RESPONSE TO

24 – 30 GHz USE IN NEW ZEALAND
Discussion Document

10 June 2021

Introduction

The Global Satellite Coalition (GSC) welcomes the opportunity to respond to the *24 – 30 GHz use in New Zealand Discussion document* ("Discussion document") issued by the RSM unit of the Ministry of Business, Innovation and Employment of the New Zealand Government.[1] The GSC is the voice of the global satellite industry representing the combined membership of seven satellite associations worldwide: ABRASAT, APSCC, AVIA, CA SSWG, ESOA, GVF, and SIA.[2]

The GSC makes this submission to highlight views and proposals in response to the above captioned Discussion document, particularly regarding the operation of satellite services in the 27.5 – 29.5 GHz ("28 GHz band") in New Zealand. As RSM is aware, the 28 GHz band is already the subject of extensive existing and ongoing multi-billion USD investments by the satellite industry, with the vast majority of countries worldwide preserving and expanding the use of this band for satellite services. The GSC offers responses to the specific questions in the Discussion document below.

Responses to Specific Discussion Document Questions

Q1. What are the most likely use cases in New Zealand for mmWave based 5G services?

The GSC expresses no view on the most likely use cases in New Zealand for mmWave based terrestrial 5G services. The GSC observes that the propagation characteristics of mmWave based 5G, including its short range and low building penetration, suggests that the mmWave bands will likely be used to provide additional 5G network capacity in populated areas (particularly in indoor/encapsulated environment or short-distance line of sight to 5G base stations) that are already receiving terrestrial 5G services in other frequency bands. In some countries, mmWave based 5G technologies are being used to deliver Fixed Wireless Access ("FWA") services.

In the GSC's view, all foreseeable mmWave based 5G services in New Zealand can be accommodated in the 24.25 – 27.5 GHz band ("26 GHz band"). As the RSM itself has found, "there is sufficient spectrum for MNOs in the 26 GHz band."[3] Indeed, there is enough spectrum in this frequency range to provide each of New Zealand's three Mobile Network Operators ("MNOs") with 800 MHz of spectrum (a total of 2400 MHz), while still leaving another 850 MHz for FWA, IMT private networks and/or indoor enhanced mobile broadband ("eMBB") applications.

To put this in perspective, 800 MHz is the same amount of spectrum that Finland's three MNOs were each licensed by auction in the mmWave bands to serve a country with a similar population and population density as New Zealand.[4] Finland is well known for having the highest mobile data

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[1] RSM, *24-30 GHz use in New Zealand* (Apr. 2021) ("Discussion document"), *at* https://www.rsm.govt.nz/projects-and-auctions/consultations/24-30-ghz-use-in-new-zealand/.
[2] *See* https://gscoalition.org.
[3] Discussion document at page 17, para. 3.2.2.
[4] *See EU 5G Observatory Quarterly Report* at 83-84 (Mar. 2021), *available at* http://5gobservatory.eu/wp-content/uploads/2021/04/90013-5G-Observatory-Quarterly-report-11-2.pdf.

consumption in Europe and among the highest in the world, reaching 36.3 GB per SIM card in 2019[5] (as compared with about 3.3 GB per month in New Zealand in 2020).[6] The remaining 850 MHz of the 26 GHz in Finland was reserved for local 5G networks and educational and research usage.[7] Comparably, the Republic of Korea (a 5G leader) licensed 800 MHz of spectrum by auction to each of its three MNOs to serve a country with much higher population and population density.

By accommodating mmWave based 5G use cases in the 26 GHz band, New Zealand will enjoy all of the benefits of robust 5G networks and services with ample mmWave spectrum *and* all of the benefits of broadband satellite services in the Ka-band (see Q2 below).

Q2. What are the likely use cases for Ka band satellite services in New Zealand in the short and long term?

Satellite operators have deployed, and are continuing to deploy, multiple geostationary ("GEO") and non-geostationary ("non-GEO") high throughput satellite (HTS) systems in the 28 GHz band, including many with actual or projected coverage of New Zealand. High-throughput GEO satellites, such as IPStar, Inmarsat GX, and Kacific-1, use the 28 GHz band for gateways and/or user terminals to deliver broadband satellite connectivity to households, aircraft and ships in New Zealand and throughout the Asia-Pacific region. Other GEO networks are planned for deployment in the near future, including ViaSat-3 and Jupiter 3. Advanced non-GEO satellite constellations, such as the O3b Medium Earth Orbit ("MEO") constellation (and the next-generation mPOWER constellation launching in 2021), are delivering high-throughput connectivity to large cruise vessels visiting New Zealand. In addition, thousands of Low Earth Orbit ("LEO") using the 28 GHz have been and are being launched by companies such as Amazon, OneWeb, SpaceX, Viasat, and Telesat to provide broadband via satellite to all.

New satellite use cases are also emerging, powered by HTS systems in the Ka-band. For example, several members of the GSC have partnered with global Cloud providers to enable direct connections to cloud computing capabilities everywhere via satellite, including the aggregation and processing of widely dispersed Internet-of-Things (IoT) networks.[8] HTS systems will enable traditional narrowband satellite-IoT applications and new broadband IoT applications via satellite. Seamless integration of satellite solutions into 5G networks with support for 5G capabilities, such as network function virtualization and software-defined networking, have been successfully demonstrated at Mobile World Congress. As RSM notes, 3GPP is also studying the inclusion of non-terrestrial networks (NTN) for 5G, including satellite networks, and is expected to incorporate NTNs into the 5G NR standards.

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[5] *See* TRAFICOM, *Finland consumes a significant share of all mobile data used in the Nordics and Baltics*, https://www.traficom.fi/en/news/finland-consumes-significant-share-all-mobile-data-used-nordics-and-baltics; *see also* https://tefficient.com/wp-content/uploads/2021/04/tefficient-industry-analysis-1-2021-mobile-data-usage-and-revenue-FY-2020-per-operator-13-April-2021.pdf.

[6] Commerce Commission NZ, *2020 Annual Telecommunications Monitoring Report* at 4 (Mar. 2021) (showing historical trend in mobile data usage), *at* https://comcom.govt.nz/__data/assets/pdf_file/0030/247377/2020-Annual-Telecommunications-Monitoring-Report-Revised-version-16-March-2021.pdf.

[7] *See EU 5G Observatory Quarterly Report* at 83-84 (Mar. 2021), *available at* http://5gobservatory.eu/wp-content/uploads/2021/04/90013-5G-Observatory-Quarterly-report-11-2.pdf.

[8] *See, e.g.*, Microsoft, *Satellite connectivity expands reach of Azure ExpressRoute across the globe* (Sep. 2019) (announcing SES, Intelsat and ViaSat as Microsoft Azure ExpressRoute partners), *at* https://azure.microsoft.com/en-us/blog/satellite-connectivity-expands-reach-of-azure-expressroute-across-the-globe/; Inmarsat, *Inmarsat and Microsoft Azure IoT join forces to deliver cloud services via satellite* (Feb. 2019), *at* https://www.inmarsat.com/en/news/latest-news/enterprise/2019/inmarsat-and-microsoft-azure-iot-join-forces-to-deliver-cloud-services-via-satellite.html; SES, *SES Networks Enables Direct Connectivity to IBM Cloud via Global Satellite Network* (Oct. 2018), *at* https://www.ses.com/press-release/ses-networks-enables-direct-connectivity-ibm-cloud-global-satellite-network.

Satellites operating in the Ka-band frequencies will therefore help ensure ubiquitous broadband, extend 5G networks to areas they would not otherwise reach, support broadcast/multicast to the network edge, and meet growing requirements for aeronautical and maritime broadband communications. Existing and planned Ka-band HTS capacity is also expected to support Machine-to-Machine ("M2M") / IoT networks through direct connection or backhauling of aggregated M2M/IoT data from multiple locations – *e.g.*, to support sensor networks and other Smart City applications, or to enable connected cars, planes and ships.

All of these developments in the Ka-band satellite sector, together with New Zealand's positioning of itself as the "ideal location" for space,[9] makes New Zealand an attractive destination for satellite deployments in the Ka-band; but only if the Ka-band and the 28 GHz, in particular, remains fully available for use by satellite services.

Q3. What are the spectrum requirements for ESIM use in New Zealand?

As RSM notes, ITU WRC-19 further validated and extended the bands for earth stations in motion (an "ESIM" or "ESIMs") communicating with GEO satellites to 17.7 – 19.7 GHz and 27.5 – 29.5 GHz and initiated a WRC-23 Agenda Item for ESIMs to communicate with non-GEO satellites in the Ka-band. In fact, these frequency bands are already being used in New Zealand to provide high throughput maritime connectivity to thousands of passengers and crew on large cruise vessels visiting New Zealand using the O3b MEO constellation. Several additional GEO and non-GEO HTS systems are also launching and will begin offering commercial services in the next few years. In contrast, the 27.5 – 29.5 GHz band was not included among the mmWave bands identified for IMT-2020/5G. Instead, WRC-19 identified over 17 GHz of *other* spectrum for such applications, including the 26 GHz, 38 GHz, 43 GHz, and higher frequency bands.[10]

The expansion of the frequency ranges for Ka-band ESIMs by the ITU reflects the growing demand for ESIMs and other Ka-band satellite services. According to data from Northern Sky Research, the demand for satellite mobility services (comprising both aeronautical and maritime sectors) in all frequency bands was projected to grow by 30% CAGR globally from 2018 through 2028.[11] ESIMs operating in the Ka-band are expected to contest and capture a significant portion of that rapidly growing market, with projected demand growth of 34% CAGR over the same period.[12] While the COVID-19 pandemic had dented growth rates in 2020, both the aeronautical and maritime sectors are poised to rebound as the pandemic situation improves.

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[9] *See, e.g.*, NZ Space Agency, *New Zealand is the ideal location for New Space, at* https://www.mbie.govt.nz/science-and-technology/space/new-zealand-is-the-ideal-location-for-new-space/

[10] ITU Press Release, *WRC-19 identifies additional frequency bands for 5G,* Nov. 22, 2019 ("While identifying the frequency bands 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2 and 66-71 GHz for the deployment of 5G networks, WRC-19 also took measures to ensure an appropriate protection of the Earth Exploration Satellite Services, including meteorological and other passive services in adjacent bands. In total, 17.25 GHz of spectrum has been identified for IMT by the Conference, in comparison with 1.9 GHz of bandwidth available before WRC-19. Out of this number, 14.75 GHz of spectrum has been harmonized worldwide, reaching 85% of global harmonization.") https://news.itu.int/wrc-19-agrees-to-identify-new-frequency-bands-for-5g/.

[11] Data from *Northern* Sky Research, *Aeronautical Satcom Markets,* 8th ed. (2020); Northern Sky Research, *Maritime Satcom Markets*, 8th ed. (2020).

[12] Data from *Northern* Sky Research, *Aeronautical Satcom Markets,* 8th ed. (2020); Northern Sky Research, *Maritime Satcom Markets*, 8th ed. (2020).

Q4. Do you think the existing fixed service licenses in 26 GHz can be migrated to the 23 GHz and/or 38 GHz fixed service bands?

The GSC observes that one MNO in New Zealand has a small number of existing fixed link licenses in the 26 GHz band. Given that "a ministerial decision was made in May 2018 that no renewal offer would be made to the right holders,"[13] GSC agrees with RSM's proposal to migrate these small number of fixed link licences to the 23 GHz and/or 38 GHz fixed service bands. This would enable a better spectrum replanning option in the 26 GHz band.

Q5. If not, do you think the existing fixed services should be allowed in the 26 GHz?

The GSC supports the migration of existing fixed services out of the 26 GHz band. See Response to Q4 above.

Q6. Do you agree New Zealand should allocate 24.25 – 27.5 GHz primarily for IMT use?

The GSC agrees that there is sufficient spectrum in the 24.25 – 27.5 GHz band to accommodate all mmWave IMT requirements in New Zealand and more. Even if each of New Zealand's three MNOs is assigned 800 MHz of spectrum in the 26 GHz band for 5G (a total of 2400 MHz), there will still be 850 MHz of spectrum in the 26 GHz band available for individually area-licensed FWA, private 5G and/or indoor eMBB. As noted in response to Q1 above, 800 MHz is the amount of spectrum that each MNOs in Finland and the Republic of Korea obtained by auction in the mmWave bands to serve a much more mobile data hungry (Finland) and a much more populous and densely populated country (Republic of Korea), respectively.

Q7. How should RSM accommodate other use in this band such as space services?

The GSC supports the RSM's proposal to consider potential uses of the 26 GHz band for other space services (*e.g.*, Earth Exploration Satellite Service (EESS) and Space Research Service (SRS)) on a case-by-case basis. See also the response to Q27, below.

Q8. How do you see our proposal of the 28 GHz band allocation?

The GSC concurs with the RSM's observation that "[t]he emerging satellite broadband market sees an increased demand for spectrum access for satellite use, including by ESIMs and NGSO satellite constellations providing broadband services."[14] Accordingly, the RSM correctly concluded that"[t]o support such demand, we propose to allocate the whole 28 GHz band for satellite use."[15]

Further, the GSC agrees with the RSM that "there is sufficient spectrum for MNOs in the 26 GHz band" and that "allocating spectrum in the 28 GHz band for national mobile broadband would bring only marginal gains."[16] As noted in response to Q1 above, there is enough spectrum in the 26 GHz band to provide each of New Zealand's three MNOs with 800 MHz of spectrum (total 2400 MHz). This is the same amount of mmWave spectrum licensed to each of the MNOs in Finland and the Republic of Korea to serve a much more mobile data hungry (Finland) and a much more populous and densely populated country (Republic of Korea), respectively. .

[13] Discussion document at page 5, para. 1.3.2
[14] Discussion document at page 17, para. 3.2.2.
[15] *Id.*
[16] *Id.*

However, the GSC disagrees with the RSM's suggestion that "depending on the result of the 26 GHz spectrum allocation and global developments, there may be requirements in 28 GHz to be allocated to FWA, private IMT networks and/or indoor eMBB." As noted above, even if each of New Zealand's three MNOs is assigned 800 MHz of spectrum in the 26 GHz band for 5G (a total of 2400 MHz), there will still be 850 MHz of spectrum in the 26 GHz band available for individually area-licensed FWA, private 5G, and/or indoor eMBB. There is nothing to suggest that the remaining 850 MHz in the 26 GHz band will not be enough to accommodate other uses, such as FWA, private 5G and/or indoor eMBB. In addition, given the global identification of the 26 GHz band for IMT-2020, equipment availability is assured (and certainly by October 2022, when the RSM intends to implement its new band arrangements).

In contrast, global fixed-satellite service ("FSS") use and deployments in the 28 GHz band (including in New Zealand) has been sustained for well over a decade and is continuing at an accelerating pace with multiple new Ka-band HTS systems, consisting of thousands of satellites, being deployed in both GEO and non-GEO orbits. The 28 GHz band is already being used today to deliver broadband via satellite to households and businesses and aircraft and ships (see Response to Q2 and Q3, above).

Q9. Which option do you prefer for allocating 28 GHz band? Or is there any other option for managing the shared use of IMT, ESIMs and FSS in the 28 GHz band?

As indicated above in response to Q8, the GSC concurs with the RSM's proposal "to allocate the whole 28 GHz band for satellite use." However, the GSC disagrees with the RSM's suggestion that "there may be requirements for spectrum in the 28 GHz to be allocated to FWA, private IMT networks and/or indoor eMBB." As explained above, even if each of New Zealand's three MNOs is assigned 800 MHz of spectrum (same as in Finland and the Republic of Korea), there will be 850 MHz remaining in the 26 GHz band to accommodate these additional applications without encroachment on the 28 GHz band currently being used by the FSS. There is nothing to indicate that 850 MHz in the 26 GHz band will not be enough to support FWA, private IMT and/or indoor eMBB applications.

Accordingly, the GSC does not favour Option 1. This option envisages sharing criteria to be implemented between certain ESIMs and IMT private networks/FWA in the 27.5 – 28.35 GHz band and indoor restrictions on IMT in the 28.35 – 29.5 GHz. In the GSC's view, this option unnecessarily constrains deployment of ubiquitous FSS terminals and ESIMs in the 28 GHz band (which is already taking place in New Zealand) to accommodate new FWA, private IMT and/or IMT indoor-only applications that can be fully accommodated in the 26 GHz band.

The GSC also does not favour Option 2, since it envisages a strict band segmentation that would exclude ESIMs in an undefined portion of the 28 GHz band ("IMT and ESIM would not share the spectrum"), as well as sharing criteria between FSS gateways and the private IMT and FWA applications in this band. Again, this approach unnecessarily precludes and/or constrains FSS deployment in the 28 GHz band. As explained above, the proposed new FWA, private IMT applications can all be accommodated in the 26 GHz band without encroachment on the 28 GHz band currently being used by the FSS.

Instead, the GSC prefers and proposes an "Option 3" whereby the entire 28 GHz band is allocated for satellite use since there is sufficient spectrum for the MNOs in the 26 GHz band with spectrum leftover to accommodate other potential applications in this band, such as FWA, private IMT and/or indoor-eMBB. By adopting this option, New Zealand can enjoy the "best of both worlds," with all mmWave-based 5G services (and more) fully accommodated in the 26 GHz band and all existing planned and emerging high-throughput satellite services accommodated in the 28 GHz band. New Zealand would thereby maximise the benefits of both access technologies.

Q10. If you prefer option 1, do you agree with the proposed sharing mechanism (defining satellite coordination zones) between IMT use and FSS ground stations?

As indicated in response to Q9 above, the GSC does not favour Option 1 because it unnecessarily constrains satellite use of the 28 GHz band when other applications (FWA, private IMT and IMT indoor-only) can be fully accommodated in the 26 GHz band. Under the GSC's proposed "Option 3," no sharing mechanism between IMT use and FSS ground stations would need to be developed and enforced.

Q11. If you prefer option 2, how much spectrum do you think RSM should allocate to ESIM, IMT private network/FWA? And what's the preferred spectrum placement?

As indicated in response to Q9 above, the GSC does not favour Option 2 because it unnecessarily precludes satellite use of a portion of the 28 GHz band when the other applications (FWA and private IMT) can be fully accommodated in the 26 GHz band – see Responses to Q1 and Q9, above. Ideally, under the GSC's proposed "Option 3", the band would be segmented at 27.5 GHz, with all IMT and FWA applications below 27.5 GHz and satellite services above 27.5 GHz.

Q12. Are there any other issues of sharing use between satellite earth stations and ESIMs that you would like to bring to our attention?

There are no sharing issues between satellite earth stations and ESIMs that require RSM's attention. This matter is typically addressed through a coordination agreement between satellite operators in accordance with the ITU Radio Regulations. In addition, it would be unnecessary to consider sharing criteria between ESIMs (and other ubiquitously deployed FSS terminals) and terrestrial services (IMT, FWA, etc.) under the GSC's preferred "Option 3" since they would not occupy the same spectrum. See also response to Q36, below.

Q13. Do you agree that the current satellite allocation and licensing regime for 29.5 - 30 GHz should remain?

Yes. However, the GSC would to invite the RSM to initiate a separate proceeding to review and update the general use radio licence conditions for satellite terminals in 29.5 – 30.0 GHz (such as the max eirp, emission bandwidth, etc.) to reflect the characteristics of current Ka-band operations.

Q14. What's your preferred licensing option in 26/28 GHz spectrum?

Under the GSC's proposed "Option 3" (see the response to Q9 above), a general user radio licence for satellite services across the whole 28 GHz band would be suitable to simplify the deployment of ubiquitous FSS earth stations (including ESIMs). This licensing method is already in place in the 29.5 – 30.0 GHz band, which is currently used exclusively for satellite services. For FSS gateway at fixed locations, the current arrangement of radio licensing should continue to apply in the 28 GHz band.

Q15. Do you see any need for a general user licence spectrum for IMT? If so, what use case might there be?

The GSC expresses no view on the need for a general user licence spectrum for any particular IMT use case in the 26 GHz band. GSC does not support IMT any part of the 28 GHz band (under general user licence or not) for the reasons set out above.

Q16. If there is a need for general use spectrum for IMT and ESIM, how much spectrum should we set aside for it? Should RSM mandate technical conditions on the general use licence?

As explained in response to Q14 above, a general use radio licence for satellite services across the whole 28 GHz band would be suitable to simplify the deployment of ubiquitous FSS earth stations (including ESIMs) in this band.

As indicated in the response to Q13, the GSC would invite the RSM to initiate a separate proceeding to review and update the general use radio licence conditions to reflect the characteristics of current Ka-band operations.

Q17. Do you agree RSM should adopt 3GPP NR FR2 based channel bandwidth to design a channel plan in the radio licence regime for IMT services?

The GSC expresses no view on the size of channel bandwidth to design a channel plan in the radio licence regime for IMT services. However, the GSC does not support the adoption of channel plans that extend into the 28 GHz band (27.5 – 29.5 GHz). For example, GSC does not support channel plans that would rely on 3GPP band classes n257 or n261 for IMT above 27.5 GHz.

Q18. Do you agree RSM should refer 3GPP standards to set the regulatory requirements for spectrum allocated to IMT?

Generally yes, subject to any requirements for protecting co-frequency services and adjacent-frequency services deemed relevant in New Zealand.

Q19. Should we introduce a breakpoint for MR technical conditions mid-way through the duration of the MR? Or is it sufficient to set AFELs based on current technology and standards only?

The GSC expresses no view on Q19.

Q20. Do you agree RSM should mandate equivalent ETSI harmonised standards for radio licences in Radio Standards Notices and review these standards regularly?

The GSC expresses no view on Q20.

Q21. Which option do you prefer to set the unwanted emissions?

The GSC expresses no view on Q21.

Q22. If we use a TRP option for setting AFEL and UEL, do you have any recommended solutions on TRP measurement in the field?

The GSC expresses no view on Q22.

Q23. Do you agree that RSM should set unwanted emissions limits (in UELs and AFELs) base on 3GPP category B requirements? If no, please explain the reasons and provide your suggestions?

The GSC expresses no view on Q23.

Q24. Do you agree that we should we implement (e.g. through UELs and AFELs) the ITU Radio Regulations, Resolution 750 limits, including the 1 September 2027 transition date and

grandfathering clause for the protection of the EESS (Passive) Band? If not, please explain what limits and transition dates you consider to be more appropriate.

The GSC supports the implementation of ITU WRC-19 Resolution 750.

Q25. Do you have any insights on equipment availability at, or close to, the edge of 24.25 GHz that can meet both pre-1 September 2027 and post-1 September 2027 unwanted emission limits? Is there any additional technical solution such as frequency separation or filtering required for some equipment types?

The GSC expresses no view on Q25, except to note that IMT equipment availability in the globally harmonized 26 GHz band will likely be better by October 2022 when the current spectrum management rights expire and the new spectrum arrangements take effect.

Q26. Do you agree with RSM's position to not establish a framework for coordination zones for RAS?

The GSC expresses no view on Q26.

Q27. Do you see a need for RSM to allow EESS and SRS earth stations to operate in the band?

As indicated in Response to Q7, above, GSC supports the RSM's proposal to consider potential uses of the 26 GHz band for other space services, such as the EESS and SRS, on a case-by-case basis. As the RSM notes, it may be possible to consider future applications in rural areas where IMT or FWA use of the 26 GHz band is unlikely to be extensive. In particular, there is interest in the use of 25.5 – 27 GHz EESS (space-to-Earth) by remote sensing satellite systems.

Q28. Do you agree a semi-synchronised or unsynchronised network should be used in 5G high band deployment?

The GSC expresses no view on Q28.

Q29. If the network is unsynchronised, what is the best way to manage the interference between unsynchronised operators?

The GSC expresses no view on Q29.

Q30. If your preference is a semi-synchronised network, what is your suggestion on setting the synchronized parameter?

GSC expresses no view on Q30.

Q31. Do you agree that think RSM should implement ITU Radio Regulations, Resolution 242, resolves 2.1 in the management rights and licences conditions? If not please explain why or propose an alternative?

The measures in ITU WRC-19 Resolution 242 are intended to protect space stations receiving in the 26 GHz band. As noted in Response to Q32 below, at least one such system operates in 27.0 – 27.5 GHz in New Zealand and several others in the region without coverage of New Zealand.

The GSC supports the implementation of ITU WRC-19 Resolution 242, resolves 2.1, requiring IMT base station antennas to "normally" point at or below the horizon and for mechanical pointing to be at

or below the horizon. In addition, the RSM should also consider requiring licensees and Approved Radio Engineers to implement ITU WRC-19 Resolution 242, resolves 2.2, when selecting sites for IMT base stations. This is especially important to limit the risk of fixed transmitters pointing continuously at or near satellites in the geostationary arc.

Q32. Do you see a need for RSM to allow continued FSS gateway access to 27.0 - 27.5 GHz on a case by case basis? If so, how should we coordinate FSS Earth stations and IMT?

Most but not all Ka-band FSS systems use uplink spectrum in 27.5 GHz and above. However, because there is an FSS uplink allocation in the 27.0 – 27.5 GHz band in ITU Regions 2 and 3, a few commercial GEO HTS systems have been launched that use this band. In ITU Region 3, for example, IPStar uses the 27.0 – 27.5 GHz band at its gateway in New Zealand. Similarly, Australia's nbn SkyMuster GEO HTS satellites use the 27.0 – 27.5 GHz band at their gateways, though no gateways are in New Zealand. Accordingly, ITU WRC-19 Resolution 242 measures would be warranted in this band to ensure that such satellite systems are protected (see the response to Q31, above).

Despite the relatively sparse use of this band to date, future use of the band by Ka-band satellites in ITU Region 3 cannot be ruled out. Access to large amounts of the spectrum is a key element in reducing the overall costs of bandwidth in modern Ka-band HTS system designs (more spectrum can help reduce the cost-per-MHz on the satellite), avoiding multiplication of gateways, and facilitating frequency reuse on the spot beams.

If the RSM wishes to preserve some flexibility for the continued use of the 27.0 – 27.5 GHz by the FSS in New Zealand (*e.g.*, by IPStar or its replacement beyond 2022), it may wish to consider some kind of shared use mechanism in this band. Such shared use could be as simple as preserving the possibility of future FSS gateway access at an existing site (*e.g.*, Albany SES). Or the RSM could make the 27.0 – 27.5 GHz band available for FWA band and accommodate potential future FSS gateways with coordination zones or geographic separation between FWA sites and FSS gateways.

If FSS access is maintained only at existing FSS gateway sites (*e.g.*, Albany SES), then a PFD limit protection criterion could be used to define an area around that site within which IMT FWA base stations would have to tolerate any potential interference. If broader access is to be maintained for future FSS earth stations beyond the existing sites, then a system of geographic licensing would be needed to delineate the areas licensed for FWA and those still available for FSS gateway deployment. In this regard, RSM may wish to consider whether aspects of the sharing regime adopted by the Australian Communications and Media Authority ("ACMA") might be suitable in New Zealand. For example, the ACMA adopted a PFD limit of -91 dBW/m^2/MHz, measured at a height of 5m above ground level, for the protection of FWA from FSS earth stations.

Q33. Do you have any comments regarding the spectrum sharing approach proposed by RSM between FSS and IMT FWA in the 28 GHz band?

Under GSC's preferred "Option 3" (see the response to Q9, above), there would be no need for any sharing mechanism between FSS and IMT FWA in the 28 GHz band. As explained in the responses to Q8 through Q12, above, there is no basis for making spectrum available in the 28 GHz for IMT FWA, private IMT networks and/or indoor eMBB applications when there is ample spectrum in 26 GHz to support such applications. As explained in the response to Q33, even if New Zealand's three MNOs are assigned 800 MHz of 26 GHz spectrum each (the same amount as the MNOs in Finland and the Republic of Korea), there would still be 850 MHz of spectrum remaining for FWA and private/indoor IMT in the 26 GHz band. In contrast, there is ample evidence of extensive and rapidly growing use of the 28 GHz band for satellite services, including ESIMs.

If it turns out that there are indeed additional needs in the mmWave for IMT or for private networks in the future, New Zealand could look to the other large number of frequency bands identified by the WRC-19 for IMT, such as portions of the 37-43.5 GHz and 66-71 GHz bands.[17] Should the additional spectrum be necessary, RSM should consider licensing those bands first, instead of looking at bands, such as the 28 GHz, that are not identified for IMT and in heavy use by satellite operators.

As a result, the sharing approach proposed by the RSM between FSS and IMT FWA in the 28 GHz band is unnecessary. However, the sharing approach could be adapted for the 27.0 – 27.5 GHz band if the RSM decides that FWA and FSS are to share that band (see the response to Q32, above).

Q34. If RSM were to apply an EIRP limit on horizontal plane for FSS, what is the maximum EIRP value we should assume?

An EIRP limit on FSS transmissions in the horizontal plane would not be required if the GSC's preferred "Option 3" for the 28 GHz band is adopted. Under that option, as explained above, the 28 GHz band would not be shared between the FSS and any FWA or private/indoor IMT. In the absence of such shared use, a horizontal EIRP limit would serve no purpose.

It should be noted that FSS earth stations communicating with non-GEO Ka-band constellations may need to operate at low elevation angles, and they should not be constrained by a horizontal EIRP limit that is not necessary for the protection of other services.

Q35. Which option do you prefer for arranging the existing fixed service in the 26 GHz band?

The GSC expresses no view on Q35.

Q36. Do you think RSM should mandate the regulatory requirements as laid out in Resolution 169 (WRC-19) for ESIM use if a shared use between 27.5 – 28.35 GHz?

As explained in the responses to Q8 through Q12, above, there is no basis for shared use of the 27.5-28.35 GHz band. There is ample spectrum in the 26 GHz band to support the proposed FWA, private IMT networks and/or indoor eMBB applications. Even if New Zealand's three MNOs are assigned 800 MHz of 26 GHz spectrum each (the same amount as the MNOs in Finland and the Republic of Korea), there would still be 850 MHz of spectrum remaining for FWA and private/indoor IMT in the 26 GHz band. In contrast, there is ample evidence of extensive and rapidly growing use of the 28 GHz band for satellite services, including ESIMs.

Thus, under the GSC's preferred "Option 3" (see the response to Q9, above), there would be no sharing of spectrum in the 27.5 – 28.35 GHz between ESIMs on the one hand and private IMT or FWA on the other. As a result, the regulatory requirements in ITU WRC-19 Resolution 169 for aeronautical and maritime ESIMs that are only for rare cross-border situations, would not apply and would be redundant.

But if contrary to the GSC's submissions, the RSM were to adopt a shared spectrum regime in the 28 GHz band, the GSC prefers the approach of the European Conference of Postal and Telecommunications Administrations ("CEPT") to sharing between ESIMs and terrestrial services over

[17] ITU Press Release, *WRC-19 identifies additional frequency bands for 5G,* Nov. 22, 2019 ("While identifying the frequency bands 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2 and 66-71 GHz for the deployment of 5G networks, WRC-19 also took measures to ensure an appropriate protection of the Earth Exploration Satellite Services, including meteorological and other passive services in adjacent bands. In total, 17.25 GHz of spectrum has been identified for IMT by the Conference, in comparison with 1.9 GHz of bandwidth available before WRC-19. Out of this number, 14.75 GHz of spectrum has been harmonized worldwide, reaching 85% of global harmonization."), *at* https://news.itu.int/wrc-19-agrees-to-identify-new-frequency-bands-for-5g/.

the inapplicable approach in WRC-19 Resolution 169. The CEPT approach is established by two ECC Decisions: (a) ECC Decision (15)04 for ESIMs on non-GEO satellite networks; and (b) ECC Decision (13)01 for ESIMs on GEO satellite networks. These Decisions are the result of thorough studies and have ensured compatible operations in practice for many years in Europe. In contrast, the regulatory requirements in Resolution 169 were the result of compromise during the WRC-19, intended to address cross-border coordination only, and include some measures that unnecessarily restrict ESIMs and which are not necessary given New Zealand's geographic isolation. In this regard, New Zealand is free to adopt different domestic protection criteria as appropriate and applicable to the spectrum allocation within the country.

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Sincerely yours, on behalf of the GSC,

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