



**Submission to the
Infocomm Media Development Authority
on
Next Wave of 5G Growth & Deployment in
Singapore: Policy Issues & Proposed Regulatory
Design for 2.1 GHz Band**

by Omnispace Satellite Holdings PTE LTD

August 23, 2021

**Mindel De La Torre
Chief Regulatory and International Strategy Officer
Email: mdelatorre@omnispace.com**

Table of Contents

Summary.....	3
Statement of Interest.....	4
Comments.....	5
Background on Omnispace.....	5
Singapore as a Smart Nation: Regional Leader in Technology, Trade and Technology and 5G NTN	5
Planning the 2.1 GHz Band in Singapore.....	6
Resolving Interference Issues.....	7
Global Trends in the 2 GHz S-Band.....	7
Conclusion.....	8

Summary

- 1) In addition to modifying the 1920-1980 MHz / 2110-2170 MHz band, Singapore also has a timely opportunity to create a regulatory framework for the 1980-2110 MHz / 2170-2200 MHz band to enable 5G Non-Terrestrial Networks (5G NTN) integrated mobile satellite services to flourish in the region.
- 2) Singapore can plan to allocate 3GPP New Radio (NR) band 65, “n65,” 1920-2110 MHz / 2110-2200 MHz¹, which expands upon band 1, “n1,” 1920-1980 MHz / 2110-2170 MHz. Band n65 maintains the same duplex frequency of 90 MHz and the same directional uplinks and downlinks as band n1. This additional spectrum provides a coherent expansion band for countries with flexible communications options for 5G and beyond – thereby supporting Singapore’s forward-thinking outlook.
- 3) As a regional technology, trade and transportation leader, it is important for Singapore to consider licensing integrated mobile satellite connectivity in its planning for the 2.1 GHz band. Mobile Satellite Services (MSS) with a Complementary Ground Component (CGC) can provide a broad range of possible commercial and government communications services such as smart city, transportation and logistics (on-shore and off-shore); unmanned aerial vehicles, aviation networks, and maritime coverage. Currently, 3GPP is standardising 5G Non-Terrestrial Networks (NTN) in Release 17 which will be finalised in early-mid 2022 for equipment production.
- 4) ITU Resolution 212 (WRC-19) addresses the implementation of International Mobile Telecommunications (IMT) for both the terrestrial and satellite components in the frequency bands 1980-2010 MHz and 2170-2200 MHz.² The Resolution states that the availability of the satellite component of IMT simultaneously with the terrestrial component of IMT in these bands would improve the overall implementation and the attractiveness of IMT. Further, the Resolution provides technical parameters to mitigate interference concerns for the coexistence between the two services.
- 5) Utilising the 2 GHz S-band for hybrid mobile satellite services is a growing trend globally with proceedings ongoing in Australia, Brazil, New Zealand and Saudi Arabia and services licensed in Europe, the United States, Canada and Mexico.
- 6) Omnispace welcomes the opportunity to provide further input on the design of the proceeding for the award of the frequency bands based on our own experience as well as best practices in other jurisdictions.

¹ 3GPP first standardised Band 65 in 2015 in [TS 36.101 V13.2.1 \(2016-01\)](#). As a superset of Band 1, Band 65 has an opportunity to supplant the Band 1 hardware that already exists within handsets, such that Band 1 and Band 65 can both be supported in future handsets with relatively minor modifications to the handset hardware. New Radio Band n65 was standardised in 2019 in [TS 38.101-1 V16.2.0 \(2019-12\)](#). The frequency band is the same; Band 65 and n65 can be used interchangeably as can Band 1 and n1.

² ITU Resolution 212 (Rev.WRC.219), [“Implementation of International Mobile Telecommunications in the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz.”](#)

Statement of Interest

Omnispace Satellite Holdings PTE LTD, a company incorporated in Singapore, and Omnispace LLC have a specific interest in the spectrum immediately adjacent to the 1920-1980 MHz / 2110-2170 MHz band as the company is the owner and operator of the only currently on orbit global non-geostationary (“NGSO”) satellite system that has been brought into use in the 1980-2110 MHz / 2170-2200 MHz band in accordance with applicable International Telecommunication Union regulations. Omnispace is investing in new technology and infrastructure as part of its next generation global constellation to provide hybrid 5G Non-Terrestrial Network (NTN) connectivity and is interested in exploring the opportunity to offer its services in Singapore and neighbouring countries in these frequency bands, in partnership and cooperation with local companies. Our particular interest is that the band in which Omnispace operates (1980-2110 MHz / 2170-2200 MHz, also known as the “2 GHz S-band”) is directly adjacent to 3GPP band n1 that Singapore’s proceeding addresses. 3GPP band n65 is the expansion band for 3GPP band n1 as it includes the entire 1920-2010 MHz / 2110-2200 MHz band. As technology continues to evolve towards 3GPP Release 17, which includes 5G NTN, Singapore may wish to consider moving forward in the allocation of the full band n65.

Comments

Background on Omnispace

Omnispace is managed by veteran satellite industry executives and has investments from leading private equity firms and strategic partners with a successful track record in the wireless and satellite domains. Omnispace acquired NGSO satellite network assets valued at over \$1 billion to initiate mobile-satellite service (MSS) connectivity and is now investing in new technology and infrastructure as part of its next generation global constellation to provide hybrid 5G connectivity. Omnispace continues to advance the development of its 5G NTN and expand in key markets globally. The Omnispace network will power critical global communications, including 5G and Internet of Things (IoT) connectivity, directly from its satellites in space to mobile devices around the world. Omnispace is building upon the investments it has already made to validate 3GPP standards-based 5G products and technologies and to demonstrate 5G connectivity from space.

Omnispace is currently offering MSS capacity in various markets through its existing operational on-orbit F2 satellite network. The F2 satellite network is the first element of the NGSO constellation that will be capable of providing 24 x 7 coverage around the globe (“Omnispace System”). Omnispace plans to launch two additional satellites into space next year, leading to the expansion of the Omnispace System.

Omnispace’s integrated MSS/Complementary Ground Component (CGC) system can provide a broad range of services, including a wide array of possible commercial and government communications services:

- **Industries:** Commercial services to enterprises in oil, gas, mining, fishing, agriculture, etc.;
- **Connectivity:** Internet connectivity in maritime and rural and remote areas;
- **Emergencies/Public Safety:** Communications during natural and man-made emergencies, as well as disaster warnings to the public and government agencies;
- **Internet of Things (IoT):** Connected car applications, smart city (urban and rural), transportation and logistics (on-shore and off-shore);
- **Unmanned Aerial Vehicles:** Situational awareness for disasters such as fires, damage caused by weather events, delivery, insurance inspections, etc.;
- **Hybrid:** In areas that are lacking in coverage or capacity due to blockage or density; and,
- **Aviation Networks:** hybrid networks that utilise both satellite and terrestrial networks to provide Internet access to aviation interests.

Singapore as a Smart Nation: Regional Leader in Technology, Trade and Technology and 5G NTN

Singapore is a leader in digital innovation in the Asia Pacific Region in the areas of the digital economy, government and society. This is exemplified through major national projects, in areas such as digital infrastructure and service delivery, involving the public and private sectors. As Singapore continues to lead the region in the deployment of 5G technology, Singapore also has an excellent opportunity to set an example with the roll out of 5G NTN in the 2 GHz S-band. Hybrid mobile satellite and terrestrial connectivity can provide a much broader coverage area for the range of possible commercial and government communications services mentioned above.

As part of the 5G development process, 3GPP has identified the 1980-2010 / 2170-2200 MHz band segments as targets for 5G NTN. These developments anticipate that a common operator will manage the spectrum through an integrated satellite and terrestrial system that is able to utilise satellite 5G coverage for areas beyond the reach of the terrestrial infrastructure (such as maritime and isolated rural areas) while simultaneously managing the spectrum to support terrestrial deployments in cities and more congested areas that require more capacity and where satellite service can be compromised by physical structures such as buildings.

By implementing its CGC system based upon the 5G NTN work currently being finalised in Release 17 at 3GPP, satellite providers such as Omnispace can provide 5G services to any area without terrestrial infrastructure, such as commercial shipping, while simultaneously supporting high capacity 5G service in areas requiring significant development of terrestrial infrastructure to support the capacity needs of the area. As noted, 5G NTN is standardised in Release 17 of 3GPP which will be finalised for equipment vendors in early-mid 2022.

Given the progress and results of the 3GPP process on the development of the 5G NTN standards, countries like Singapore have an opportunity to not only lead on adopting policies for the 1920-1980 MHz / 2100-2170 MHz band, but to begin regulatory activities related to the extension of the band in the 1980-2010 MHz / 2170-2200 MHz range.

Planning the 2.1 GHz Band in Singapore

Singapore has already identified and is utilising 1920-1980 MHz / 2100-2170 MHz for 3G and now, 5G communications. If IMDA does not designate a specific technology for this band but, rather, leaves it to the market to determine which technology to deploy within the band will enable a seamless transition for mobile network operators and customers. Should nomenclature be needed, a more generic term such as mobile services or IMT may be an appropriate designation for the band so that operators can choose to deploy 3G, 4G, 5G or migrate to 6G and beyond within the band when the market dictates.

The 1920-1980 MHz / 2110-2170 MHz band was the first frequency band pairing standardised by 3GPP for advanced mobile communications and is now known as New Radio (NR) band 1 or n1 and is widely deployed globally. Within 3GPP, Omnispace and its affiliates have successfully worked to harmonise standards for 5G base station and user equipment in frequency band pairing n65, 1920-2010 MHz / 2110-2200 MHz, effectively expanding band n1 to this larger band to enable the coexistence of mobile satellite services. This will drive the economies of scale in network and radio equipment, as well as user terminals for both MSS and CGC in the 2 GHz band.

Decisions made decades ago envisaged a satellite component of IMT in this band – specifically within the 1980-2010 MHz / 2170-2200 MHz band – such that all services and applications could seamlessly be provided over all geographical areas. Recently, at WRC-19, actions were taken to ensure that various services can be deployed in the 2 GHz band without coexistence issues. Because Singapore already has an existing band plan that allows both satellite and terrestrial services to be deployed using the same MSS uplink (1980-2010 MHz) and MSS downlink (2170-2200 MHz) frequencies consistent with 3GPP Band n65, Singapore has an opportunity to make a regulatory decision that also allows the MSS designation to be used by an integrated terrestrial system known as the Complementary Ground Component (CGC). CGC uses the same frequencies as the associated

satellites and can fill in areas where satellite communication is not possible. MSS with CGC allows important national interests to be met by MSS operations in offshore maritime areas while improving the quality of service available to terrestrial users by increasing the amount of spectrum available in urban and high usage areas.

Resolving Interference Issues

Given Singapore's small geographical size and proximity to its neighbouring countries, the possibility of cross-border interference is an important factor that IMDA will no doubt consider when determining spectrum allocation. Interference is also a key aspect when planning the coexistence of the terrestrial and mobile components of IMT in adjacent frequency bands.

WRC-19 agenda item 9.1.1 considered possible technical and operational measures to ensure coexistence and compatibility between the terrestrial component of IMT and the satellite component of IMT in the 1980-2010 MHz and 2170-2200 MHz bands in different countries. At WRC-19, Resolution 212 was revised to provide detailed guidance on the implementation of technical and operational measures to facilitate coexistence between terrestrial and satellite components of IMT in the frequency bands 1980-2010 MHz / 2170-2200 MHz, which has provided a more certain regulatory framework for the 2 GHz S-band.

Since the issue of interference was addressed at WRC-19 and 3GPP is in the final stages of completing Release 17, which includes 5G NTN, Singapore has a timely opportunity to create a robust regulatory framework for the 1980-2110 MHz / 2170-2200 MHz band in addition to the 1920-1980 MHz / 2110-2170 MHz band and enabling integrated mobile satellite services to thrive and expand in the region.

Global Trends in the 2 GHz S-Band

Many countries have already licensed hybrid mobile satellite services in the 2 GHz S-band. For example, the European Union, the United States, Canada and Mexico have licensed MSS/CGC in this band. And because of the resolution of outstanding issues at WRC-19, regulatory proceedings are underway to determine how to implement MSS/CGC in this band in Australia³, Brazil⁴, New Zealand⁵ and Saudi Arabia⁶. These countries have noted the advantages of licensing integrated satellite/terrestrial systems that achieve higher spectrum efficiency by creating more pathways for the evolution of 5G. Singapore has a timely opportunity to create a regulatory framework in the Asia Pacific region that can be followed by neighbouring countries to ensure cross border IoT and maritime services, amongst others, leading in the 5G digital economy.

Omnispace would welcome the opportunity to provide IMDA further input on the design of the proceeding for the award of the frequency bands based on our own experience as well as best practices in other jurisdictions.

³ ACMA, "[Replanning the 2 GHz band \(1980–2010 and 2170–2200 MHz\): Outcomes paper.](#)"

⁴ Anatel, "[Radiofrequency Spectrum Usage Plan of Brazil: 2021-2028.](#)"

⁵ RSM, "[Re-planning the 1710–2300 MHz Band – Decisions.](#)"

⁶ CITC, "[Spectrum Auction, 2021 – Preliminary Consultation.](#)"

Conclusion

Omnispace appreciates the opportunity to provide comments on the IMDA's *Public Consultation on 2.1 GHz Policy and Regulatory Design*. As a subsequent step to this proceeding, Omnispace respectfully suggests IMDA consider licensing the 1980-2110 MHz / 2170-2200 MHz for hybrid satellite mobile connectivity (MSS/CGC) in line with ITU Resolution 212 and global trends. Singapore is a digital nation and regional leader in the Asia Pacific and will be an important economy to spur the development of 5G NTN.