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May 4, 2023

Response to TRAI Consultation on Assignment of Spectrum for Space-based Communication Services

Myriota welcomes the Consultation Paper on Assignment of Spectrum for Space-based Communication Services published by TRAI on April 3, 2023 and wishes to reply to Questions 1 and 2, as follows:

Q1. For space-based communication services, what are the appropriate frequency bands for (a) gateway links and (b) user links, that should be considered under this consultation process for different types of licensed telecommunications and broadcasting services? Kindly justify your response with relevant details

Myriota is an established global provider of satellite-based IoT services. Through its global headquarters in Australia, Myriota Pty Ltd has authorisation from the Australian Government to operate a constellation of up to 208 two-way communications satellites in Low Earth Orbit (LEO) to utilise the UHF frequency bands of the Mobile Satellite Service (MSS).

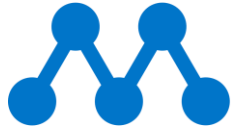
Myriota has designed a novel communications protocol that uses a Software Defined Radio (SDR) and advanced signal processing to allow very large numbers of low power signals from user terminals to be received on the same frequency channel. Myriota enables secure low-cost communications for Internet of Things (IoT) devices anywhere on the planet using patented techniques for massive scale direct-to-orbit communications. Myriota's system brings a cost-effective data communication technology to a new class of users with operations that require direct-to-orbit access to small amounts of data from numerous low-power devices.

Myriota's direct-to-orbit IoT connectivity platform allows modules to communicate directly with low earth orbit satellites, providing affordable access to location data and other data collected by sensors using devices with a battery life of several years.

Myriota's system enables millions of terrestrial IoT modules – associated with sensors or other devices – to transmit small data messages direct-to-orbit, without requiring a gateway between the device and satellite.

Examples of applications that Myriota's system can provide include:

- Environment: Weather monitoring; water flow sensing; oceanography; soil monitoring; natural resource management;
- Agriculture: Water security; livestock tracking; sensor telemetry; soil moisture probes; weather stations; feral animal trapping;
- Resource sector: Asset tracking and monitoring; predictive maintenance; process optimisation;



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- Utilities: Smart grid; meter reading; infrastructure management; remote alerts and control;
- Transport and Logistics: Asset tracking and monitoring; end-to-end freight; route planning and optimization; intelligent transport.

Myriota's low earth orbit (NGSO) Satellite IoT system intends to operate primarily using the UHF bands for satellite connections with IoT modules. The frequencies being requested for use in various jurisdictions are as follows:

- 399.9-400.05 MHz (Earth-to-space)
- 400.15-401 MHz (space-to-Earth)

The above frequency bands have international allocation to MSS (NGSO only) on a primary/ co-primary basis under Art. 5 ITU Radio Frequency Allocations. The Uplink band 399.9-400.05 MHz is allocated exclusively to the MSS (Earth-to-space) in the ITU Radio Regulations. The Downlink band 400.15-401 MHz is allocated on a co-primary basis alongside the Meteorological Aids Service, Meteorological-Satellite Service (space-to-Earth), Space Research Service (space-to-Earth).

Myriota's system can also provide service in the VHF MSS bands 137-138 MHz (space-to-Earth), 148-150.05 MHz (Earth-to-space), to give operational flexibility for the Myriota system, and enhance performance metrics of IoT modules.

In response to this consultation, Myriota wishes to highlight to TRAI the existing NGSO satellite constellations deployed by operators such as Myriota which make use the abovementioned MSS bands for providing next-generation satellite IoT services. Considering this, and the high allocation status of the bands to MSS in the ITU Radio Regulations, Myriota would greatly welcome further confirmation and guidance from TRAI about the national allocation status of these bands in India and the possibility to license these bands for the roll out of next-generation satellite IoT networks, for the benefit of the Indian IoT ecosystem and industry sectors at large.

Moreover, Myriota notes that TRAI explicitly referred to the UHF/VHF bands in its "Consultation Paper on Licensing Framework for Satellite-based connectivity for low bit rate applications" (March 2021), at paragraph 2.20: "Cubesats are IoT specific satellites [which] owing to their limited power, costs and small size, [...] can be launched into Low Earth Orbit for remote IoT applications making satellite communication more economical and technically feasible. New CubeSats technology *can be used in the range of UHF, VHF, S-band and Ku-bands to bring down the recurring service costs*".



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Myriota therefore calls on TRAI to clarify the licensing framework for VHF and UHF bands in India and issue appropriate guidelines for satellite operators wishing to deploy their networks in these bands for IoT specific services within India. The optimum availability of national spectrum for new satellite IoT services in India is absolutely crucial to unlocking the range of benefits (costs reductions, automation, etc.) which such services would bring to the Indian IoT ecosystem and industry sectors. To enable the communication between the gateways and the satellite, Myriota also wishes to understand how TRAI intends to regulate the bands that are commonly used by the NGSO satellite operators for communication with gateways: 2025-2110MHz, 2200- 2290 MHz, 8025-8400 MHz.

Myriota would like to emphasize the importance of expeditious and clear licensing procedures to unlock the myriad of opportunities for small and medium enterprises active in the IoT sectors that are looking for cost effective solutions over satellite-based technology. This same notion of stream-lined and transparent licensing for satellite IoT services was put forward by TRAI in its Consultation on Satellite-based low bite rate services, referred to above.

Q.2 What quantum of spectrum for (a) gateway links and (b) user links in the appropriate frequency bands is required to meet the demand of space-based communication services? Information on present demand and likely demand after about five years may kindly be provided in two separate tables as per the proforma given below:

Myriota indicates in the table below the current spectrum demands for Myriota’s planned IoT (MtoM) services in the VHF and UHF bands (user links) and S-band (gateway links). Noting that the demand will remain stable in these bands, and due to the bands’ intrinsic limitations it is important to note that Narrow Band (NB) MSS IoT services over satellite will face a lack of available spectrum, and Myriota would consequently welcome a world coordinated global allocation. Myriota would welcome India’s support for such a global NB MSS allocation at the ITU level that may be discussed during the next WRC- 23 and is ready to work with TRAI to achieve this goal and provide all information and assistance needed.

Type of service	Name of the satellite system	Type of satellite (GSO/ LEO/ MEO)	frequency range and quantum of spectrum required							
			User Link (Earth to space UL)		User Link (Space to Earth DL)		Gateway Link (Earth to space UL)		Gateway Link (Space to Earth DL)	
			Frequency range	Quantum (in MHz)	Frequency range	Quantum (in MHz)	Frequency range	Quantum (in MHz)	Frequency range	Quantum (in MHz)



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Access										
Internet										
NLD										
ILD										
GMPCS										
VSAT										
CUG										
Machine to Machine	MNSAT	LEO	399.9-400.05 137-138	0,15	400.15-401 148-150.05	0.15	2025-2110	85	2200-2290	90
DTH										
Teleport										
DSNG										
HITS										
IFMC										
Any other										

Respectfully -

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