

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

In the Matter of	)	
	)	
Amendment to Petition for Declaratory Ruling	)	
to Access the U.S. Market using a Non-Voice,	)	File No. SAT-APL-_____
Non-Geostationary (“NVNG”) Satellite System	)	
Operating in the 137-138 MHz and	)	Call Sign S3057
148-150.05 MHz Bands	)	

AMENDMENT TO PETITION FOR DECLARATORY RULING

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Executive Summary

Myriota Pty. Ltd. (“Myriota”) submits this amendment to its pending petition to the Federal Communications Commission for a declaratory ruling to access the U.S. market using its planned non-voice, non-geostationary (“NVNG”) mobile-satellite service (“MSS”) system (the “Myriota System”) that will operate in the 137-138 MHz (space-to-Earth) and 148-150.05 MHz (Earth-to-space) bands (the “*NVNG VHF Petition*”).

By this amendment, Myriota intends to improve the Myriota System by: (i) utilizing Spire Global, Inc.’s proven 3U CubeSat platform, equipped with active propulsion capabilities, to accelerate system implementation and enhance space safety; and (ii) adjusting the orbital architecture including number of satellites, along with certain operational parameters, to optimize coverage without increasing the potential for interference from the Myriota System. Myriota also provides updated ownership information in this amendment.

Grant of the *NVNG VHF Petition*, as amended, will enable Myriota to accelerate the deployment of its communications system and bring new competition in Internet of Things services for U.S. consumers. Because the changes contemplated herein will enhance Myriota’s ability to serve the U.S. market, will improve system reliability and space safety, and will not increase the potential for interference, Myriota respectfully seeks expeditious grant of the *NVNG VHF Petition*, as amended, consistent with the public interest, convenience, and necessity.

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AMENDMENT TO PETITION FOR DECLARATORY RULING

Myriota Pty. Ltd. (“Myriota”) hereby submits this amendment to its pending petition to the Federal Communications Commission (“Commission”) for a declaratory ruling to access the U.S. market using its planned non-voice, non-geostationary (“NVNG”) mobile-satellite service (“MSS”) system (the “Myriota System”) that will operate in the 137-138 MHz (space-to-Earth) and 148-150.05 MHz (Earth-to-space) bands (the “*NVNG VHF Petition*”).¹ This amendment has been filed contemporaneously with a petition to modify the U.S. market access grant for Myriota to provide NVNG MSS services in the 399.9-400.05 MHz (Earth-to-space) and 400.15-401 MHz (space-to-Earth) bands² to reflect the same system implementation changes.

By this amendment, Myriota seeks to improve the Myriota System by: (i) utilizing Spire Global, Inc.’s (“Spire”) proven Low Earth Multi-Use Receiver (“LEMUR”) 3U CubeSat platform, equipped with active propulsion capabilities, to accelerate system implementation and enhance space safety; and (ii) adjusting the orbital architecture and number of satellites, along

¹ See Myriota Pty. Ltd., *Petition for Declaratory Ruling to Access the U.S. Market using a Non-Voice, Non-Geostationary (“NVNG”) Satellite System in the 137-138 MHz and 148-150.05 MHz Bands*, File No. SAT-LOI-20191118-00135, Call Sign S3057 (filed Nov. 18, 2019) (“*NVNG VHF Petition*”).

² See Myriota Pty. Ltd., *Order and Declaratory Ruling*, File No. SAT-PDR-20190328-00020, Call Sign S3047 (May 29, 2020) (“*NVNG UHF Grant*”); see also Myriota Pty. Ltd., *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 (filed Mar. 28, 2019) (“*NVNG UHF Petition*”).

with certain operational parameters, to optimize coverage without increasing the potential for interference from the Myriota System. These important system improvements are described herein, in the accompanying Schedule S, and in the attached Technical Description. Myriota also provides updated ownership information in this amendment.

The changes described herein should not be deemed a “major amendment” under Section 25.116(b) of the Commission’s rules because they do not increase the potential for interference from Myriota System operations. Accordingly, the *NVNG VHF Petition*, as amended, should not be considered “newly filed” under Section 25.116(c) of the rules. To the extent the Commission concludes otherwise, however, Myriota seeks a waiver of these rules to permit consideration of the *NVNG VHF Petition* in the unique context of the current processing round.

Grant of the *NVNG VHF Petition*, as amended, will enable Myriota to accelerate system deployment and bring new competition in Internet of Things (“IoT”) services for U.S. consumers. Because the changes contemplated herein will enhance Myriota’s ability to serve the U.S. market, will improve system reliability and space safety, and will not increase the potential for interference, Myriota respectfully seeks expeditious grant of the *NVNG VHF Petition*, as amended, consistent with the public interest, convenience, and necessity.

I. DISCUSSION

Myriota is a leader in satellite-based IoT services and continues to innovate to address the needs of consumers in the United States and around the world. Myriota has a growing list of hundreds of partners worldwide and has delivered millions of messages via its existing satellite and ground network. Myriota-enabled applications serve critical industries around the world such as agriculture, resources, utilities, logistics, environmental management, and defense. Myriota has refined its U.S. implementation plans in order to optimize Myriota System operations and has

recently partnered with Spire to leverage the previously authorized LEMUR CubeSat platform and international ground station network³ to accelerate system deployment and improve the operational characteristics of the Myriota System.

The Myriota System is being improved in two fundamental areas: (i) using the LEMUR 3U CubeSat platform, equipped with active propulsion capabilities, to enhance reliability and space safety; and (ii) adjusting its orbital architecture and number of satellites, along with certain operational approaches, to optimize coverage without increasing the potential for interference. Myriota also updates its officers/directors and ownership in this amendment.

The Commission grants satellite operators with significant latitude to make implementation adjustments, provided they do not increase the potential for interference into other spectrum users.⁴ The changes described in this amendment are consistent with the system design and implementation discretion afforded by the Commission's rules and policies. Myriota will be able to deploy its constellation more rapidly, thereby accelerating the availability of competitive IoT services to U.S. consumers. In addition, these changes to the Myriota System will enhance service provision, reliability, and space safety. As a result, expeditious grant of the *NVNG VHF Petition*, as amended, would strongly serve the public interest.

A. Myriota System Improvements

The operational characteristics of the Myriota System were described in the *NVNG VHF Petition* and, because the system operates in multiple NVNG bands, also by reference to the

³ All Spire ground stations operating with the Myriota system will be sited outside the United States. In addition, for the avoidance of doubt and as discussed herein, Spire's separate U.S. market access grant is not being used in the context of Myriota's operations.

⁴ See DigitalGlobe, Inc., *Order and Authorization*, 20 FCC Rcd 15696 (2005) at ¶ 9; see also ViaSat, Inc., *Petition for Declaratory Ruling Granting Access for a Non-U.S.-Licensed Non-Geostationary Orbit Satellite Network, Order and Declaratory Ruling*, File Nos. SAT-PDR-20161115-00120 and SAT-APL-20180927-00076 (rel. Apr. 23, 2020) ("*Viasat Order*").

now-granted *NVNG UHF Petition*. This amendment provides information regarding relevant changes to the operational characteristics of the Myriota System. Unless otherwise stated herein, the information included in the *NVNG VHF Petition* remains unchanged.

1. The Myriota Satellite

At the time the *NVNG VHF Petition* was filed, Myriota was planning for a constellation of 3U CubeSats but had not finalized its satellite design or manufacturer.⁵ Myriota has since worked to optimize its satellite system design and recently partnered with Spire to implement the Myriota System. This new partnership will bring substantial benefits to Myriota customers in the United States and around the world through increased reliability, expeditious system deployment, the addition of active propulsion to Myriota satellites, and other improvements.

a. Use of the LEMUR CubeSat Platform

Spire satellites cumulatively have centuries of spaceflight heritage, with more than 110 LEMUR satellites launched over the past eight years.⁶ Spire's space industry expertise and global network of ground stations, combined with Myriota's innovative satellite-based IoT technology, offers unique and important system implementation benefits.

The Commission has previously authorized LEMUR satellite operations in connection with U.S. space station licenses,⁷ as well as U.S. market access for satellites authorized by a foreign administration,⁸ granted to Spire. Not only is the LEMUR 3U CubeSat platform well-

⁵ *NVNG VHF Petition*, Narrative at 11.

⁶ See <https://directory.eoportal.org/web/eoportal/satellite-missions/l/lemur>.

⁷ Spire Global, Inc., File No. SAT-LOA-20151123-00078 *et. seq.*, Call Sign S2946 (grant stamp Nov. 28, 2018) (LEMUR-2 satellite license).

⁸ Spire Global, Inc., *Order and Authorization*, File No. SAT-PDR-20190321-00018, Call Sign S3045 (grant stamp October 17, 20219) ("*Spire U.S. Market Access Grant*") (grant-in-part of market access for Spire's Luxembourg-licensed MINAS satellites, which are technically identical to the U.S.-licensed LEMUR-2 satellites).

known to the Commission, prior grants also establish that LEMUR satellites can be operated consistent with applicable domestic and international rules and policies.

For this and other reasons, Myriota has chosen Spire as its global implementation partner. Marrying the Myriota IoT payload with the proven LEMUR CubeSat platform leverages Spire's space heritage to rapidly and reliably implement the Myriota System. Under this arrangement, Myriota expects to commence system deployment in Q2 2022 and to complete system implementation by Q4 2022.

Importantly, the fundamental operational characteristics of Myriota's NVNG VHF communications payload will not change. In the context of its system implementation partnership with Spire, Myriota satellites will have other capabilities generally unrelated to the provision of NVNG VHF services in the United States. Although not part of this amendment, Myriota provides information regarding these capabilities in the attached Technical Description in the interest of full disclosure.

b. Enhanced Maneuvering Capabilities

The Commission has concluded that maneuverability can be an important component of space debris mitigation, both by enabling space stations to engage in collision avoidance and by facilitating spacecraft disposal.⁹ The Spire-operated LEMUR spacecraft will be authorized by

⁹ Mitigation of Orbital Debris in the New Space Age, *Report and Order and Further Notice of Proposed Rulemaking*, Docket No. 18-313, FCC 20-54 (rel. Apr. 24, 2020) at ¶ 51 (“*Orbital Debris Order*”). The Commission has also adopted a requirement that U.S.-licensed space stations disclose the extent of maneuverability of planned satellites. See 47 C.F.R. § 25.114(d)(14)(iv)(A)(4) (adopted, not yet effective).

Luxembourg,¹⁰ and Myriota is including updated ODAR information for the Myriota satellites with this amendment.

In the *NVNG VHF Petition*, Myriota indicated that its first generation of satellites would not have active propulsion but would instead trial limited maneuvering capabilities using differential drag techniques.¹¹ Under its new implementation plan, all Myriota System satellites will have active propulsion. As a result of deployment schedule and supply chain constraints, as well as a desire to evaluate performance under real-world conditions, all Myriota satellites will include one of two propulsion systems: the Morpheus MultiFEEP (3U - Low T) system or the Thrustme I2T5 system. These propulsion systems are described more fully in the attached Technical Description.

The ability to include active propulsion in the Myriota System is an important public interest benefit associated with this amendment. In addition to maintaining orbital spacing with the rest of the constellation, the onboard propulsion system will be used to avoid conjunction events and, assuming sufficient fuel remains at end-of-life, to help deorbit the satellites. The precise number of satellites with each of these propulsion systems will depend on availability, performance, and other factors.

Myriota recognizes that the Commission is conducting a rulemaking regarding orbital debris mitigation requirements that may alter its existing rules.¹² Myriota acknowledges that it may be subject to any rule changes adopted in that proceeding and respectfully reserves the right to further update the Commission regarding any adjustments to its active propulsion plans.

¹⁰ The Commission has previously authorized Luxembourg-licensed space stations on multiple occasions. See, e.g., SES-17 S.a r.l., File No. SAT-PDR-20190305-00014 (granted May 8, 2020) (authorizing U.S. market access for a Luxembourg-licensed space station); see also *Spire U.S. Market Access Grant*.

¹¹ See *NVNG VHF Petition*, Technical Description at Section A.8.

¹² See generally *Orbital Debris Order*.

c. Eligibility and Operational Requirements

Myriota previously provided information concerning its legal and technical qualifications as is required under Section 25.137 for applicants seeking U.S. market access for non-U.S. licensed satellite systems.¹³ These basic qualifications have not materially changed. Myriota will operate Myriota System satellite payloads consistent with any Commission grant of U.S. market access authority and will otherwise work with its system implementation partner, Spire, to operate the Myriota System consistent with the Commission's rules and policies.

In this connection, Myriota is pursuing a system implementation approach that is consistent with the authority granted to it by the Australian Communications and Media Authority ("ACMA"). Specifically, to facilitate the most efficient and expeditious system implementation, Myriota has contracted with Spire to procure and operate the satellite buses of the Myriota System. Myriota will independently operate the satellites' NVNG VHF communications payloads under the Australian MNSAT filing at the International Telecommunication Union and pursuant to its Australian authorization. In this way, Myriota will ensure that the Myriota System satellites are operated, and communications services are offered to the U.S. market, in compliance with Commission rules and policies.

2. Constellation Adjustments

The updated Myriota System orbital architecture will include six equally spaced satellites, equipped with active propulsion, operating in each of six equally spaced orbital planes with a sun synchronous inclination of 97.55°. ¹⁴ Thus, the total number of satellites in the Myriota System

¹³ See *NVNG VHF Petition*, Narrative. at 11-12.

¹⁴ The inclination angle reflects an orbital altitude of 550 km. The satellites are in a sun-synchronous orbit and, therefore, the inclination angle is set by altitude. Because the *NVNG VHF Petition* sought to operate with an orbital altitude range of 400-600 km, the updated orbital parameters are well within those previously contemplated.

will be 36 rather than 26 as originally proposed.¹⁵ At the same time, however, Myriota is reducing the number of orbital planes from the eighteen (18) to only six (6). As described in Section I.A.2.a, *infra*, and in the attached Technical Description, Myriota will ensure that the potential for interference to other NVNG VHF systems is not increased as a result of these changes. Taken together, these constellation changes improve the uniformity of Myriota System coverage, continue to facilitate spectrum sharing, enhance space safety, and reduce the use of orbital resources. As a result, implementing these changes will further the public interest.

a. Spectrum Compatibility with NVNG VHF Systems

Myriota has analyzed the spectrum compatibility of its updated constellation in relation to other users of the NVNG VHF bands. The Myriota System's operational characteristics, as amended herein, remain compatible with other NVNG VHF operations. The Myriota System's spectrum use is not directly linked to the number of satellites or its orbital architecture, particularly given its large satellite beams and near-omnidirectional earth station antennas. As a result, the implementation improvements contemplated by this amendment will not increase the potential for interference.

i. Equivalent Downlink and Uplink Operations

Myriota previously described in detail its ability to share spectrum with other NVNG VHF systems. Consistent with the Commission's rules, and under operator-to-operator coordination arrangements, the software-defined radios on Myriota's satellites can dynamically select channels depending on the availability of spectrum, vary the bandwidth of satellite emissions, and organize their emissions to accommodate sharing arrangements with other users

¹⁵ Myriota also seeks authority to communicate with replacement satellites with parameters equivalent to those described herein to replenish its constellation as satellites reach end-of-life to ensure continued operations.

of the band. Downlink transmissions can range in bandwidth anywhere between 10 and 100 kHz and operate anywhere within the entire one-megahertz downlink band or within any portion thereof that may be assigned or coordinated. All these parameters remain unchanged from the *NVNG VHF Petition*.

Downlink communications will typically operate at 10% system-wide duty cycle (*i.e.*, any individual location in the United States, on average, would receive downlink transmissions for a given frequency range from one or more Myriota satellites no more than 10% of the time). In other words, given the system's operational characteristics (broadcast and "bursty" nature of downlink transmissions, satellite recharge time, self-interference avoidance, etc.) and the unique nature of Myriota's IoT services, 90% of the time there are no Myriota downlinks at any individual location within the United States for a given frequency range. Unlike continuous transmission satellite services, Myriota's IoT system-wide downlink duty cycle is independent of the potential coverage of the system so changes to the number of satellites and orbital architecture will not alter its downlink interference potential. Myriota will maintain this 10% system-wide duty cycle, ensuring that there will be no increase in the potential for interference from Myriota's downlink operations.

On the uplink, Myriota's IoT modules will operate with the same duty cycle described in the *NVNG VHF Petition* (typically less than 0.02% and only occasionally up to 0.5%) and employ frequency hopping across the band with an emission bandwidth of just 2 kHz. Myriota's micro-gateways will also maintain the same transmit duty cycle (typically less than 0.5% and occasionally up to 5%) with an emission bandwidth ranging from 10-100 kHz.¹⁶ These low

¹⁶ Since the micro-gateways are far less numerous than other devices communicating with Myriota satellites in this band, their slightly higher duty cycle will have a negligible effect on the spectrum environment.

uplink duty cycles give Myriota the ability to share the entire uplink band with other NVNG VHF systems, as well as the ability to operate in any portion of the band which is coordinated or assigned. These parameters remain unchanged from the *NVNG VHF Petition*.

The operating parameters and the number of Myriota modules and micro-gateways in the United States are the core drivers of the potential for uplink interference. The contemplated changes to the Myriota System do not alter the number of NVNG VHF earth stations Myriota can support in the United States nor the manner in which they operate. Specifically, maintaining the same uplink duty cycles for Myriota modules and micro-gateways ensures that the potential for uplink interference will not increase.

ii. Reduced Potential for Interference

The changes to the Myriota System's orbital architecture will further facilitate spectrum sharing and will reduce rather than increase the potential for interference from Myriota's NVNG VHF operations.¹⁷ As discussed in the attached Technical Description, the contemplated constellation changes generally make Myriota System coverage more uniform. With the exception of Alaska, any increase in average daily single-satellite coverage in the United States is effectively offset by a greater reduction in multiple-satellite coverage thereby maintaining or reducing the spectrum impact of the system. In Alaska, where the multiple-satellite coverage is not reduced, Myriota will control satellite operations to ensure that the spectrum impact is no greater than that of its original constellation design.

In this way, Myriota will reduce the total U.S. coverage of the system (measured in satellite-hours) by offsetting any increases in single-satellite coverage with greater decreases in multiple-satellite coverage. In addition, spreading uplink and downlink transmissions more

¹⁷ See Technical Description at Section A.4.3.

evenly over time and limiting the impact of overlapping beams facilitates spectrum sharing with the Myriota System. Such changes would decrease the potential for interference from the Myriota System.

iii. Impact on Other NVNG VHF Systems

Two NVNG MSS systems are authorized to operate in the NVNG VHF bands:

ORBCOMM License Corp. (“ORBCOMM”), and Swarm Technologies, Inc. (“Swarm”).¹⁸

ORBCOMM is the only remaining original licensee in the NVNG VHF bands.¹⁹ Swarm, which is licensed to operate in a portion of the NVNG VHF spectrum, is a participant in the current NVNG VHF processing round.²⁰

Myriota recognizes the need to avoid causing harmful interference to ORBCOMM’s licensed operations authorized in prior processing rounds. This requirement exists regardless of Myriota’s constellation architecture. Myriota’s advanced spectrum sharing capabilities and low duty cycles will facilitate spectrum sharing with ORBCOMM. Myriota accepts that the Myriota System should not cause harmful interference to ORBCOMM.²¹ Thus, the contemplated system changes will not increase the potential for interference to ORBCOMM.

¹⁸ ORBCOMM License Corp., *Order and Authorization*, DA Docket No. 08-633 (rel. Mar. 2, 2008) (“*Orbcomm Order*”) *et seq.*; Swarm Technologies, Inc., File No. SAT-LOA-20181221-00094, Call Sign S3041 (granted Oct. 17, 2019).

¹⁹ *Orbcomm Order* at ¶ 2.

²⁰ Swarm Technologies, Inc., File No. SAT-LOA-20181221-00094, Call Sign S3041 (granted Oct. 17, 2019).

²¹ A condition requiring protection of ORBCOMM’s licensed operations from harmful interference in the absence of a good-faith coordination would be consistent with the *NVNG UHF Grant*. *NVNG UHF Grant* at ¶ 26.

Swarm, the only other participant in the current NVNG VHF processing round,²² operates in various segments of the relevant uplink and downlink bands.²³ Myriota and Swarm have reached a global coordination agreement for operations throughout the entire 137-138 MHz (space-to-Earth) and 148-150.05 MHz (Earth-to-space) bands on an operator level. Given this coordination status, the adjustments to the Myriota System will not increase the potential for interference to Swarm.

Again, as discussed more fully below and in the attached Technical Description, spectrum sharing with prior and current processing-round participants will be facilitated by the Myriota System's more traditional orbital architecture and more uniform coverage throughout most of the United States. Even with the addition of satellites, the time associated with irregular and higher levels of multiple-satellite coverage is reduced in low- to mid-latitude regions because orbital planes and inclination differences have been eliminated. These changes make spectrum sharing easier to achieve. At higher latitudes, however, multiple-satellite coverage (*i.e.*, the time with a larger number of overlapping satellite beams) increases because the beams converge as satellites approach the poles.

A greater number of satellite beams does not result in more intensive spectrum use given the very low duty cycles of satellite and earth station transmissions, particularly in less-populated, higher-latitude regions (*i.e.*, Alaska), and thus will not increase the potential for interference from Myriota System operations. Nonetheless, Myriota will control satellite

²² The "purpose of the major amendments rule is to assess the effect of an amendment on applications filed as part of the same processing round." O3b Limited, *Order and Declaratory Ruling*, File No. SAT-AMD-20171109-00154 (rel. June 6, 2018) at n.120.

²³ See Swarm Technologies, Inc., File No. SAT-AMD-20200504-00041, Call Sign S3041 (grant-in-part July 1, 2021).

operations in Alaska to ensure that the spectrum impact is limited to that of its prior 26-satellite constellation design.²⁴

b. Spectrum Compatibility with U.S. Government Systems

For all of the reasons that facilitate spectrum compatibility with other commercial NVNG VHF systems, Myriota can also share spectrum effectively with U.S. government operations. The *NVNG VHF Petition* seeks to provide ubiquitous IoT services throughout the United States. The updated Myriota System design provides more uniform coverage and offsets increases in single-satellite coverage with decreases in multiple-satellite coverage.²⁵ Myriota's IoT operations thus remain ubiquitous and have effectively the same impact on other spectrum users.

As a result, the contemplated changes to the Myriota System will not increase the potential for interference into U.S. government operations. In any event, Myriota acknowledges that any grant of U.S. market access authority may be conditioned on coordinating with federal government operations.

c. Space Safety

Although the number of satellites in the Myriota System will increase, Myriota is adopting a more traditional orbital architecture, decreasing the number of orbital planes by two-thirds, and including active propulsion on the satellites. Physical coordination of NGSO systems is effected primarily by avoiding the potential for conjunctions which, in turn, involves minimizing orbital plane and altitude overlap.

²⁴ See Technical Description at Section A.4.3.

²⁵ With the exception of Alaska, the reduction in multiple-satellite coverage is the result of the Myriota System's new orbital architecture. In Alaska, Myriota will limit the number of serving satellites to that available in its previous constellation design.

The decrease in the Myriota System's orbital planes from eighteen (18) planes to six (6) planes will greatly reduce the potential for conjunctions with other NGSO systems. Moreover, the addition of active propulsion to the Myriota System satellites provides conjunction avoidance capability to further enhance space safety.

B. Updated Ownership Information

Myriota provides updated information regarding its ownership and officer/directors in Attachment A. Myriota respectfully submits that present ownership should be found by the Commission to be in the public interest and Myriota requests exemption from the cut-off date associated with the NVNG VHF processing round pursuant to Section 15.116(c)(2) of the Commission's rules.²⁶

Myriota has support from major Australian and international investors including Boeing and InQTel, and has successfully raised over US\$37,000,000 to date. Myriota's investors represent a diverse group of sophisticated entities, many of whom have extensive experience in the space, communications technology, and government sectors. In addition to the entities described in Attachment A which each hold more than 10% of Myriota's shares, Myriota has 12 corporate shareholders from Australia, United States, and Singapore that are unaffiliated with each other or any other shareholder, and which collectively hold 43.13% of Myriota's shares (with an average shareholding of 3.59%). The balance of Myriota's shares are held by individual shareholders from Australia.

Given the relatively dispersed and equivalent ownership interest of Myriota's major shareholders, shareholders can provide top-level guidance but do not control the day-to-day operations of the company. Indeed, Myriota management remains largely unchanged since the

²⁶ See *infra* Section II.B.

NVNG VHF Petition was filed. Finally, Myriota notes that its diverse ownership does not include any entities or individuals that would raise foreign policy, international trade, or national security concerns.

For these reasons, the Commission should find Myriota's current ownership to be in the public interest and, as discussed below, grant an exemption from a "cut-off" date associated with the NVNG VHF processing round pursuant to Section 15.116(c)(2) of the Commission's rules.

C. Amendment Processing Issues

The contemplated adjustments to the Myriota System do not fundamentally alter its spectrum access characteristics, its interference potential, or the public interest benefits associated with grant of the *NVNG VHF Petition*. Accordingly, the Commission should continue to process and grant Myriota's request to access the U.S. market in the context of the current NVNG VHF processing round.²⁷

1. Major Amendment Rules.

The Commission has designed its policies to be flexible enough to permit satellite operators to respond to changing technological, market, and regulatory conditions.²⁸ In particular, the Commission attempts, when possible, to leave spacecraft design decisions to the space station licensee because the licensee is in a better position to determine how to tailor its system to meet the particular needs of its customers.²⁹

The Commission's rules generally permit any pending application or petition to be amended but establish different processing requirements depending on whether the amendment

²⁷ See 47 C.F.R. § 25.116(b).

²⁸ DigitalGlobe, Inc., *Order and Authorization*, 20 FCC Rcd 15696 (2005) at ¶ 9.

²⁹ ESAT, Inc. *Order and Authorization*, DA 98-619 (rel. Apr. 1, 1998) at ¶ 26.

is classified as “major.”³⁰ An amendment is considered “major” if it “increases the potential for interference or changes the proposed frequencies or orbital locations to be used.”³¹ The Commission has stated that the “purpose of the major amendments rule is to assess the effect of an amendment *on applications filed as part of the same processing round.*”³² Accordingly, it has determined that “the key element of a major amendment is one that increases the potential for interference.”³³

Section 25.116(b) of the Commission’s rules identifies certain kinds of amendments to pending satellite applications that are deemed “major amendments,” including amendments that increase the potential for interference, change a system’s proposed frequencies, or are otherwise determined to be substantial by the Commission.³⁴ In addition, Section 25.116(c) of the Commission’s rules states that an NGSO-like application “will be considered to be a newly filed application if it is amended by a major amendment . . . after a ‘cut-off’ date applicable to the

³⁰ See 47 C.F.R. § 25.116.

³¹ *Id.* at § 25.116(b). Although inapplicable here, an amendment may also be deemed a major amendment if it has a significant environmental effect, would be considered substantial under Section 309 of the Communications Act, or amends a defective space station application. *Id.*

³² O3b Limited, Request for Modification of U.S. Market Access for O3b Limited’s Non-Geostationary Satellite Orbit System in the Fixed-Satellite Service and in the Mobile-Satellite Service, *Order and Declaratory Ruling*, File No. SAT-AMD-20171109-00154 (rel. June 6, 2018) at n.120 (emphasis added).

³³ *Viasat Order* at ¶ 11 (internal quotations omitted) (citing Amendment of the Commission’s Space Station Licensing Rules and Policies, *Notice of Proposed Rulemaking and First Report and Order*, 17 FCC Rcd 3847, 3860 (2002) at ¶ 36).

³⁴ 47 C.F.R. §§ 25.116(b)(1)-(4). See also *Viasat Order* at ¶ 11 (“For NGSO space station applications or petitions for market access...the triggers for a major amendment under section 25.116(b)(1) that are relevant to our analysis are a change in proposed frequencies or an increase in the potential for interference.”). To the extent section 25.116(b)(1) references changes to “orbital locations”, the Commission has determined that this language does not apply to NGSO systems and therefore Myriota’s proposed changes to orbital characteristics would not constitute a ‘major’ amendment. *Id.*

application.”³⁵ The changes described in this amendment should not be deemed a major amendment under Section 25.116 of the Commission’s rules and should not affect the relative status of the *NVNG VHF Petition* in the current processing round.

2. The Amendment Will Not Increase the Potential for Interference to Other Processing Round Participants.

Myriota proposes to adjust the orbital architecture and number of satellites in the Myriota System and add active propulsion to its satellites, but there are no changes to the spectrum requested³⁶ or orbital locations to be used.³⁷ Myriota and Swarm have reached a global coordination agreement for operations throughout the entire 137-138 MHz (space-to-Earth) and 148-150.05 MHz (Earth-to-space) bands on an operator level. Given this coordination status, the adjustments to the Myriota System will not increase the potential for interference to Swarm, the only other VHF processing round applicant. Therefore, this should not be considered a major amendment.

The Commission has previously deemed an amendment to an NGSO application to be non-major even where significant changes to the orbital parameters were proposed because the changes, on balance, did not increase the potential for interference.³⁸ In that instance, ORBCOMM filed an amendment in a processing round to add 16 satellites to its constellation of 20.³⁹ The Commission

³⁵ 47 C.F.R. § 25.116(c). Section 25.116(c) also contains explicit exceptions for amendments that “resolve[] frequency conflicts with authorized stations or other pending applications but do[] not create new or increased frequency conflicts.” *Id.* at § 25.116(c)(1).

³⁶ Information regarding other frequency bands that may be utilized by Myriota satellites outside the United States and thus not used in the U.S. market to provide NVNG VHF services are not part of Myriota’s request for U.S. market access. Accordingly, there have been no changes to the spectrum that is the subject of the *NVNG VHF Petition*, as amended.

³⁷ *Viasat Order* at 11 (“reference to “orbital locations” in section 25.116(b)(1) is only applicable to GSO space station applications”).

³⁸ *See* *Orbital Communications Corp., Order and Authorization*, 9 FCC Rcd 6476 (1994) at ¶ 19 (“*Orbcomm 1994 Order*”); *see also* *Orbital Communications Corp., Order and Authorization*, 13 FCC Rcd 10828 (1998) at ¶ 24 (“*Orbcomm 1998 Order*”).

³⁹ *Orbcomm 1994 Order* at ¶¶ 5, 19.

noted “higher satellite visibility due to the increased number of satellites, lower orbit altitude and increased EIRP per satellite channel collectively could increase potential intersystem interference due to each channel[,]” but determined that the potential for interference did not increase because the amended system would actually reduce the PFD level from the original application by reducing the number of downlink channels per satellite.⁴⁰

Here, Myriota seeks to add 10 satellites to its proposed 26-satellite system –less than half the percentage increase approved for ORBCOMM – and to simplify its orbital architecture, without a change in its authorized altitude or increase in EIRP or PFD per satellite. As discussed above and in the Technical Description, through changes in orbital architecture and operational controls, Myriota will offset an increase in single-satellite coverage with a greater decrease in multiple-satellite coverage such that the Myriota System’s aggregate U.S. coverage (*i.e.*, total “satellite-hours” of coverage calculated by summing coverage multiplied by the number of satellites covering a U.S. location) is lower than that of the originally-proposed constellation design.

As a result, Myriota’s changes will reduce the potential for interference. In addition, Myriota has entered into an operator-level coordination agreement with Swarm, the only other processing-round participant, and the amended operational characteristics of the Myriota System are consistent with that agreement. Accordingly, this amendment is not a major amendment under the Commission’s rules.⁴¹

⁴⁰ *Id.* at ¶ 19.

⁴¹ See 47 C.F.R. § 25.116(c)(1) (the amendment resolves frequency conflicts with authorized stations or other pending applications but does not create new or increased frequency conflicts)

3. The Commission Should Grant the NVNG VHF Petition, as Amended, as part of the Current Processing Round.

Because the changes contemplated by Myriota do not constitute a major amendment, this amended application may be considered in the current processing round. Section 25.116(c) states that an “application for a NGSO-like satellite license ... will be considered a newly filed application if it is amended by a major amendment ... after a ‘cut-off’ date applicable to the application.”⁴² Non-major amendments are excluded from this rule. Therefore, it is proper to consider Myriota’s amendment in the current NVNG VHF processing round.

Furthermore, although the Commission is required to wait a period of 30 days following the issuance of a public notice to grant an “application, or any major amendment thereto,”⁴³ other amendments are not subject to the public notice requirements of Section 25.151, and an application (or, in this case, petition) that is subject to a non-major amendment may be granted more expeditiously.⁴⁴ Given that the adjustments and clarifications proposed herein do not rise to the level of a major amendment, the public notice requirement of Section 25.151 appears inapplicable and the Commission may expeditiously grant the *NVNG VHF Petition*, as amended. The Commission may, however, issue an informational public notice regarding the amendment without constraining the timing of a grant of the NVNG VHF Petition, as amended.⁴⁵

⁴² *Id.* at § 25.116(c).

⁴³ *Id.* at § 25.151(d).

⁴⁴ *See Id.* at §§ 25.116(b), 151(a)(4). Section 25.116 provides only that major amendments are subject to the Commission’s public notice requirements under Section 25.151.

⁴⁵ *See* 47 C.F.R. § 25.151(a)(7) (the Commission may issue a public notice for any “[i]nformation that the Commission in its discretion believes to be of public significance”).

II. WAIVER REQUESTS

The Commission has authority to grant waivers of its rules for “good cause shown.”⁴⁶ 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.⁴⁷ As discussed below, compelling reasons exist to grant the requested waivers in connection with this amendment.

A. Limited Waiver of Section 25.116(c)

If the Commission concludes that this amendment constitutes a major amendment implicating Section 25.116(c), the Commission should waive the rule for good cause and consider the *NVNG VHF Petition*, as amended, in the current processing round.

This amendment increases the number of satellites and reduces the number of orbital planes in the Myriota System. These changes simplify the system’s orbital architecture and make its coverage more uniform, generally reducing multiple-satellite coverage throughout much of the United States. Out of an abundance of caution, however, Myriota will control operation of the system in higher latitude regions to ensure that the spectrum impact of the updated system is equivalent to that proposed in the *NVNG VHF Petition*.

These changes described in this amendment do not alter the NVNG VHF spectrum access characteristics of the Myriota System. In fact, through changes in orbital architecture and operational controls, Myriota will offset increases in single-satellite coverage with decreases in multiple-satellite coverage such that the spectrum impact of the Myriota System is not greater than that of its originally proposed constellation design. And the changes in this amendment in

⁴⁶ See 47 C.F.R. § 1.3; *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969).

⁴⁷ *WAIT Radio*, 418 F.2d at 1157; *Intelsat North America LLC*, 22 FCC Rcd 11989 (2007) at ¶ 6.

no way disadvantage Swarm, the only other operator in the VHF Processing Round, because Myriota and Swarm have coordinated their operations in the band.

Waiving Section 25.116(c) is thus entirely consistent with the purpose of the Commission's processing round "cut-off" rules: to prevent other processing round applicants from experiencing an increased potential for interference.⁴⁸ Therefore, to the extent necessary, the Commission should waive Section 25.116(c) of the Commission's rules to process the Myriota System's implementation updates in the current NVNG VHF processing round.

B. Updated Ownership and Exemption from the Processing Round Cut-Off Date pursuant to Section 15.116(c)(2) of the Commission's Rules

The Commission's rules provide that any application for an NGSO-like satellite license within the meaning of § 25.157 will be considered to be a newly filed application if it is amended by a major amendment after a "cut-off" date applicable to the application, unless "[t]he amendment reflects only a change in ownership or control found by the Commission to be in the public interest and, for which a requested exemption from a "cut-off" date is granted[.]"⁴⁹

The updated ownership information does not reflect a "change in ownership or control" within the meaning of 25.116(c)(2). Indeed, the Commission has previously stated that even under instances where there has been a transfer of control – a far more significant change than the shareholder changes provided herein – that its rules do not treat such changes as major amendments as this could "deter legitimate business transactions[.]"⁵⁰

⁴⁸ See, e.g., Amendment of the Commission's Space Station Licensing Rules and Policies, Notice of Proposed Rulemaking and First Report and Order, 17 FCC Rcd 3847 (2002) at ¶ 56 ("Generally, a 'major amendment' is one that increases the potential for interference.")

⁴⁹ 47 C.F.R. § 25.116.

⁵⁰ See Amendment of the Commission's Space Station Licensing Rules and Policies, *First Report and Order and FNPRM*, Docket No. 02-34, et al, FCC 03-102 (rel. May 19, 2003) at ¶ 140 ("in light of the evidence in the record that continuing to treat transfers of control as major amendments in a first-come,

Nonetheless, and out of an abundance of caution, Myriota requests an exemption from the processing round cut-off for the purpose of the updates to Myriota's ownership structure described above. Grant of the exemption would be entirely consistent with the purpose of the Commission's processing round "cut-off" rules and ensure that such updates do not inadvertently trigger a new processing round.⁵¹ Therefore, to the extent necessary, the Commission should grant an exemption under Section 25.116(c)(2) of the Commission's rules to process the Myriota System's implementation updates in the current NVNG VHF processing round.

C. Limited Waiver of Schedule S Constraints

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 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

first-served procedure might deter legitimate business transactions, we revise this rule. We also revise this rule for NGSO-like satellite system applications considered in modified processing rounds. We see no reason to treat transfers of control differently in the two licensing procedures we adopt in this Order.”).

⁵¹ See, e.g., Amendment of the Commission's Space Station Licensing Rules and Policies, *Notice of Proposed Rulemaking and First Report and Order*, 17 FCC Rcd 3847 (2002) at ¶ 56 (“Generally, a ‘major amendment’ is one that increases the potential for interference”).

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 VHF services, and will not undermine the purpose of the Commission's rule.

III. GRANT OF THE NVNG VHF PETITION, AS AMENDED, WOULD SERVE THE PUBLIC INTEREST

Myriota stands ready to provide a state-of-the-art IoT service in the NVNG VHF bands to the U.S. public, dramatically increasing the availability of IoT connectivity in remote and underserved locations. This amendment will enable the Myriota System to deploy such services as rapidly as possible, improve the uniformity of Myriota System coverage, facilitate spectrum sharing, enhance space safety, and reduce the use of orbital resources. Through changes in orbital architecture and operational controls, Myriota will more than offset increased single-satellite coverage with decreased multiple-satellite coverage such that the spectrum impact of the Myriota System is lower than that of its originally proposed constellation design. Because the *NVNG VHF Petition*, as amended, will not increase the potential for interference from the Myriota System, Myriota will be able to better serve the U.S. public without disadvantaging other NVNG VHF processing-round participants. Thus, significant public interest benefits can be realized consistent with Commission policies and strongly support expeditious grant of the *NVNG VHF Petition*, as amended.

Grant of the *NVNG VHF Petition*, as amended, will drive competition in the IoT market, improving services and reducing costs to U.S. consumers. Public demand for IoT devices

continues to escalate with a projected global market of nearly \$1.4 trillion by 2026.⁵² Myriota seeks to support this growth in the United States by bringing a range of innovative IoT services, especially for those in areas underserved or completely unserved by terrestrial networks, in a cost-effective, spectrum-efficient manner.

Moreover, Myriota recognizes the vital importance of ensuring the orbital environment is not cluttered by debris. By significantly simplifying its orbital architecture and ensuring all of its proposed spacecraft are equipped with propulsion systems capable of engaging in conjunction avoidance maneuvers, Myriota is seeking to ensure a clean and safe space environment for all operators. This, too, furthers the public interest.

The improved Myriota System operations described herein will ensure robust service to consumers through increased competition and more efficient use of the NVNG VHF bands, while simultaneously improving space safety. Accordingly, Commission grant of the *NVNG VHF Petition*, as amended, strongly supports the public interest.

IV. CONCLUSION

This amendment seeks to improve the Myriota System by (i) using Spire's LEMUR 3U CubeSat platform, including active propulsion capabilities, to facilitate more expeditious system implementation and enhance space safety; and (ii) adjusting the system's orbital architecture and number of satellites, along with certain operational characteristics, to optimize coverage without increasing the potential for interference. Myriota also provides updated ownership information for Commission review.

⁵² Mordor Intelligence, *IoT Market Grown, Trends, Covid-19 Impact, and Forecasts (2021-2026)*, available at <https://www.mordorintelligence.com/industry-reports/internet-of-things-moving-towards-a-smarter-tomorrow-market-industry>.

For the reasons set forth herein and in the *NVNG VHF Petition*, expeditious grant of Myriota's request for U.S. market access in the NVNG VHF bands, as amended, will strongly serve the public interest.

Respectfully submitted,

MYRIOTA PTY. LTD.

A handwritten signature in dark ink, appearing to read 'Carlos M. Nalda', written in a cursive style.

Carlos M. Nalda
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Dr. David Haley
Chief Technology Officer
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Attachment A
Ownership, Directors, and Officers

Myriota is an Australian company (ACN 609 161 373) with registered office McEwin Building, North Terrace, Adelaide, SA, 5000.

The following individuals serve as officers and directors of Myriota and can be contacted through the address listed above:

Name	Title	Nationality
Alexander Grant	Chief Executive Officer	Australia
Peter Mabson	Chairman	United Kingdom
David Haley	Director	Australia
Martin Duursma	Director	Australia
David Rohrsheim	Director	Australia
Karina McLauchlan	Company Secretary	Australia

The following table contains the names, addresses, and citizenship of the only stockholders of record directly or indirectly owning and/or voting 10% or greater of Myriota voting stock. All three shareholders were previously disclosed to the Commission.¹

¹ See *NVNG VHF Petition*, Ownership Exhibit.

Name	Nationality	Address	Ownership
exactEarth Ltd ²	Canada	260 Holiday Inn Drive Unit 30, Building B Cambridge ON N3C4E8 Canada	12.69%
Ardaco Pty Ltd ³	Australia	33 Wellington Square North Adelaide SA 5006	11.89%
CSIRO ⁴ Innovation Fund 1, LP & CSIRO Innovation Follow-On Fund 1	Australia	GPO Box 1700 Canberra ACT 2601	14.35%

² exactEarth Ltd is a global satellite operator specializing in AIS vessel tracking. See <https://www.exactearth.com/>. On November 22, 2021, exactEarth became a fully-owned subsidiary of Spire Global, Inc. See *id.* Spire's ownership is a matter of public record before the Commission. See File No. SAT-T/C-20210401-00043 (granted June 9, 2021), Exhibit D.

³ Ardaco Pty Ltd ("Ardaco") is owned by Alex Grant, director and CEO of Myriota Pty Ltd, and his family, who are Australian nationals. Alex Grant is a director of Ardaco. Ardaco is the trustee for the Grant Super Fund and Grant Family Trust (both also owned by the Grant family). Grant Super Fund owns 10.62% of Myriota and Grant Family Trust owns another 1.27%.

⁴ Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) is an Australian entity organized to carry out scientific research. See <https://www.csiro.au/>. CSIRO owns their shares in Myriota over 2 different entities, totaling more than 10% together, but not 10% individually. The CSIRO funds are managed by Main Sequence, an Australian based Venture Capital firm created by CSIRO for the purpose of translating Australian research into new companies to solve critical challenges. See <https://www.csiro.au/en/work-with-us/funding-programs/funding/main-sequence>.