

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of

Streamlining Licensing Procedures for Small
Satellites

IB Docket No. 18-86

COMMENTS OF IRIDIUM COMMUNICATIONS, INC.

Maureen C. McLaughlin
Vice President, Public Policy
IRIDIUM SATELLITE LLC
1750 Tysons Boulevard, Suite 1400
McLean, VA 22102
(703) 287-7518

Scott Blake Harris
V. Shiva Goel
HARRIS, WILTSHIRE & GRANNIS LLP
1919 M Street, NW, 8th Floor
Washington, DC 20036
(202) 730-1313

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INTRODUCTION AND SUMMARY

Iridium Communications, Inc. (“Iridium”) commends the Commission’s leadership in paving the way for commercial small satellites operating in non-geostationary satellite orbit (“smallsats”). With the right regulatory provisions in place, Iridium believes that smallsats can fulfill their promise of reducing entry barriers into the space industry, and thereby expand the scope of human activity supported by space-based missions. As the Commission tailors its rules to accommodate the unique needs of smallsats, however, it must manage carefully the risks to other satellite constellations, especially those that operate in nearby orbital locations or that communicate in the same or adjacent frequency spectrum. The new framework thus should endeavor to unleash new applications for smallsat technologies, while preserving a safe operating environment for continued innovation by the space industry at large.

The Commission can accomplish these objectives if it properly defines the types of operations eligible for a streamlined smallsat licensing procedure, and if it requires reasonable demonstrations from applicants that such eligibility criteria are met. The Commission also should clarify that guideposts for limiting collision risk and space debris established in this rulemaking are subject to change should the Commission examine those issues in a future and more comprehensive proceeding. In addition, when making satellite spectrum available to smallsats licensed using the streamlined procedure, the Commission should ensure that existing mobile-satellite service (“MSS”) operations in the L-band remain protected. In doing so, the Commission must recognize the limits of existing technical rules in satellite bands, which were developed with large communications satellites, and not smallsats, in mind.

Thus, as explained below, the Commission should:

- Adhere to the ten-satellite maximum system size and 180 kg limit proposed in the NPRM.¹
- Adhere to the 400 km altitude limit for eligible smallsats without propulsion systems.
- For applicants seeking to deploy smallsats above 400 km, either require a reasonable demonstration that propulsion systems are sufficient for collision avoidance and end-of-life disposal, or process applications under the standard Part 25 process.
- Employ license termination provisions to mitigate the risk of space debris in the event of in-orbit space vehicle failures, and adopt license terms that ensure disposal durations are no longer than necessary.
- Ensure that eligible smallsats are easily tracked from the ground, and incentivize them to share information with providers of space situational awareness data, including the Joint Space Operations Center.
- Require applicants benefiting from the streamlined procedure to protect and accept interference from incumbent Part 25 licensees, and to explain persuasively the basis for their determination that harmful interference will not occur in light of the technical characteristics of their system.
- Ensure that smallsat space-ground operations in the 1610.6-1613.8 MHz band do not cause harmful interference into Iridium's adjacent-band MSS operations.
- Limit proposed smallsat intersatellite-link operations in the L-Band to relay operations between smallsats or launch vehicles and existing Big LEO systems.

¹ *Streamlining Licensing Procedures for Small Satellites*, FCC 18-44 ¶ 27 (rel. Apr. 17, 2018) ("NPRM").

- Develop smallsat-specific out-of-band emission (“OOBE”) limits and separation requirements for intersatellite-link operations in the L-Band to protect licensed Big LEO systems.

I. STREAMLINED LICENSING SHOULD BE LIMITED TO APPLICANTS THAT DO NOT POSE A RISK TO OTHER SPACE-BASED OPERATIONS.

The Commission proposes a streamlined application process for “a limited group of applicants whose operations are small enough in scope that it would not serve the public interest to apply certain of our standard Part 25 procedures.”² Eligible applicants would be exempt from the processing round procedures that ordinarily apply to NGSO-like applications, and would benefit from a one-year grace period from bond requirements. In addition, in lieu of providing the demonstrations typically required under existing Part 25 rules, each smallsat applicant would be required simply to certify that it complies with the eligibility criteria, will not interfere with the operations of existing Part 25 licensees, and will not unreasonably preclude future operators from using assigned frequency bands. Certifications about spectrum sharing, maneuverability mechanisms and deorbiting systems, and collision avoidance with manned spacecraft below the International Space Station (“ISS”) would be supported only by brief narrative explanations.

The Commission is right to establish a streamlined licensing procedure for smallsats. The key to ensuring that the new procedure serves the public interest, however, inevitably lies in the details. The Commission must ensure that the smallsat applicant procedures apply only to those systems for which they make sense. Moreover, while simple certifications are an appropriate mechanism to demonstrate compliance with criteria that are easily verifiable, the Commission should ensure that smallsat applications provide enough information to support

² *Id.* ¶ 27.

more complex claims, including claims concerning the adequacy of propulsion systems and avoiding interference with Part 25 licensees.

A. MISSION PARAMETERS AND RISK MITIGATION

Iridium supports most of the key criteria proposed by the Commission for identifying smallsat missions eligible for streamlined processing. As explained below, however, the Commission should ensure that its new procedure does not put other constellations or public safety at risk.

Satellite mass and system size. The Commission proposes to limit streamlined processing to applicants seeking to license ten or fewer satellites with a maximum mass of 180 kg each. Iridium believes that these basic satellite and system size criteria are reasonable, and in combination with other criteria, should capture the small satellite missions that may be processed on a streamlined basis without causing undue risk. As the Commission observes, “many small satellite applicants intend only to launch one or a few satellites in total,”³ and the mass of smallsat spacecraft commonly falls far below 180 kg.⁴ The parameters proposed in the NPRM will help ensure that smallsat operators put the Commission’s streamlined procedure to good use safely. There is no reason to increase maximum size and mass criteria beyond these limits, which could open the door to applicants hoping to launch larger and more complex systems that raise a variety of concerns better addressed as part of the standard Part 25 licensing process.

Orbital altitude. The Commission proposes to allow smallsats to benefit from streamlined processing if they operate in orbits below 400 km, which is the approximate altitude

³ *Id.*

⁴ *Id.* ¶ 2.

of the ISS.⁵ Eligible smallsats orbiting below 400 km would be required to develop and describe methods of collision avoidance with manned spacecraft, which could include the use of propulsion.⁶ The Commission also seeks comment on whether it should allow streamlined processing for smallsats above 400 km if the applicant certifies that the licensed space stations will both possess sufficient propulsion capabilities to perform collision avoidance maneuvers and deorbit within five years.⁷ For space stations equipped with a means of maneuverability, whether passive or active, the applicant would be required to include a description of the maneuverability and deorbit systems in the narrative accompanying the application.⁸

Iridium agrees that smallsats with planned orbits above 400 km should not be eligible for streamlined processing if they lack sufficient onboard propulsion systems. Without adequate means of maneuverability, there is an increased risk of collision in these more congested portions of low-Earth orbit. Also, without sufficient maneuverability, deorbiting from higher altitudes may exceed the five-year term proposed by the Commission, and could disrupt space operations in lower altitudes—including those of the ISS.

As the Commission acknowledges, however, propulsion systems for smallsats are a relatively new technology,⁹ and all smallsats face a significant risk of failure in the early stages of their adoption. As a result, for deployments above the ISS, operator certification and a brief narrative description as proposed in the NPRM may not suffice. The Commission may wish to require a more significant showing concerning the adequacy of maneuverability and deorbit

⁵ *Id.* ¶ 33.

⁶ *Id.*

⁷ *Id.* ¶ 34.

⁸ *Id.* at Appendix A.

⁹ *Id.* ¶ 34.

systems, or to process applications to launch smallsats above 400 km under the standard Part 25 licensing procedure.

On-orbit lifetime and license term. The Commission proposes to make the streamlined application procedure available only to smallsats with a “total on-orbit lifetime [of] five years or less, including the time it takes for the satellite(s) to deorbit.”¹⁰ Consistent with that approach, it proposes to license smallsats under the streamlined procedure for five-year terms without an opportunity for renewal.¹¹

Iridium agrees that five years represents a reasonable maximum length for smallsat missions eligible for licensing under the proposed streamlined procedure. Importantly, however, the Commission should consider developing licensing provisions or rules that equip it to respond quickly in the event of in-orbit smallsat space station failures. Smallsats could proliferate rapidly—indeed, ensuring their ability to do so is the precise point of this proceeding. In addition, smallsats may rely on minimally tested launch, manufacturing, and communications technologies. As a result, the Commission must be more cautious about additional launches of smallsats that have already failed while in space. In addition to counseling restraint in the case of higher orbital altitudes for smallsats licensed under a streamlined procedure, these risks warrant serious consideration of license termination provisions that would allow the Commission to halt smallsat launches if necessary. Clear termination provisions built into the licenses would allow the Commission to mitigate the risk of debris from multiple failures in space.

Moreover, in lieu of licensing all eligible smallsats for five-year terms, the Commission should consider requiring licensees to comply with disposal durations measured as a function of

¹⁰ *Id.* ¶ 32.

¹¹ *Id.* ¶ 29.

the design life of the licensed smallsat system. In the past, many smallsat operators have deployed space stations for shorter periods of time. If smallsat operators say they intend to deploy their systems for shorter than five-year durations, the license term could be calibrated to the expected life of the system.

Trackability. The Commission proposes that eligible smallsats be no smaller than 10 cm x 10 cm x 10 cm in size, and include a unique telemetry marking allowing them to be distinguished from other satellites and objects in space.¹² Iridium believes that all smallsats should be designed to be trackable from the ground either by active means—for example, through the use of laser retro-reflectors or radar-cross-section enhancements—or by ensuring that they are sufficiently large to be discerned by common radar capabilities. It is Iridium’s understanding that spacecraft exceeding 10 cm in all directions can be tracked reliably by radar. Accordingly, Iridium has no objection to the Commission’s proposal.

Importantly, however, Iridium believes that space situational awareness (“SSA”) capabilities are critical to maintaining a safe operating environment in space, and that smallsats should share information with providers of SSA data like the Joint Space Operations Center. Iridium understands that these and other issues related to space debris may be considered more holistically by the Commission in the future. The Commission thus should clarify that the criteria used to determine eligibility for the streamlined procedure could change in the future depending on the outcome of a future proceeding that focuses more comprehensively on orbital debris matters.

¹² *Id.* ¶ 38.

B. INTERFERENCE RISKS TO OTHER LICENSEES

The FCC anticipates that smallsats authorized on a streamlined basis would be subject to some limitations on a frequency-band specific basis, including, “in appropriate circumstances,” the requirement that smallsats operate on a non-interference, unprotected basis with respect to current Part 25 systems.¹³ Although not part of the eligibility criteria, the FCC anticipates that the actual amount of spectrum used by any particular small satellite will be small. The Commission thus proposes to ensure that existing satellite operations remain protected by requiring smallsat applicants to certify that their systems will not cause harmful interference to existing Part 25 licensees, and will not unreasonably preclude future satellite entrants from using the same spectrum. To support the certifications, the Commission proposes to require applicants to submit a short narrative description of the means of spectrum sharing proposed.¹⁴

Iridium supports the Commission’s proposal, and believes that smallsats benefiting from a streamlined licensing procedure generally should be required to protect, and accept interference from, other Part 25 services. But the success of the Commission’s streamlined approach depends entirely on how it enforces the rules adopted. Smallsat applicants should not be able to obtain a license based on mere recognition that other users operate in the frequency bands requested, and conclusory assertions that they will operate on a non-interference, unprotected basis with respect to those users. Instead, eligible smallsat licensees must be required to explain the technical basis for their determination that there will be no harmful interference.

¹³ *Id.* ¶ 44.

¹⁴ *Id.* at Appendix A.

II. THE COMMISSION SHOULD ENSURE THAT SMALLSAT OPERATIONS DO NOT INTERFERE WITH MSS L-BAND SERVICES.

In the NPRM, the Commission seeks comment on whether it should permit smallsat service links in selected bands allocated to the MSS, and proposes to provide for smallsat intersatellite links in certain bands allocated to the MSS and fixed-satellite service (“FSS”). While the Commission proposes to make smallsat operations subject to “existing generally applicable technical rules in Part 25,” it also seeks comment on whether different service rules would be necessary to protect incumbent operations in certain frequency bands.¹⁵ As explained below, Iridium does not object to the entry of smallsats in the L-Band in the manner proposed so long as existing MSS systems—both co-frequency and adjacent—are protected.

A. SMALLSAT UPLINKS IN THE L-BAND

The Commission seeks comment on whether it should permit smallsat operations in the 1610.6-1613.8 MHz band under the existing allocation for MSS uplinks. Globalstar, which operates an MSS system using code division multiple access technology, uses this spectrum for service uplinks on an exclusive basis with respect to other MSS systems. As the Commission is aware, Iridium is authorized to operate in the adjacent 1617.775-1626.5 MHz band for service links in both the space-to-Earth and Earth-to-space directions. Iridium accomplishes bi-directional transmissions in the band by using time division duplex (“TDD”) technology, which assigns uplink and downlink communications to different time slots within the same frequency channel.

Iridium has no objection to the Commission’s proposal to permit smallsat uplinks in the 1610.6-1613.8 MHz band so long as Iridium’s adjacent band operations are protected.

¹⁵ *Id.* ¶ 54; *see also id.* ¶ 68.

Importantly, however, the ability of L-Band smallsat deployments to coexist with Iridium will depend on the design of each proposed smallsat system, and on variables including anticipated terminal deployment patterns. Thus, the Commission should consider developing rules that would ensure the location and density of smallsat terminals do not pose a threat of harmful interference into Iridium's terminals. At a minimum, when processing applications seeking access to the 1610.6-1613.8 MHz band for smallsats, the Commission should not assume that compliance with existing technical rules will suffice, and should require applicants to make an affirmative demonstration that their systems will not interfere with Iridium's adjacent-band services.

Iridium also agrees with the Commission's decision not to entertain smallsat operations in the portion of the L-Band used by Iridium. As the Commission has recognized, Iridium's use of TDD technology, though spectrally efficient, makes it difficult to share meaningful amounts of L-band service link spectrum with other satellite systems except under limited circumstances.¹⁶

B. SMALLSAT INTERSATELLITE LINKS IN THE L-BAND

The Commission also proposes to provide for the authorization of smallsat intersatellite links of certain varieties in most of the Big LEO band, including Iridium's service-link spectrum.¹⁷ The Commission believes that these efforts could "encourage[e] relay operations using Iridium, Globalstar, or other systems can alleviate some of the difficulties faced by small satellite operators in identifying frequencies for Earth-to-space and space-to-Earth links and

¹⁶ See *Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands*, Report and Order, 9 FCC Rcd. 5936 (1994); *Spectrum & Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands*, 22 FCC Rcd. 19733, 19741 ¶ 17 (2007).

¹⁷ NPRM ¶ 72.

building or seeking out ground station infrastructure.”¹⁸ Iridium supports this proposal as well, subject to reasonable protections for incumbent L-band services.

First, in implementing the change in rules, the Commission must ensure that smallsat intersatellite-link operations advance the objective set forth in the NPRM: reducing the need for ground infrastructure by facilitating relay operations with existing systems. Thus, the Commission should clarify that intersatellite links in this spectrum are limited to communications between smallsats (or launch vehicles) and licensed Big LEO systems—since this would allow smallsat operators to leverage the capabilities of existing MSS systems. The Commission’s proposal to provide for the authorization of intersatellite-links through a footnote to the U.S. Table designating certain bands for space-to-space operations, rather than through the development of a new radio service allocation, would be more appropriate vehicle for advancing the Commission’s vision of smallsat operations in this spectrum.¹⁹

Second, the Commission should develop technical rules specific to smallsat intersatellite links to protect Big LEO constellations. While existing OOB limits are intended to protect MSS space stations against OOB from earth stations operating terrestrially, they may be insufficient with respect to OOB from smallsats in low-Earth orbit, which would be located significantly closer to Iridium and Globalstar satellites. Thus, new technical rules may be necessary to ensure that smallsat intersatellite links operating in the portion of the L-band licensed to Iridium do not cause harmful interference to Globalstar’s adjacent-band operations, and that smallsat operations in L-band frequencies licensed to Globalstar do not cause harmful interference with Iridium. The Commission also should consider whether separation

¹⁸ *Id.*

¹⁹ *See id.* ¶ 73.

requirements are needed between smallsats and Big LEO satellites to prevent desensitization of Big LEO satellite receivers.

CONCLUSION

Iridium supports the Commission's vision of removing regulatory barriers to entry for smallsat operators. With careful attention to the smallsat deployments eligible for streamlined treatment—and with technical rules in place to protect existing spectrum licensees—the Commission can ensure that its efforts to support the smallsat industry promotes the public interest.

Respectfully submitted,



Maureen C. McLaughlin
Vice President, Public Policy
IRIDIUM SATELLITE LLC
1750 Tysons Boulevard, Suite 1400
McLean, VA 22102
(703) 287-7518

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V. Shiva Goel
HARRIS, WILTSHIRE & GRANNIS LLP
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(202) 730-1313

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