

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

In the Matter of)	
)	
MYRIOTA PTY. LTD.)	File No.: SES-LIC-____-____
)	
Application for Blanket Earth Station)	Call Sign: _____
Authorization to Operate Myriota-Enabled)	
Terminals in the 399.9-400.05 MHz)	
and 400.15-401 MHz Frequency Bands)	

APPLICATION FOR BLANKET EARTH STATION AUTHORIZATION

Myriota Pty. Ltd. (“Myriota”), pursuant to Sections 25.115, 25.135, and 25.142 of the Commission’s rules,¹ submits this application for a blanket earth station authorization to operate up to 1,000,000 Myriota-enabled terminals (“METs”) to support satellite Internet of Things (“IoT”) applications throughout the United States² (the “Application”). The METs may operate in fixed and mobile IoT applications on frequencies in the 399.9-400.05 MHz (Earth-to-space) and 400.15-401 MHz (space-to-Earth) bands (together, the “UHF bands”)³ in conjunction with

¹ 47 C.F.R. §§ 25.115, 25.135, 25.142.

² See 47 U.S.C. § 153(58); see also 47 C.F.R. §§ 25.103.

³ Myriota previously sought and received an equipment authorization for one type of MET. See Myriota Pty. Ltd., *Equipment Authorization*, FCC ID 2ATKL-SL2-1 (granted Oct. 7, 2019), available at https://apps.fcc.gov/oetcf/tcb/reports/Tcb731GrantForm.cfm?mode=COPY&RequestTimeout=500&tcb_code=&application_id=SJBdaxcNO%2BP91Soj8FwvFw%3D%3D&fcc_id=2ATKL-SL2-1 (“*Equipment Authorization*”).

Myriota’s authorized non-voice, non-geostationary (“NVNG”) mobile-satellite service (“MSS”) system.⁴

As demonstrated in this Application and the accompanying materials,⁵ the METs comply with the Commission’s technical and operational requirements and grant of this Application will serve the public interest by furthering the Commission’s mandate to “make available, so far as possible, to all the people of the United States... rapid, efficient, Nation-wide, and world-wide ... communication service[s.]”⁶ Accordingly, the Commission should expeditiously grant this blanket earth station application.

I. INTRODUCTION

Myriota’s breakthrough communications technology enables secure, low-cost communications services using its NVNG system of small satellites, METs, micro-gateways, and international ground stations.⁷ The METs consist of a battery-powered IoT module and will be coupled with various antenna types as detailed in Schedule B. The METs are equipped with intelligent transmit-scheduling algorithms and reliable, low-power transmissions, reducing the operating time for each MET and resulting in multi-year battery life. Additionally, MET

⁴ See 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*”); see also Order and Declaratory Ruling, File No. SAT-PDR-20190328-00020, Call Sign S3047 (May 29, 2020) (“*NVNG UHF Grant*”) (authorizing Myriota’s constellation of satellites (the “Myriota System”)).

⁵ A completed Form 312, Main form and Schedule B, and radiation hazard report are associated with this application, consistent with the information required by the Commission’s rules in support of the requested authorization. See 47 C.F.R. § 25.115(d).

⁶ 47 U.S.C. § 151.

⁷ Myriota sought market access for communications with its METs and micro-gateways. Myriota will request authorization for its micro-gateways in a separate application, and the international ground stations will be operated in other countries pursuant to appropriate national authority. *Myriota UHF Petition*, Narrative at 6.

transmissions are encrypted and use authenticated access via AES-CBC-256, with unique per-module keys, while also providing secure private device identities. These characteristics allow users to enjoy secure global IoT connectivity and reliable, long battery life for a wide range of applications including environmental resource monitoring, equipment tracking and preventative maintenance, asset tracking, and infrastructure management.

The METs are designed to minimize interference to other authorized users in the UHF bands and would otherwise operate consistently with the Commission's rules. The METs transmit and receive only when a Myriota satellite is overhead, significantly reducing the times during which the MET is transmitting.⁸ Moreover, all METs operate with an EIRP of less than 5 dBW.⁹ These power levels and duty cycles are consistent with other requests for blanket earth stations operating authority in the UHF bands.¹⁰ Accordingly, expeditious grant of this Application would be consistent with the Commission's rules.¹¹

II. ELIGIBILITY AND OPERATION REQUIREMENTS

Section 25.137(a) of the Commission's rules require earth station applicants seeking authority to communicate with non-U.S.-licensed space stations to demonstrate that U.S.-licensed satellite systems have effective competitive opportunities to provide analogous services, including effective competitive opportunities to provide analogous service in the country where the non-U.S.-licensed space station is licensed (in this case, Australia), and any other country in

⁸ The typical transmit duty cycle for the METs is less than 0.02%, and occasionally with duty cycle of 0.5%. *See NVNG UHF Petition*, Narrative at 10.

⁹ *Id.*

¹⁰ *See, e.g., Hiber Inc., Blanket Earth Station License Application*, SES-LIC-20191217-01739 (filed Dec. 17, 2019) at 4-6 (stating that Hiber will comply with the 5 dBW EIRP limit and will operate with a transmit duty cycle of 0.44%).

¹¹ *See* 47 C.F.R. §§ 25.115, 25.135, 25.142.

which communications with U.S. earth stations will originate or terminate.¹² Myriota incorporates by reference its market access grant to fulfill this condition.¹³ Myriota has complied with all Commission requirements related to its market access grant, including surety bond requirements.¹⁴

III. TECHNICAL INFORMATION

A. Radio Frequencies

The METs will transmit and receive in the 399.9-400.05 MHz band and the 400.15-401 MHz band, respectively.¹⁵ In the 399.9-400.05 MHz uplink band the MET will employ frequency hopping across the intended band, and utilize various emission bandwidths as discussed below.¹⁶ As noted in Schedule B, the MET uplink will employ minimum-shift keying (“MSK”) modulation enabling efficient spectrum usage. These operating characteristics give METs the ability to operate across the entire 150 kHz uplink range.

In the 400.15-401 MHz downlink band Myriota downlink emissions can range in bandwidth up to 140 kHz and operate within the entire downlink allocation. Myriota downlink emissions can also employ frequency hopping to move throughout the assigned band or operate with a defined channel plan, using multiple contiguous channels or a fragmented channel arrangement. Myriota downlink emissions operate using frequency shift keying (“FSK”)

¹² *Id.* at § 25.137(a).

¹³ *See NVNG UHF Grant.*

¹⁴ *See id.*; *see also* 47 C.F.R § 25.137(d).

¹⁵ These frequencies reflect those authorized in Myriota’s *NVNG UHF Grant*. *See NVNG UHF Grant* at ¶¶ 1, 19.

¹⁶ MSS earth station operations are permitted across the entire 399.9-400.05 MHz band, subject to a maximum equivalent isotropically radiated power (“EIRP”) of 5 dBW. ITU-R Radio Regulations, footnote 5.260A (WRC-19). While higher power telecommand (“TT&C”) uplinks are permitted in the 400.02-400.05 MHz band, the METs are capable of coordinating with such operations, consistent with the Radio Regulation’s allowance of operation across the band. *See Id.*; *see also id.* at 5.260B.

modulation to ensure robust data transmission. Accordingly, the METs have the ability to operate in the entire uplink and downlink ranges, consistent with the Commission's requirements.¹⁷

B. Emission Characteristics

Myriota’s satellite system and METs operate using various emission designators which permit Myriota to serve its customers’ needs. In Schedule B, Myriota specifies those carriers with the highest EIRP density, narrowest bandwidth, and largest bandwidth, and will transmit using emissions not specifically listed only if doing so would “not exceed the highest EIRP, EIRP density, and bandwidth prescribed for any listed emission.”¹⁸ The characteristics of the MET emission designators are set forth in Table 1.

Table 1: Bandwidths, power levels, and EIRP levels for METs.

Emission Designator	Necessary Bandwidth (kHz)	Authorized Bandwidth (kHz)	Power Level (W)	Max EIRP (dBW)	Max EIRP Density (dBW/4kHz)	Max EIRP Density towards Horizon (dBW/4kHz)
2K00F1D	2	150	1	5	5	5
2K36F1D	2.36	150	0.5	5	5	5
4K00F1D	4	150	1	5	5	5

C. Out-of-Band Emissions (47 C.F.R. § 25.202(f))

The emission masks for the METs demonstrate compliance with the limits set forth in Section 25.202(f) of the Commission’s rules.¹⁹ One type of MET (FCC ID 2ATKL-SL2-1) with

¹⁷ As discussed *infra*, the MET’s ability to operate throughout the NVNG UHF Bands will facilitate Myriota’s ability to comply with coordination requirements with other licensed NVNG MSS operators.

¹⁸ 47 C.F.R. § 25.275.

¹⁹ See 47 C.F.R. § 25.202(f). Figures 1 and 2 reflect Myriota’s initial MET communications links. Additional emission designators listed in Table 1 will comply with the emission mask requirements shown for each frequency band, as applicable.

necessary bandwidth 2.36 kHz has been previously certified by the Commission and Figure 1 illustrates the out-of-band attenuation characteristics of a single emission.²⁰

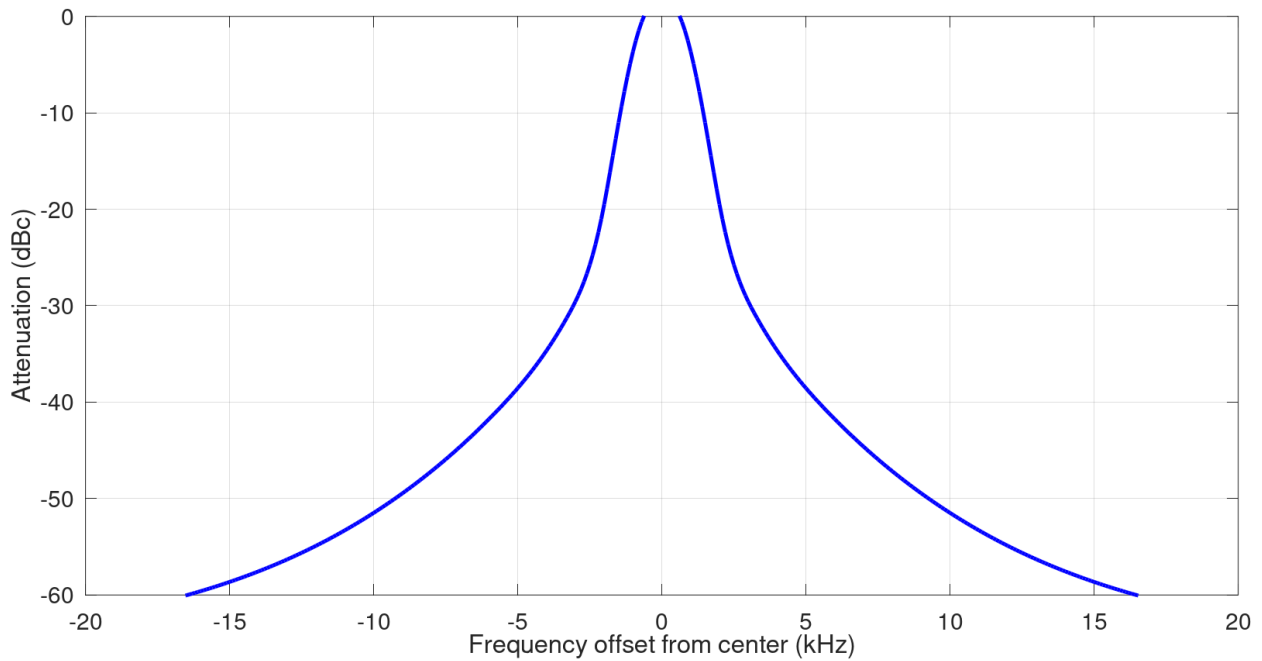


Figure 1: Out-of-band attenuation for MET 2.36 kHz Emission.

METs are able to employ frequency hopping throughout the authorized 399.9-400.05 MHz bandwidth and comply with Section 25.202(f) for all bandwidths, power levels, and EIRP levels listed in Table 1, and any variation of these parameters within the range listed. In the example of the MET with 2.36 kHz bandwidth, the requirements of Section 25.202(f) are met within less than 7 kHz of frequency offset. Therefore, as shown in Figure 2, MET emissions can hop with a center frequency anywhere within the range from 399.907 to 400.043 MHz without being limited to a discrete channel.

²⁰ See *Equipment Authorization*.

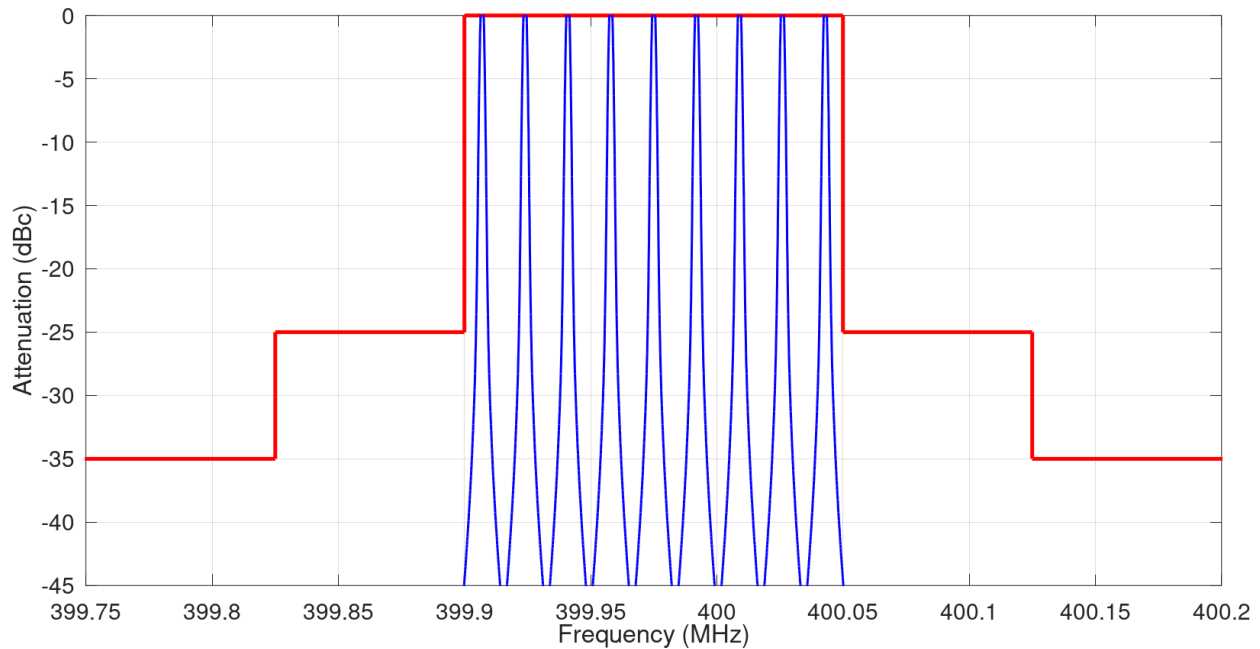


Figure 2: Emission Mask for MET 2.36 kHz Emission (Frequency Hopping).

Figure 2 illustrates a number of representative locations within the authorized bandwidth where METs can transmit without exceeding the emissions mask; however, a MET will only transmit a single emission within the 399.9-400.05 MHz range at any given time. Strict compliance with the requirements of Section 25.202(f) for all types of MET emissions will ensure protection of adjacent-band services in the United States.

D. Frequency Tolerance (47 C.F.R. § 25.202(d))

The METs also comply with Section 25.202(d), which requires the carrier frequency of earth station transmitters to be maintained within 0.001 percent of the reference frequency.

E. Technical Parameters and Operating Conditions (47 C.F.R §§ 25.135, 25.142)

Myriota provides the following information to demonstrate that its proposed METs comply with the requirements set forth in Sections 25.135 and 25.142(b), including a demonstration of (i) technical parameters and (ii) operating conditions.

1. Technical Parameters

The following characteristics give Myriota the ability to operate its METs in the 399.9-400.05 MHz band for Earth-to-space communications while minimizing harmful interference to other services operating within the band.

EIRP Limits: METs will operate with various antenna gain parameters, and their transmit power will always be controlled to ensure the maximum EIRP of any MET is less than 5 dBW, consistent with the applicable EIRP limits.²¹ For example, a MET with maximum antenna gain in any direction of 5 dBi will ensure that transmit power never exceeds 0 dBW (1 Watt). Even in a worst-case scenario, where a victim receiver is exposed to the MET in the direction of maximum antenna gain, the EIRP will not exceed a maximum of 5 dBW. Furthermore, the majority of METs are expected to be battery powered, with battery life related to the transmit power. Therefore, the majority of these METs will be motivated to operate with the minimum necessary transmit power.

Duty cycle: METs will operate with a typical transmit duty cycle of less than 0.02%, and occasionally with duty cycle of 0.5%. With each transmission burst of a MET lasting only 260 ms, and the low typical duty cycle of each MET, there will be minimal potential impact to other services. For METs which are battery powered, battery life is also related to the total number of transmissions and correlated with MET transmit duty cycle. Therefore, the majority of these METs will be motivated to operate with the minimum necessary duty cycle.

Frequency hopping: Myriota's system enables operation throughout the 399.9-400.05 MHz range. METs employ frequency hopping with narrow bandwidth emissions. This variation

²¹ See ITU-R Radio Regulations, footnote 5.260A (WRC-19).

in transmit frequency provides added protection to victim receivers by spreading any perceived impact across the 399.9-400.05 MHz range.

Transmit scheduling: Each MET has sophisticated transmit scheduling algorithms, so that they are instructed to only transmit when a Myriota satellite is overhead. This ensures that all transmissions are limited to only those which are necessary, maximizing their effectiveness and minimizing the impact on potential victim receivers. The scheduling data is kept up to date via the downlink to guarantee its long-term effectiveness.

Mitigation techniques: METs have awareness of their own location and geofencing abilities which allow them to adapt their emission parameters (such as transmit power, operating frequency range) based on their location. This enables the METs to be controlled by Myriota to protect other services. The METs hold regulatory compliance data in their local memory which determines what they are able to do dependent on their location. This data can be updated via Myriota's downlink should the requirements change. The downlink is also able to be used to command specific METs to cease transmission, if ever required.

2. Operating Conditions

The METs will also comply with the requirements set forth in 47 C.F.R. § 25.142 and will not cause harmful interference to other authorized users of the spectrum.

Voice service limitation: In accordance with 47 C.F.R. § 25.142(b)(1) and as conditioned in Myriota's *NVNG UHF Grant* Myriota will not provide voice services.²²

Coordination with Federal government users: The METs will also comply with technical parameters intended to protect federal users from NVNG MSS ground-to-space operations.²³

²² See *NVNG UHF Grant* at ¶ 21.

²³ 47 C.F.R. § 25.142(b)(2); see *NVNG UHF Grant* at ¶ 10.

Myriota's agile and spectrally efficient system will facilitate coordination with federal spectrum users, and Myriota has already committed to working with the Commission and NTIA to reach appropriate coordination agreements to protect federal users.²⁴ Myriota will also provide any additional information requested by the Commission which is necessary for coordination with federal users.

Federal government users operating below 399.9 MHz, or above 400.05 MHz will not experience any harmful interference from METs due to their operating characteristics listed above. Federal government users operating out-of-band from METs will also benefit from significant frequency separation from METs operating between 399.9-400.05 MHz, and therefore MET emissions will have high levels of attenuation in the Federal government user's operating frequency band. Furthermore, the METs are equipped with mitigation techniques, as discussed above, enabling counter measures in case of interference issues with Federal government operations.

Coordination with other users within the NVNG UHF Bands: Myriota will soon complete coordination with duly authorized NVNG MSS operators and will otherwise comply with the Commission's rules if such coordination is not achieved.²⁵ Myriota has also commenced coordination discussions with TT&C operators regarding their Earth-to-space operations in the 400.02-400.05 MHz frequency band.²⁶

²⁴ See *NVNG UHF Grant* at ¶ 10; see also *NVNG UHF Petition*, Technical Information at 17.

²⁵ See *Myriota UHF Grant* at ¶ 13 (citing 47 C.F.R. § 25.157).

²⁶ Due to the intended EIRP of TT&C Earth-to-space operations having significantly higher EIRP than the METs, the proposed risk from METs causing harmful interference to such operations is negligible.

IV. GRANT OF THIS APPLICATION SERVES THE PUBLIC INTEREST

Expeditious grant of this application serves the public interest by providing U.S. users with access to secure, low-cost global IoT connectivity for applications including environmental resource monitoring, equipment tracking and preventative maintenance, asset tracking, and infrastructure management. Investment and spending on IoT devices and remote monitoring has increased exponentially and is expected to maintain a double-digit growth rate through 2022.²⁷ The ever-growing demand for reliable, remote, and cost-effective IoT communications far outstrips the current satellite-based capacity available to provide such services.

Myriota seeks to meet this demand by providing massive scale connectivity virtually anywhere on Earth thereby enabling a range of innovative services to the IoT market, especially for those in areas underserved or completely unserved by terrestrial networks. Critically, the METs are able to bring this connectivity in a low-cost, spectrum-efficient manner that can create new opportunities for individuals and businesses across the United States and thus fully support the public interest.

The Commission recently granted Myriota's *NVNG UHF Petition* allowing market access for its UHF system. In doing so, the Commission recognized the public interest benefits of Myriota's *NVNG UHF Petition*, which are incorporated herein by reference.²⁸ Given the observed demand for Myriota's system and the previous grant of market access, the public

²⁷ *NVNG UHF Petition* at 8 (*citing* 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>; *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).

²⁸ *Myriota UHF Grant* at ¶ 1.

interest supports an expeditious grant of this blanket earth station license Application so that Myriota can commence providing its services in the United States.

Expeditious grant of this application is also in the public interest because, as noted above, the Commission has already approved the Myriota System to operate in the NVNG UHF Bands. Moreover, the Commission recently granted a similar blanket earth station authorization for another NVNG MSS operator, making expeditious grant appropriate in this case.²⁹

V. CONCLUSION

Given the foregoing, grant of this Application will enable Myriota to bring its innovative IoT service to customers in the United States, thereby serving the public interest. Accordingly, Myriota respectfully requests the Commission expeditiously grant this Application to operate its METs.

Respectfully submitted,

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September 18, 2020

for MYRIOTA PTY. LTD.

²⁹ See, e.g., Hiber, Inc., Blanket Earth Station Authorization, File No. SES-LIC-20191217-01739 (granted August 7, 2020).

ENGINEERING CERTIFICATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this application, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this application, and that it is complete and accurate to the best of my knowledge and belief.

/s/

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