arise. Swarm recently held a very positive and productive discussion regarding the waiver with staff at NTIA—acknowledging its potential to benefit federal satellite users and noting no interference concerns. Swarm nevertheless understands that any grant would be issued in consultation with NTIA and affected agency spectrum managers and is willing to accept the operating condition proposed above.

Finally, the only party to object to the waiver request was ORBCOMM, which speculated that the waiver might result in "the blocking of open channels on which ORBCOMM could operate."[10] Because ORBCOMM's concern only applies to the extent Swarm operates in frequencies that overlap with ORBCOMM's own, its objection is irrelevant to a waiver that would be limited solely to Swarm's existing frequency assignments. In any event, ORBCOMM's sheer conjecture that transmitting for 1700ms rather than 450ms at the same duty cycle would complicate sharing lacks all credibility; indeed, even ORBCOMM acknowledges that US323 was adopted to protect federal terrestrial systems, and not other NVNG licensees such as itself.[11] Moreover, ORBCOMM's concern appears to rely on the mistaken premise that Swarm transmissions will be "more frequent,"[12] even though Swarm's terminals would transmit *less often* under the waiver proposed.[13] In sum, because ORBCOMM's objection has nothing to do with the frequencies at issue and is in any event unfounded, it poses no obstacle to the narrow relief sought by Swarm.

If you have any questions, please contact the undersigned.

Sincerely,

Kyle Wesson

Kyle Wesson, Ph.D.
Lead Regulatory Engineer
Swarm Technologies, Inc.

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10 *See* ORBCOMM Petition at 13.

11 *Id.* (explaining that "[t]he 450 ms limit was incorporated in US323 because Federal user spectrum manages [sic] agreed that such short bursts would not disrupt co-frequency push-to-talk terrestrial Federal radio operations, even if an NVNG MSS subscriber terminal transmitted operated on a channel in use by a nearby Federal user").

12 *Id.* at 14.

13 As explained above, to comply with a 1% duty cycle with longer burst durations, Swarm terminals would need to transmit less frequently than they are able to transmit under footnote US323 as written.