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

In the Matter of	)	
	)	
Petition for Declaratory Ruling to Access the U.S. Market using a Non-Voice, Non-Geostationary ("NVNG") Satellite System Operating in the 137-138 MHz and 148-150.05 MHz Bands	)	File No. SAT-PDR-_____
	)	
	)	Call Sign S3047
	)	

PETITION FOR DECLARATORY RULING

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November 18, 2019

EXECUTIVE SUMMARY

Myriota Pty. Ltd. ("Myriota") seeks authority to operate the Myriota System, a non-voice, non-geostationary ("NVNG") mobile-satellite service ("MSS") system operating in the 137-138 MHz (space-to-Earth) and 148-150.5 MHz (Earth-to-space) bands (the "NVNG VHF Bands"), to provide next-generation, satellite-based Internet of Things ("IoT") services in the United States. The Myriota System will consist of 26 small, non-geostationary satellite orbit ("NGSO") spacecraft communicating with low-power IoT modules with low-gain (*i.e.*, non-directional) antennas, micro-gateway earth stations, and international ground stations.

The Myriota System is licensed by Australia and operates under Australian satellite network filings submitted to the International Telecommunication Union. Myriota previously filed a petition for declaratory seeking U.S. market access to provide IoT services in other (UHF) NVNG bands. With this Petition, Myriota establishes its legal and technical qualifications to operate the Myriota System in the NVNG VHF Bands and demonstrates that grant of the requested authority would serve the public interest. These petitions should be considered independently, on separate tracks given disparate spectrum access issues and interested parties.

To provide necessary guidance regarding spectrum access and appropriate consideration of the authorized operations of ORBCOMM License Corp. and Swarm Technologies, Inc., to establish the total number of systems that may operate in the NVNG VHF Bands, and to maximize efficient use of the spectrum, the Commission should commence a processing round for the NVNG VHF Bands. In the context of such a processing round, and consistent with its NVNG rules and policies, the Commission should enable the proposed operations of the Myriota System and other new NVNG entrants to enhance competition and expand the availability of advanced IoT services to U.S. consumers.

TABLE OF CONTENTS

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	)	
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PETITION FOR DECLARATORY RULING

Myriota Pty. Ltd. ("Myriota"), pursuant to Section 25.137 of the Commission's rules,[1] submits this petition for declaratory ruling ("Petition") requesting access to the U.S. market for the Myriota System, a planned non-geostationary system that will use certain non-voice, non-geostationary ("NVNG") mobile-satellite service ("MSS") spectrum bands to provide connectivity for a new generation of Internet of Things ("IoT") devices, operating in the 137-138 MHz (space-to-Earth) and 148-150.5 MHz (Earth-to-space) bands (the "NVNG VHF Bands").

This Petition constitutes a separate and distinct request by Myriota for authority to use the NVNG VHF Bands to serve the U.S. market , and should be considered independent of Myriota's previously filed request for market access in other NVNG spectrum.[2] Furthermore, because the Myriota System and other NVNG systems use earth stations with non-directional antennas, a new processing round is necessary to establish the total number of NVNG systems

[1] 47 C.F.R. § 25.137.

[2] On March 28, 2019, Myriota filed a request for authority to operate the Myriota System in the 399.9-400.05 MHz (Earth-to-space) and 400.15-401 MHz (space-to-Earth) bands (the NVNG UHF Bands"). *See* Petition for Declaratory Ruling Granting Access to the U.S. Market for Non-Voice, Non-Geostationary Satellite System, File No. SAT-PDR-20190328-00020, Call Sign S3047 ("*NVNG UHF Petition*").

that may operate in the NVNG VHF Bands, may participate in a negotiated spectrum sharing plan, and may be subject to the spectrum access provisions of Section 25.157(e).[3]

Myriota submitted substantial information regarding the Myriota System and its planned IoT services in the *NVNG UHF Petition*.[4] As demonstrated by this information, and by the additional information relating to Myriota System operations in the NVNG VHF Bands included in this Petition and its accompanying materials, Myriota is legally, technically, and otherwise qualified to hold the authority requested herein, and its proposed facilities and operations comply with applicable Commission rules and policies. Furthermore, grant of this Petition will serve the public interest, convenience, and necessity.

I. INTRODUCTION

Myriota was founded in 2015 to commercialize breakthrough communications technology to enable robust, cost-effective, satellite-based IoT communications. Key elements of Myriota's technology include:

- Synchronization and error correction techniques to ensure that messages are correctly received, even at low elevation, with link paths greater than 2,000 km;
- Individual satellite ability to receive, synchronize and decode messages from a large number of devices at once even if they overlap each other in time and frequency;
- Sophisticated network control functionality and an advanced, software-defined satellite payload that enables the use of various frequencies and emission bandwidths throughout the authorized spectrum to facilitate co-frequency operation with other NVNG systems in the NVNG VHF Bands; and
- IoT devices with intelligent transmit-scheduling algorithms and reliable, low-power transmissions resulting in multi-year battery life.

[3] 47 C.F.R. 25.157(e). In the event insufficient spectrum is available in the frequency band to accommodate all qualified applicants, the available spectrum will be divided equally among the licensees whose applications are granted.

[4] A full description of Myriota's proposed services and the Myriota System was provided in the *NVNG UHF Petition*, which is hereby incorporated by reference.

Myriota recently requested authority for the Myriota System to operate in the NVNG UHF Bands but, as a result of uncertainty regarding spectrum access in the NVNG UHF Bands and other factors, Myriota anticipates that additional spectrum will be needed to satisfy burgeoning demand for IoT services in the United States and around the world. Accordingly, the Myriota System will be capable of operating in the NVNG VHF Bands. Given the details regarding the Myriota System submitted with the *NVNG UHF Petition*, this Petition focuses on the characteristics of the Myriota System with respect to its proposed operations in the NVNG VHF Bands. Because the parties and spectrum access issues differ between the NVNG VHF Bands and NVNG UHF Bands, however, consideration of Myriota's requests for market access and the processing rounds themselves can proceed on independent tracks.

The NVNG VHF Bands were part of several processing rounds and rulemakings, culminating in the grant of five licenses, all subject to a sharing plan, in 1997.[5] Ultimately, every licensee except ORBCOMM License Corp. ("ORBCOMM") either lost or surrendered their license.[6] ORBCOMM's authorization was subsequently modified several times and it remains authorized to operate in certain segments of the NVNG VHF Bands.[7]

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[5] Amendment of Part 25 of the Commission's Rules to Establish Rules and Policies Pertaining to the Second Processing Round of the Non-Voice, Non-Geostationary Mobile Satellite Service, Report & Order, IB Dkt. No. 96-220 13 FCC Rcd 9111, 9112-13 (rel. Oct. 15, 1997) ("*NVNG MSS Second Processing Round Report and Order*") (two of the licensees, including ORBCOMM were granted modifications of existing licenses, and three new NVNG MSS systems were granted licenses).

[6] E-Sat, Inc., Memorandum Opinion and Order, 18 FCC Rcd 7662 (Int'l Bur. 2003); Final Analysis Communication Services, Inc., Memorandum Opinion and Order, 19 FCC Rcd 4768 (Int'l Bur. 2004); Leo One Worldwide, Inc., Memorandum Opinion and Order, 19 FCC Rcd 5369 (Int'l Bur. 2004); Policy Branch Information, Actions Taken, 20 FCC Rcd 20273 (2005) (stating the spectrum formerly licensed to VITA is now available).

[7] ORBCOMM License Corp., For Authority to Modify its Non-Voice, Non-Geostationary Satellite System, Order and Authorization, DA Dkt. No. 08-633 (rel. Mar. 2, 2008) ("*2008 ORBCOMM Order*"), ¶¶ 22-23.

In addition, the Commission recently granted Swarm Technologies, Inc. ("Swarm") authority to operate in certain sub-bands of the NVNG VHF Bands where ORBCOMM had been given authority to operate until the commencement of operations by a new system.[8] In authorizing Swarm in these sub-bands, the Commission rejected ORBCOMM's contention that the band plan in the *NVNG MSS Second Processing Round Report and Order* applied to future applicants, and also rejected Swarm's contention that the spectrum was available to NVNG system operators on a first-come, first-served basis.[9]

Myriota, ORBCOMM, and Swarm use earth stations with non-directional antennas. Although it appears there may be some potential for spectrum sharing with these operators based on publicly available information regarding their NVNG systems, a new processing round is essential to establish the total number of systems that may operate in the NVNG VHF Bands and to maximize efficient use of the spectrum. These systems may participate in a negotiated spectrum sharing plan or may be subject to the spectrum access provisions of Section 25.157(e).

As discussed herein, commencement of an NVNG processing round, enabling processing round participants to develop a spectrum sharing arrangement based on current technologies and system designs, and ultimate grant of authority for Myriota to serve the U.S. market in the NVNG VHF Bands would strongly serve the public interest.

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[8] *Id.*, ¶ 22; Swarm Technologies, Inc., Application for Authority to Deploy and Operate a Non-Voice, Non-Geostationary Lower Earth Orbit Satellite System in the Mobile-Satellite Services, *Memorandum Opinion, Order and Authorization*, DA Dkt. No. 19-1044 (rel. Oct. 17, 2019) ("*Swarm Order*"), ¶¶ 11, 18-19.

[9] *Swarm Order*, ¶ 17.

II. DISCUSSION

A. The Myriota NVNG MSS System

The various components comprising the Myriota System were described fully in the *NVNG UHF Petition*. Salient technical and operational characteristics are summarized below and provided in more detail in the FCC Form 312, Schedule S, and Technical Description (Attachment A) accompanying this application.

1. Space Segment

The Myriota System will consist of 26 small satellites, 12 of which will operate with an inclination of 97.7° (sun synchronous) and 14 of which will operate with an inclination of 54°. Myriota's first generation of satellites will not have active propulsion, but collision avoidance maneuvers will be trialed using differential drag techniques.[10]

The Myriota System satellite payload will be capable of operating in the NVNG VHF Bands. This payload will be connected to the antenna subsystem such that all available NVNG spectrum can be utilized through the same antennas, subject to commands from Myriota regarding frequencies available for use in a particular geographic region. This will allow the Myriota satellites to communicate seamlessly with Myriota IoT modules operating in different frequency bands. This will also afford the Myriota System additional operational flexibility in sharing the NVNG VHF Bands and other NVNG spectrum. Additional information regarding the channel bandwidths and emissions of the NVNG VHF payload is included in the Technical Description (Attachment A) and FCC Form 312, Schedule S submitted herewith.

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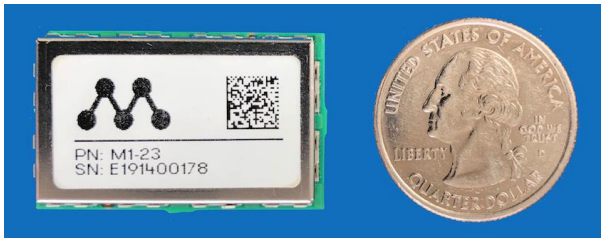
[10] *See* Myriota Pty Ltd., Response to Information Request, File No. SAT-PDR-20190328-00020, at 2-3 (filed July 19, 2019). Future Myriota satellites under development will have propulsion capability to enable in-orbit maneuvers for constellation station-keeping and to avoid potential collisions. At the appropriate time, Myriota will request Commission authority to provide IoT services in the United States using these upgraded satellites.

The Myriota System will operate under an International Telecommunication Union ("ITU") filing made by Australia for the "MNSAT" satellite network, which has been submitted for coordination and includes the NVNG VHF Bands. In addition, Myriota has been authorized by the government of Australia to use the MNSAT satellite network and operate the Myriota System in the NVNG VHF Bands.[11]

2. Ground Segment

The Myriota System includes three broad categories of earth stations: IoT modules (*i.e.*, user terminals), micro-gateway earth stations, and international ground stations. IoT modules (pictured below) enable secure, low-power data transmission along with a system for sophisticated power management. These modules allow original equipment manufacturers to add global IoT connectivity and reliable, long battery life to their devices for a wide range of fixed and mobile applications.



Low-cost, micro-gateways also backhaul data to and from the Myriota System, augmenting the international ground station network and providing low latency in-country connectivity to the Internet. Each micro-gateway includes a Myriota radio, which operates at low transmit power, for satellite connectivity.

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[11] *See* Australian Communications and Media Authority, *Register of Radiocommunications Licences*, Licence Nos. 10771624/1; 10771625/1; 10771626/1 (granted Nov. 18, 2019) (each licence authorizes communications with the MNSAT satellite network and grants Myriota access to the NVNG VHF Bands).

International ground stations backhaul data to and from the Myriota System to provide connectivity to the Internet (*i.e.*, provide gateway functionality), and also perform telemetry, tracking, and control ("TT&C") functions.

Myriota seeks authority to operate the Myriota System in the U.S. market with IoT modules and micro-gateways only. Myriota or its partners will submit applications to the Commission requesting blanket licenses for earth station operations in the United States, pursuant to Sections 25.115 and 25.135 of the Commission's rules.[12]

3. System Architecture

Myriota's system architecture and data flow is illustrated in Figures 1 and 2 below. Figure 1 shows the communication pathways between IoT modules and micro-gateway earth stations in the United States.

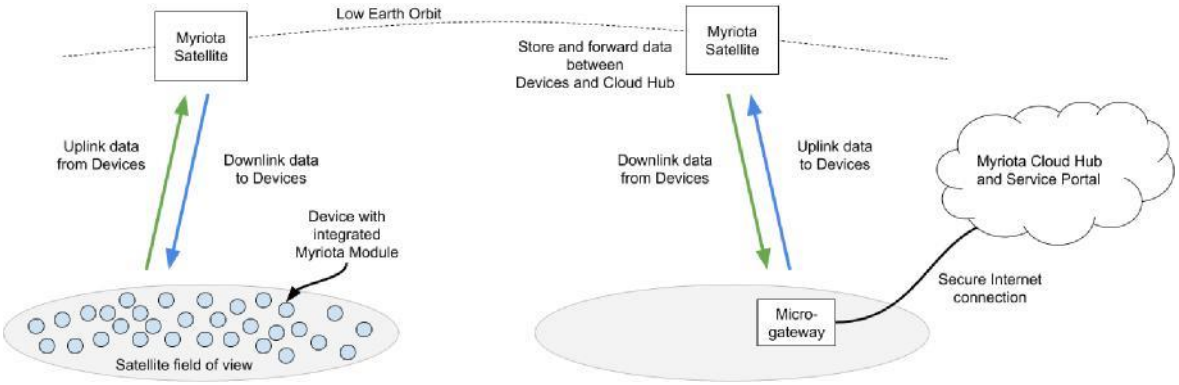

Figure 1. Myriota System Architecture within the U.S.

Importantly, IoT modules transmit only when a Myriota satellite is within range. The satellite receives transmissions from large numbers of IoT modules, and decoded data is stored on the satellite until it can be downlinked to a micro-gateway and delivered to Myriota customers via

[12] *See* 47 C.F.R. §§ 25.115, 25.135.

terrestrial communications infrastructure for their use. Conversely, data can be uplinked to a satellite for later delivery, allowing customers to push data to their IoT modules in the field.

Figure 2 depicts Myriota System satellites communicating with international ground stations located outside the United States. Like the micro-gateways discussed above, these ground stations have the ability to receive data from and transmit data to IoT devices via the satellites. However, they also provide the link used for TT&C functions.

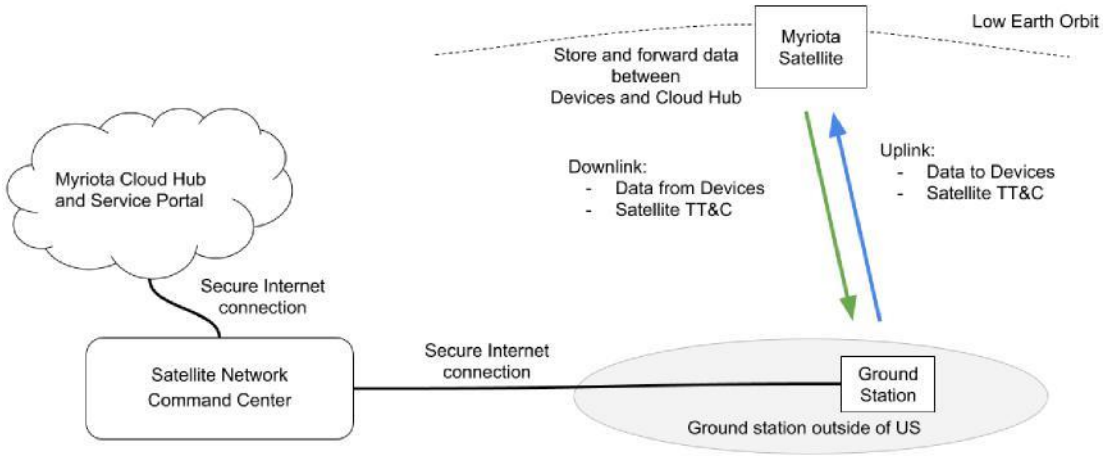

Figure 2. Myriota International Ground Station Architecture

Myriota has contracted with Tyvak Nanosatellite Systems Inc. ("Tyvak") to coordinate operations of the Myriota System from Tyvak's satellite network command center in Irvine, California. Thus, in addition to Myriota's 24/7 point of contact, the Commission will have access to Myriota's subcontracted network control facility in the United States to address relevant issues as they arise.

B. Eligibility and Operational Requirements

Under Section 25.137, applicants seeking U.S. market access for non-U.S. licensed satellite systems must provide the same information concerning legal and technical qualifications as is required of applicants for space station licenses issued by the Commission.[13] The

[13] *See* 47 C.F.R. § 25.137; *see also* Amendment of the Commission's Space Station Licensing Rules and

information set forth in this narrative application, the supporting Technical Description, and FCC Form 312 and Schedule S, demonstrates compliance with these requirements.

In addition, Myriota hereby confirms that: (i) it will post a surety bond as required under Section 25.165 of the Commission's rules;[14] (ii) it will comply with the Commission's milestone requirements under Section 25.164;[15] (iii) it does not have any other application for an NGSO-like satellite system license on file with the Commission, or any other licensed-but-unbuilt NGSO-like system, in any frequency band involved in this application;[16] and (iv) it will not provide voice services with its NVNG systems.[17]

C. Petition Processing Issues

Generally, the Commission's rules contemplate that an application for an "NGSO-like satellite system" authorization will trigger the initiation of a modified processing round for competing NGSO system applications pursuant to Section 25.157 of the Commission's rules.[18] The purpose of the Commission's NGSO "processing round procedure is to prevent one applicant from unreasonably precluding additional entry by other operators in the requested frequency band."[19] Moreover, the Commission seeks to "establish a sharing environment among NGSO systems, to provide a measure of certainty in lieu of adopting an open-ended requirement

Policies, 18 FCC Rcd 10760, ¶ 288 (2003).

[14] *See id.* § 25.165(a)(1).

[15] *See id.* § 25.164(b).

[16] *See id.* § 25.159(b).

[17] *See id.* § 25.142(b).

[18] For example, Section 25.157(c) provides that an NGSO system application not filed in response to such a public notice will initiate a new processing round. See 47 C.F.R. § 25.157(c).

[19] *Swarm Order*, ¶ 16.

to accommodate all future applicants."[20] Through these rules, the Commission is able to ensure "the most efficient use of the satellite spectrum and orbit resources."[21]

In the *Swarm Order*, the Commission generally noted conditions whereby a future applicant, like Myriota, might trigger a new processing round. The Commission stated that "depending on the number of … applications and their ability to effectively share spectrum, a processing round, including Swarm, may be initiated … to resolve mutual exclusivity concerns."[22] However, the *Swarm Order* creates uncertainty in how many and what types of additional applicants will be permitted to operate in the NVNG VHF Bands, as well as other uncertainties associated with Swarm's participation in any NVNG processing round and the impact of the *Swarm Order* and any new processing round on ORBCOMM.[23]

Initiating a processing round would ensure that the Commission has an appropriate vehicle to provide guidance in these issues and that all interested NVNG system operators, including Swarm, have the opportunity to provide input into a new spectrum sharing plan for the NVNG VHF Bands. A new processing round is needed to maximize the use of the extremely limited NVNG VHF Bands to ensure that the latest operational approaches and technological solutions are leveraged to facilitate co-frequency NVNG operations. By bringing interested NVNG system operators to the table now, the Commission may ensure that the NVNG VHF Bands are put to their most efficient use.

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[20] *Id.* at fn. 52 (citing Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 7809, 7829 (2017)).

[21] *See* Amendment of the Commission's Space Station Licensing Rules and Policies, 18 FCC Rcd. 10760, ¶ 7 (2003).

[22] *Id.*

[23] Myriota has filed a petition for clarification of the *Swarm Order*. *See* Petition for Clarification of Myriota Pty. Ltd., File No. SAT-LOA-20181221-00094, Call Sign S3041 (filed Nov. 18, 2019).

Although Myriota will coordinate its operations outside of the United States with ORBCOMM and Swarm pursuant to ITU procedures, such coordination would not govern operations within the United States. Myriota understands that the Commission's own rules and policies govern the operation of U.S.-licensed and non-U.S.-licensed NVNG systems operating in the NVNG VHF Bands. Accordingly, updated guidance is needed from the Commission for Myriota and other new NVNG entrants to appropriately take the authorized operations of ORBCOMM and Swarm into account in operating their proposed NVNG systems.

Additionally, Section 25.142(b)(3) encourages coordination of frequency usage between new NVNG applicants and existing permittees and licensees whose facilities could be affected by the new proposal, and requires all such parties, at the direction of the Commission, to "cooperate fully and make every reasonable effort to resolve technical problems and conflicts that may inhibit effective and efficient use of the radio spectrum."[24] Myriota has demonstrated the Myriota System's ability to share spectrum and its willingness to coordinate the Myriota System's operation in the NVNG VHF Bands with ORBCOMM and Swarm.

Given the uncertainties described in this Petition and in Myriota's Petition for Clarification, however, the Commission's guidance would be useful in the context of a processing round. This would be consistent with Section 25.142(b)(3) to ensure that the existing operators and new entrants have a clear understanding of the Commission's framework from which they can coordinate their operations and resolve potential issues.[25]

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[24] 47 C.F.R. 25.142(b)(3).

[25] *See id.* ("All affected applicants, permittees, and licensees shall, at the direction of the Commission, cooperate fully and make every reasonable effort to resolve technical problems and conflicts that may inhibit effective and efficient use of the radio spectrum; however, the permittee or licensee being coordinated with is not obligated to suggest changes or re-engineer an applicant's proposal in cases involving conflicts.")

Finally, this Petition presents a distinct and independent spectrum access request from Myriota's previously filed *NVNG UHF Petition*, and should be considered separately. Under 47 C.F.R. 25.156, "[a]pplications for … NGSO-like satellite operation … in two or more service bands will be treated as separate applications for each service band, and each service band request will be considered pursuant to §25.157…as appropriate."[26] The frequencies at issue in this Petition and the *NVNG UHF Petition* are separate service bands with separate operational rules and should be considered independently of each other[27] The Commission regularly considers, and grants, co-pending petitions for different frequency bands independently of each other.[28] Accordingly, the instant Petition should be treated independently of Myriota's *NVNG UHF Petition*.

D. Spectrum Compatibility

1. The Myriota System's Spectrum Sharing Capabilities

Myriota developed its NVNG system with the flexibility and spectral efficiency to operate harmoniously with other NVNG systems. Consistent with the Commission's rules ,and under operator-to-operator coordination arrangements, Myriota can dynamically select channels depending on the availability of spectrum for use by a particular satellite. In particular, Myriota's satellites can vary the bandwidth of their emissions through onboard processing[29] and organize their emissions to accommodate sharing arrangements with other users of the band. Downlink transmissions can range in bandwidth anywhere between 10 and 100 kHz, and operate

[26] 47 C.F.R. § 25.156(d)(3).

[27] *Compare* 47 C.F.R. § 25.259 (provisions applying to the 137-138 MHz band) with § 25.260 (provisions applying to the 400.15-401 MHz band).

[28] *See, e.g.*, Space Exploration Holdings, LLC, File No. SAT-LOA-20161115-00118 (SpaceX Ka-band and Ku-Band applications).

[29] *See* Technical Description, Figure A.5-1 (illustrating channel variations).

anywhere within the entire 1 MHz allocated to MSS, or within any portion thereof that may be assigned. Moreover, downlink communications will typically operate at 10% duty cycle, further decreasing their potential to cause interference.

In the uplink band, Myriota NVNG modules are capable of operating with less than 10 dBW EIRP. The majority of these transmitters will operate with a typical duty cycle less than 0.02%, and only occasionally up to 0.5%, and employ frequency hopping across the intended band, with an emission bandwidth of just 2 kHz. These operating characteristics give Myriota the ability to share the entire 2.05 MHz range with other NVNG systems also operating in the NVNG VHF Bands, as well as the ability to operate in any portion of the bands to which it is assigned. These features ensure that Myriota will be able to operate its NVNG system in conformance with the Commission's rules and mitigate the potential for harmful interference to other operators.

2. Other Systems Authorized To Use the NVNG VHF Bands

Two parties are currently authorized to operate in the NVNG VHF Bands: ORBCOMM and Swarm. ORBCOMM is authorized to operate in specific sub-bands in the NVNG VHF Bands on an exclusive and shared basis.[30] Additionally, ORBCOMM has authority to operate throughout the 137-138 MHz and 148-150.05 MHz frequency bands, until "commencement of operations by another U.S.-licensed non-voice, non-geostatinary mobile satellite system."[31] More recently, the Commission authorized Swarm to operate in specific NVNG VHF sub-bands,

[30] *See Swarm Order*, ¶ 8 (citing ORBCOMM License Corp., For Authority to Modify its Non-Voice, Non-Geostationary Satellite System, Order and Authorization, DA Dkt. No. 08-633, ¶¶ 22-23 (rel. Mar. 2, 2008) ("*2008 ORBCOMM Order*"), and SAT-AMD-20151223-00087 (partial grant of Apr. 25, 2013 and partial grant of Dec. 17, 2015)).

[31] *2008 ORBCOMM Order*, ¶ 10.

without overlapping ORBCOMM's exclusive or shared authorized bands.[32] In each instance, the Commission explicitly provided for additional entry into the NVNG VHF Bands.

The Commission conditioned Swarm's authorization to ensure NVNG VHF spectrum is available to new entrants. The Commission stated that granting Swarm's application "before any possible future applications" does not give Swarm a higher status with respect to later authorized systems.[33] In doing so, the Commission ensured that new entrants are not excluded by virtue of being later filed. By allowing new entrants to operate on a co-equal basis in the same frequencies as Swarm, the Commission actively encourages additional applicants. Thus, the NVNG VHF Bands are available for new entrants, including Myriota.

The Commission also intended that certain additional NVNG VHF spectrum allocated to ORBCOMM is i to be shared between ORBCOMM and future NVNG MSS licensees, and is therefore available.[34] In its 2008 Order assigning ORBCOMM additional frequencies, the Commission stated it assigned ORBCOMM "System 1" frequencies only, and that "sufficient

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[32] Swarm is authorized to operate in the 137.0250-137.1750 MHz, 137.3275-137.3750 MHz, 137.4725-137.5350 MHz, 137.5850-137.6500 MHz, and 137.8125-138.0000 MHz (space-to-Earth) bands; and the 148.2500-148.5850 MHz, 148.6350148.7500 MHz, and 149.9000-149.9500 MHz (Earth-to-space) bands. *Swarm Order*, ¶ 18(a). Swarm's operations in the 137.825-1378.000 MHz band are on a secondary basis only. *Id.* at ¶ 18(b).

[33] *Id.* at ¶ 17 (the Commission rejected Swarm's argument that Swarm's authorization in the NVNG VHF Bands was on a "first-come first-served" basis, noting in particular that "unlike the first-come, first-served system specified … for GSO-like satellite operations" Swarm's application "does not confer on Swarm a higher status with respect to later authorized systems").

[34] *See 2008 ORBCOMM Order*, ¶¶ 10, 11, 23 (authorizing ORBCOMM to operate in frequency bands designated for "System 1" under the *NVNG MSS Second Processing Round Report and Order*. The order also states that "sufficient spectrum remains available to license three other Little LEO systems including *spectrum licensed to system 2, system 3, and VITA*) (emphasis added). *See NVNG MSS Second Processing Round Report and Order*, ¶¶ 41-43 (Each of Systems 2, System 3, and VITA were licensed spectrum which is shared by ORBCOMM including those between 148.000-148.250 MHz, 148.750-148.855 MHz, 148.855-148.905 MHz, 148.905-149.585 MHz, and 149.635-149.810 MHz, and 149.810-149.9 MHz are intended to be shared between ORBCOMM and future NVNG MSS licensees).

spectrum remains available to license three other Little LEO systems."[35] In making this determination, the Commission relied upon ORBCOMM's statement that spectrum held by system 2, system 3, and VITA was still available for reassignment.[36] Authorizing ORBCOMM to operate on a primary basis in "System 1" frequencies, therefore did not foreclose later access to the same frequencies shared with System 2, System 3, and VITA. ORBCOMM specifically noted that "spectrum formerly licensed to VITA[] remains available," acknowledging that such shared bands would not be foreclosed by the Commission's order.[37] Thus, the frequencies licensed to these systems, including in the bands *shared* with ORBCOMM, remain available.

The Commission has also stated the sharing plan developed in the *NVNG MSS Second Processing Round Report and Order* only covered the original licensees who were part of the processing round.[38] An NVNG MSS system that did not participate in the original sharing plan established with ORBCOMM, is therefore not bound by the plan and may use new technologies.[39] Thus, while the NVNG VHF Bands remain available for reassignment, new entrants will not be subject to the same conditions established over 20 years ago.

Myriota recognizes the need to avoid causing harmful interference to ORBCOMM's exclusively licensed operations. Myriota's advanced spectrum sharing capabilities as described in this application will ensure that Myriota is able to operate harmoniously with ORBCOMM.[40]

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[35] *2008 ORBCOMM Order*, ¶ 10.

[36] ORBCOMM License Corp., Application For Authority to Modify it Non-Voice, Non-Geostationary Satellite System License (S2103) to Launch a Next-Generation System, File No. SAT-MOD-20070531-00076, at 24-25 (filed May 31, 2007) ("ORBCOMM Modification").

[37] *Id.*; *see 2008 ORBCOMM Order*.

[38] *Swarm Order*, ¶ 14 ("[w]e do not expect or require a NVNG MSS system that did not participate in the sharing plan, mutually agreed to by the second-round applicants, to be bound by the plan that in any case was intended to apply to a processing round closed more than 20 years ago.").

[39] *Id.*, ¶ 14.

[40] *See* Technical Description; 47 C.F.R. § 25.142(a).

Moreover, Myriota will seek to coordinate more broadly with ORBCOMM and Swarm, and understands that all three will be required to cooperate in such efforts.[41]

Although the NVNG VHF Bands are available to new operators and Myriota has demonstrated that it is capable of protecting and coordinating with other systems to mitigate interference, a Commission guidance in the context of a processing round is needed to establish an updated spectrum sharing regime in the NVNG VHF Bands for current and future applicants.

III. GRANT OF THIS PETITION SERVES THE PUBLIC INTEREST

Worldwide IoT spending is forecast to reach $745 billion in 2019, an increase of 15.4% over 2018, and will maintain a double-digit growth rate through 2022, at which point it will pass the $1 trillion mark.[42] Analysts predict that interest in the sort of remote monitoring involved with IoT devices will continue to rise quickly because it tends to be an easily integrated or standalone application.[43] The Myriota System will support this growth by providing connectivity from virtually anywhere.

The ability to provide such ubiquitous low-cost, spectrum-efficient connectivity for IoT devices will support a wide range of applications, including:

- Environmental management, such as weather monitoring, water-flow sensing, oceanography, soil monitoring, and natural resource management;

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[41] 47 C.F.R. § 25.142(b)(3) ("Applicants … are encouraged to coordinate their proposed frequency usage with existing permittees and licensees in the [NVNG MSS bands] … All affected applicants, permittees, and licensees shall, at the direction of the Commission, cooperate fully and make every reasonable effort to resolve technical problems and conflicts").

[42] *See* International Data Corporation, IDC Forecasts Worldwide Spending on the Internet of Things to Reach $745 Billion in 2019, Led by the Manufacturing, Consumer, Transportation, and Utilities Sectors (Jan. 3, 2019), https://www.idc.com/getdoc.jsp?containerId=prUS44596319.

[43] *See* Ann Bosche, et al., *Unlocking Opportunities in the Internet of Things*, at 2, 4, BAIN & CO., (2018), https://www.bain.com/contentassets/5aa3a678438846289af59f62e62a3456/bain_brief_unlocking_opportunities _in_the_internet_of_things.pdf.

- Agricultural uses, such as water security and irrigation, soil moisture probes, livestock tracking, weather stations, equipment tracking and preventative maintenance, and infrastructure monitoring;
- Utilities applications, such as smart grid, meter reading, asset and infrastructure management, and remote alerts and control; and
- Asset tracking and monitoring for the transport and logistics sectors, such as end-to-end freight, route planning, and intelligent transportation.

Moreover, as discussed above, the Myriota System will bring a range of innovative IoT services, especially for those in areas underserved or completely unserved by terrestrial networks. It will do so in a cost-effective, spectrum-efficient manner that can create new opportunities for individuals and businesses across the United States and around the world.

A. Effect on Competition in the United States

An applicant seeking access to the U.S. market for a non-U.S. licensed satellite system is entitled to a presumption in favor of entry if it is licensed by a World Trade Organization ("WTO") member country to provide satellite services covered by the WTO Basic Telecommunications Agreement (the "WTO Agreement").[44] As noted above, the Myriota System is authorized by Australia, a member of the WTO. In addition, Myriota seeks authority to provide only satellite services that are covered by the WTO Agreement.[45] Therefore, Myriota is entitled to a presumption that market entry for its NVNG satellite system will satisfy the competition component of the public interest analysis.[46]

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[44] *See id.*, ¶ 39.

[45] *See, e.g., id.*, ¶ 30 (noting that MSS is a WTO-covered service); *Globalstar Licensee LLC*, 26 FCC Rcd 3948, ¶ 21 (2011) ("the Commission adopted a policy that granting market entry for provision of FSS or MSS via satellites licensed by a WTO-member country will be presumed to be beneficial for competition in the United States").

[46] Accordingly, Myriota is not required to make an effective competitive opportunities showing. *See* 47 C.F.R. § 25.137(a)(2).

This presumption is further supported by the fact that Myriota, a new NVNG MSS entrant, is providing new and innovative services to the expanding market for IoT devices and connectivity. Accordingly, granting Myriota access to NVNG VHF Band spectrum will ensure robust service to consumers through increased competition and more efficient use of the NVNG VHF Bands.

B. Spectrum Availability

In considering spectrum availability, the Commission evaluates whether granting access to the U.S. market to a foreign-licensed satellite system would create the potential for harmful interference with U.S.-licensed satellite and terrestrial systems. In the attached Technical Description (Attachment A), Myriota has demonstrated the ability to operate alongside other NVNG systems while mitigating harmful interference. Moreover, the Commission recently affirmed that NVNG VHF Bands are available for new entrants on an equal status with Swarm and has stated that certain sub-bands occupied by ORBCOMM are also available.[47]

The Commission's existing NVNG rules encourage new entrants into the NVNG VHF Bands, consistent with the policy underlying spectrum availability.[48] The Commission recognizes that the NVNG VHF Bands remain underutilized, and generally applies its rules and policies to support competition, rather than inhibit new entrants.[49] As discussed above, however, additional guidance from the Commission in the context of a new NVNG processing round would be useful for incumbents and new entrants alike. Grant of the Petition, therefore, would serve the public interest by facilitating more efficient use of the NVNG VHF Bands.

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[47] *See Swarm Order*, ¶ 17; *2008 ORBCOMM Order*, ¶¶ 10, 11, 23.

[48] *See DISCO II*, ¶ 147 (in considering whether spectrum is available, "the Commission noted that where it already has licensed the maximum number of satellites that can be accommodated in a particular frequency band, [the Commission] would not be able to offer opportunities for new entrants").

[49] *See generally*, *Swarm Order*.

C. National Security, Law Enforcement, Foreign Policy, and Trade Issues

The Commission has stated that the issues of national security, law enforcement, foreign policy, and trade will be considered in evaluating requests for market access, but are likely to arise only in "rare circumstances."[50] Further, Commission policy is to defer to the expertise of the Executive Branch in identifying and interpreting issues of this nature.[51] Myriota's request for access the U.S. market with its NVNG system raises no such issues. Thus, this element of the Commission's public interest analysis is also satisfied.

IV. WAIVER REQUESTS

Myriota requests waivers of certain Commission rules in the context of this Petition. The Commission has authority to grant waivers of its rules for "good cause shown."[52] In general, good cause exists if grant of a waiver would not undermine the purposes of the rule and would otherwise serve the public interest.[53] As discussed below, compelling reasons exist to grant the requested waivers in connection with Myriota's Petition to access the U.S. market.

A. Limited Waiver of Section 25.142(a)(1)

Myriota requests a limited waiver of Section 25.142(a)(1) to the extent necessary to obtain authority to operate in the NVNG VHF Bands, including operating on a non-harmful interference basis in the bands assigned to ORBCOMM and on a co-equal basis in the bands assigned to Swarm. Section 25.142(a)(1) requires NVNG system applicants to demonstrate "that

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[50] *See DISCO II*, ¶ 180.

[51] *Id.*

[52] *See* 47 C.F.R. § 1.3; *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969).

[53] *WAIT Radio*, 418 F.2d at 1157; Intelsat North America LLC, 22 FCC Rcd 11989 ¶6 (2007).

they will not cause unacceptable interference to any non-voice, non-geostationary mobile-satellite service system authorized to construct or operate."[54]

Although both ORBCOMM and Swarm are "non-voice, non-geostationary mobile-satellite service system authorized to construct or operate" for purposes of Section 25.142(a)(1), they are in materially different positions with respect to new NVNG systems seeking authority to serve the U.S. market, and the meaning of "unacceptable interference" with respect to each system is unclear. A waiver of the rule is therefore necessary to ensure that Myriota is not foreclosed from operating in spectrum specifically designated by the Commission as available.

Myriota seeks to avoid causing harmful interference into ORBCOMM's NVNG system. However, without a new processing round in the NVNG VHF Bands in which to obtain Commission guidance, as well as authority to operate, there is little basis on which to coordinate with ORBCOMM or to define "accepted interference" versus "unacceptable interference" and thus be able to demonstrate compliance.

The Commission should waive Section 25.142(a)(1) as the rule no longer serves its purpose in the current climate of NVNG system applications. Section 25.142(a)(1) was adopted in 1993, and was designed to protect a defined group of operators that would be subject to a carefully crafted spectrum sharing arrangement.[55] The rule remained unchanged through a second processing round concluded in 1997, because the Commission determined that a new

[54] 47 C.F.R. § 25.142(a)(1).

[55] *See NVNG MSS Second Processing Round Report and Order*, ¶ 6 (noting that the rules and policies, including Section 25.142(a)(1), were largely drawn from a negotiated rulemaking proceeding in 1993 in which the original applicants represented that new NVNG systems could be licensed).

spectrum sharing plan established was able to avoid mutual exclusivity concerns among applicants.[56]

Since that time, all of the NVNG licensees with the exception of ORBCOMM have surrendered their licenses, and only now is a second NVNG VHF operator authorized to enter the band.[57] Although the applicable portions of the rule were not altered, the circumstances in which the rule operates have changed greatly.[58] Rather than forcing new applicants, like Myriota, to establish they will not cause unacceptable interference into incumbent NVNG MSS systems, the Commission should waive the rule and instead initiate a processing round so that a more efficient level of sharing can be achieved as was done previously. Indeed, waiver of the rule would provide an opportunity for both incumbents and new systems to use new system designs and operating procedures thereby ensuring the NVNG VHF Bands are used as efficiently as possible.

A lack of clarity regarding the standard for "unacceptable interference" also restricts entry into NVNG VHF Bands where Swarm is authorized. Swarm is licensed to operate in specific sub-bands, with later authorized applicants operating on an equal basis with Swarm.[59] As indicated in the *Swarm Order*, Swarm would be included in an NVNG processing round and its existing authority "does not confer on Swarm a higher status with respect to later authorized systems."[60] Without engaging with Swarm in the context of a processing round, it would not appear possible to define "unacceptable interference" or demonstrate that the Myriota System

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[56] *See* Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Non-Voice, Non-Geostationary Mobile Satellite Service, *Report and Order*, 8 FCC Rcd 8540 (1993) ("*NVNG MSS First Processing Round Report and Order*"); *see also NVNG MSS Second Processing Round Report and Order*, ¶ 6, 11.

[57] *See generally* Section I, *supra* note 6; *see also Swarm Order*.

[58] *See Swarm Order*, ¶ 14, 17.

[59] *Id*., ¶ 17.

[60] *Id*.

would not cause such interference to Swarm. Additionally, because Swarm is considered equal to future applicants, unacceptable interference may be different than between ORBCOMM and future entrants as described above.

As discussed more fully above and in the technical documents attached to this Petition, Myriota has demonstrated its ability to share spectrum with both incumbent systems, and will seek to do so. Nevertheless, applying Section 25.142(a)(1) here would undermine spectrum sharing by enforcing nebulous standards for incumbent operators owing, in part, to the unique history of the NVNG VHF Bands. As a result, it appears impractical if not impossible, as well as unnecessary, for new entrants such as Myriota to demonstrate that they will not cause unacceptable interference to the operations of ORBCOMM or Swarm. Accordingly, Myriota's requested waiver for Section 25.142(a)(1) is in the public interest and ensures that the NVNG VHF Bands remain available for future applicants absent a processing round.

B. Limited Waiver of Schedule S Constraints

As required by the Commission's rules,[61] Myriota has submitted with this application a completed Schedule S, which contains certain technical information in a prescribed form. Myriota has found, however, that it cannot accurately describe its system in two respects due to limitations in Schedule S itself. To the extent necessary, Myriota requests that the Commission waive these aspects of Schedule S in light of the form's limitations. Section 25.114(c)(4)(v) requires both the minimum and maximum saturation flux density ("SFD") values for each space station receive antenna that is connected to transponders.

The concept of SFD only applies to "bent pipe" satellite systems, and thus is not relevant to the Myriota system. However, the Schedule S software does not allow an entry of "not

[61] *See* 47 C.F.R. § 25.114(a)(1).

applicable." Instead, it requires a numerical entry for SFD, which must be different for the maximum and minimum values. In order to accommodate this requirement, Myriota has entered values of "0" and "-0.1" in Schedule S with respect to these parameters.

Schedule S also requires submission of numerical values for antenna pointing and rotational error – a concept that may be of limited applicability with respect to a dipole antenna such as Myriota's spacecraft will employ. Myriota anticipates that its antenna will have up to five degree pointing and rotational error. However, the Schedule S software does not allow an entry of any value greater than two. Accordingly, Myriota has entered this maximum value on the form, even though it does not accurately capture the value that should be entered.

Based on the above, a grant of this limited waiver would be consistent with Commission policy, will serve the public interest by enabling new commercial NVNG services, and will not undermine the purpose of the Commission's rule.

V. CONCLUSION

Myriota is prepared to support the growing demand for next-generation IoT services in the United States by operating the Myriota System in a manner that will enable sharing of the NVNG VHF Bands with ORBCOMM, Swarm, and other NVNG systems. However, in order to enable Myriota and other NVNG system operators to develop a new sharing regime that maximizes the efficient use of spectrum and orbital resources, the Commission should commence a processing round for the NVNG VHF Bands. By doing so, the Commission can enhance competition and facilitate the introduction of advanced IoT and other services in the

NVNG VHF Bands for the benefit of U.S. consumers. Accordingly, for these and other reasons set forth herein and in accompanying materials, Myriota requests that the Commission grant this Petition at the earliest practicable time.

Respectfully submitted,

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