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By Email

Radio Spectrum Management Policy and Planning
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Confidentiality Statement: Starlink Internet Services Pte. Ltd. ("Starlink") claims the information in square brackets as non-public data for review of Radio Spectrum Management only. This information may represent business sensitive and confidential data, which would result in damages and harm to Starlink and its parent company, SpaceX, and its affiliated entities, if released.

RE: Allocation of 24-30 GHz Radio Spectrum

Starlink welcomes the opportunity to comment on the technical discussion document on preferred allocation approaches for the 24-30 GHz band in New Zealand, as published by Radio Spectrum Management (**Discussion Document**).

Below is a general overview of Starlink in New Zealand, together with Starlink's submissions in relation to the allocation of 24-30 GHz radio spectrum.

Background on Starlink

Starlink, operated by SpaceX, serves customers across New Zealand, with a strong focus on rural and remote areas lacking fibre connectivity (where reliable internet is essential for education, healthcare, and economic opportunities). In addition, today there are over 8 million customers on all seven continents using Starlink as a broadband connectivity solution for homes and offices, recreational vehicles, offshore and maritime vessels and private and commercial aircraft.

Starlink's investments in New Zealand are driving significant job creation and economic growth. We partner with nearly Commercial New Zealand suppliers across our supply chain, directly supporting high-skilled jobs in manufacturing, engineering, and technology sectors. Additionally, we have invested millions of dollars in New Zealand infrastructure, including satellite gateway earth stations and points of presence. These investments extend beyond infrastructure to deliver profound economic benefits by connecting the unconnected and expanding consumer choice, especially for rural users.

24-30 GHz spectrum is critical to Starlink's operations and growth. It provides Starlink with backhaul capacity at its earth stations, underpinning the speed and performance for New Zealand users as demand grows over time. Radiocommunications environments that maximise efficient, shared access to 24-30 GHz spectrum, consistent with global practice in other jurisdictions, is critical to ensuring that Starlink's users in New Zealand can enjoy the benefits of Starlink's cutting edge innovations.

While this submission is limited to the 24-30 GHz band, Starlink takes this opportunity to emphasise the opportunities available from the use of other bands as well – most urgently E band, and in future Q/V and W bands also. Several of our licensed gateways are equipped with ‘dual-band’ antennas capable of using Ka-band and E-band simultaneously, which means that these gateways are sitting ready and waiting to use E band spectrum as soon as it can be made available. Starlink strongly encourages RSM to consider ways in which E band spectrum can be used as soon as practical, including on an interim basis.

Submissions on the Allocation of 24-30 GHz Radio Spectrum

26 GHz Radio Spectrum (24.25-27.5 GHz)

Question 1: Starlink submits that the band range between 24.75 GHz to 25.25 GHz should be made available for fixed satellite service gateway uplink purposes, consistent with the approach adopted in the United States and Europe.

Allowing use of this relatively narrow bandwidth in connection with the supply of fixed satellite services will enable more efficient use of the spectrum and will assist satellite service providers such as Starlink meet growing demand for high-capacity, low-latency satellite services (which are particularly important in rural and remote areas of New Zealand, where traditional access technologies are not present or are less effective).

With appropriate use of technical and regulatory conditions, the risks of interference between fixed satellite services and the uses proposed by the RSM (mobile services, and EESS/SRS uses) can be minimised. Relevant technical conditions and interference minimisation have been specifically identified (and recommended) by the ITU¹ and in the European context², with measures including the use of unwanted emission limiters, coordination areas and procedures, technical planning and appropriate licence conditions. These practices have also been adopted by the FCC as a condition of use for fixed satellite services alongside mobile services within the proposed band.

While the August 2023 Cabinet paper recommended the 26 GHz range was primarily allocated for mobile use, this decision still specifically contemplated use of the 26 GHz range for satellite services under appropriate technical conditions.³ The proposed allowance for the 24.75-25.25 GHz band for use in connection with fixed satellite services is consistent with this Cabinet decision, as:

- if technical conditions are adopted consistent with ITU recommendations and international practice, there is minimal risk of harmful interference between fixed satellite services and the other proposed uses in the Discussion Document (mobile and EESS/SRS); and

¹ See Recommendation ITU-R M.2161-0 (12.2023): *Guidelines to assist administrations to mitigate in-band interference from fixed satellite service earth stations operating in the frequency bands 24.65 25.25 GHz, 27-27.5 GHz, 42.5 43.5 GHz and 47.2 48.2 GHz into IMT stations*, available here: <https://www.itu.int/rec/R-REC-M.2161/en>.

² See CEPT Report 68, *Harmonised technical conditions for the 24/25-27.5 GHz ('26 GHz') frequency band* (6 July 2018), available here: <https://docdb.cept.org/document/3358>.

³ See MBIE Cabinet Paper, *Use of the 24-30 GHz radio spectrum for satellite and mobile services* (4 September 2023), paragraphs 30-31, available here: <https://www.rsm.govt.nz/projects-and-auctions/current-projects/future-use-of-the-24-30-ghz-spectrum>.

- allowing this narrow 500 MHz band to be used by fixed satellite services, under appropriate technical conditions, would allow the spectrum to be used to its full capacity.

Lower 28 GHz Radio Spectrum (27.5-28.35 GHz)

Question 19: Starlink supports continued existing uses, and new uses, of fixed satellite services within the Lower 28 GHz band and is very supportive of RSM's recognition of the growing demand for NGSO gateways and user terminals. This is aligned with ITU recommendations and international practice.

Question 20: Starlink is generally supportive of allowing continued and new use of fixed satellite services within the Lower 28 GHz band. We make the following submissions about the proposed conditions for sharing arrangements for NGSO gateways (as detailed under section 2.2.1 at page 29 of the Discussion Document):

- *Considering the above ground level height difference between the FSS GSO or NGSO gateway and the mobile BS, the minimum elevation angle of the GSO or NGSO FSS gateway is 20° above the horizon.*

Starlink submits that there is no need to set any minimum elevation angle for gateway antennas, as the primary safeguard against mobile/fixed service interference is e.i.r.p. density limits. If appropriate e.i.r.p. density limits are enforced, then the risk of harmful interference with terrestrial services is already effectively managed; in this context, imposing an additional elevation angle requirement would impose an unnecessary constraint on satellite operations.

If an operator is able to meet the e.i.r.p. density limits with lower elevation angles, then removing the minimum elevation angle offers multiple benefits, including:

- increasing the number of satellites that can be accessed from a given gateway site, improving service quality, continuity and flexibility (particularly during adverse weather events), to the direct benefit of end users; and
 - reducing infrastructure costs, as operators can use existing gateway site antenna configurations more efficiently and without the need for adjustments or unnecessary duplication.
- *The maximum e.i.r.p. density of the GSO or NGSO gateway site towards the horizon is ≤ -15 dBW/MHz within the frequency range 27.5-28.35 GHz.*

While a maximum e.i.r.p. density of -15dBW/MHz value is practically achievable, a limit of -12 dBW/MHz would provide a more suitable balance between protecting other co-channel services and supporting the operational needs of modern and future NGSO gateway sites.

Modern satellite gateways employ narrow beam, steerable antennas. Where necessary, operators can also implement mitigation techniques such as site shielding which can be shown to attenuate emissions towards the horizon by at least 15 dB, and often more. These methods significantly reduce the risk of harmful interference to terrestrial services, even at higher e.i.r.p. densities.

Starlink submits that the RSM should adopt a maximum e.i.r.p. density of ≤ -12 dBW/MHz. This would provide appropriate protection for mobile network operators, whilst also allowing satellite service providers to maximise the use of the band, consistent with the public interest in efficient spectrum use.

- *The maximum e.i.r.p. density of the GSO or NGSO gateway site towards the horizon is ≤ -35 dBW/MHz within the 24.25-27.5 GHz (adjacent) frequency band.*

Consistent with our position on the co-channel maximum e.i.r.p. density limits, Starlink suggests that the maximum e.i.r.p. value towards the horizon into adjacent channels should be slightly less stringent, with a value of ≤ -32 dBW/MHz. This value would likewise align with the considerations outlined above for co-channel and better accommodates multi-antenna gateway configurations and interference mitigation practices.

Question 22: Starlink agrees with the position set out in the Discussion Document in respect of the spectrum requirements for enabling different NGSO services and applications, and emphasises that coordination within these bands is appropriately left to the satellite operators.

Questions 26 to 31: Starlink does not support Option 1. A pure geographical split in the possible operational areas of fixed satellite services and mobile services is unnecessary and impractical. Adopting Option 2 would provide appropriate protections for the prioritised service in each area whilst ensuring flexibility for mobile and satellite network operators and, ultimately, their end users. In particular, as foreshadowed in question 28, this would avoid the need for prohibitions on L-ESIMs and potentially other transformative future technologies.

Questions 32 to 34: Starlink supports the RSM's Option 2 proposal for sharing arrangements across the Lower 28 GHz band between fixed satellite services and mobile services in different geographic areas. Starlink is generally supportive of the priority arrangement across geographies described in the Discussion Document under Parts A and B; namely that:

- Part A: inside major, large, medium, small urban areas and high urban accessibility areas, fixed satellite services and mobile services will have equal priority; and
- Part B: inside medium and low urban accessibility areas, as well as remote and very remote areas, fixed satellite services will have priority (primary status) over mobile services (secondary status).

This option reflects the critical role that satellite services now play even in more urban areas and the importance of supporting the ongoing use and growth of those services.

Questions 35 to 36: Starlink suggests that the RSM should take a light touch approach to licencing conditions for operators sharing the Lower 28 GHz band. Conditions should focus on essential technical safeguards that are necessary to give effect to the proposed sharing arrangements under Option 2, rather than prescriptive operational restrictions.

Acknowledging the potential for harmful interruption across the fixed satellite services and mobile services sharing the Lower 28 GHz band – particularly in the circumstances described under Option 2 Part A, whereby fixed satellite services and mobile services have equal priority/status in certain

geographical areas – Starlink submits that licence conditions should go no further than such conditions:

- as agreed in mutually documented coordination agreements between fixed satellite service operators and mobile operators; and
- which are otherwise necessary to adequately mitigate harmful interference between these services when they operate in shared environments (including technical coordination measures and e.i.r.p. / power density limits).

Questions 37 to 39: Consistent with Starlink’s submissions in response to Questions 35 to 36 above, Starlink respectfully disagrees with the RSM’s proposed approach to setting technical limits for the use of ESIMs across the Lower 28 GHz band. Starlink submits that, so long as those ESIMs can operate without causing harmful interference, ESIMs (of all types) should generally be permitted to operate across the Lower 28 GHz band.

Overly restrictive technical limits can prevent ESIMs from delivering high quality and capacity broadband services in what are otherwise challenging environments (e.g., geographically remote areas at sea or in-flight). Further, many modern ESIMs utilise advanced technologies allowing them to dynamically monitor and adjust their transmissions to avoid interference with mobile services (including dynamic beam steering, adaptive power controls and real-time monitoring).

Starlink submits that the RSM should reconsider its position on the permitted use of ESIMs (including those limitations discussed under section 2.4.3 of the Discussion Paper) in the Lower 28 GHz band, on the basis that such services represent a low interference risk (whilst also offering beneficial services to the New Zealand public) when appropriate technical conditions are observed.

Additional Comments: Starlink supports the understanding of the RSM in respect of section 2.5.1 (pricing) of the Discussion Document, including that demand for the Lower 28 GHz band is unlikely to exceed supply and thereby an auction process is inappropriate as an allocation mechanism.

Upper 28 GHz Radio Spectrum (28.35-29.5 GHz)

Questions 40 to 43: Similar to our response to Question 20 (and minimum elevation angles of NGSO gateway antennas), Starlink considers that a minimum elevation angle for L-ESIMs of 30° above the horizon (as described at section 3.4 of the Discussion Document) is not necessary, so long as appropriate e.i.r.p. limits are in place as the primary safeguard against interference with terrestrial services.

If appropriate e.i.r.p. technical conditions are imposed and enforced, then the benefit of a minimum elevation angle requirement becomes much more marginal, especially with modern L-ESIM antennas with well controlled beam patterns and sidelobes (which minimise unintended emissions towards the horizon).

Removing these minimum elevation angles and instead relying on appropriate e.i.r.p limits allows greater flexibility and efficiency for L-ESIMs without creating unreasonable risk of interference to other services.

Questions 44 to 46: Starlink does not support the proposed approach in respect of requiring individual satellite licences in respect of each Territorial Local Authority (**TLA**) for NGSO fixed user terminals and ESIMs (as set out in sections 3.5.2, 3.5.3 and 3.6 of the Discussion Document).

The RSM should retain the 'general user radio licence' (**GURL**) model for fixed user terminals, VSATs, and ESIMs in the Upper 28 GHz band and the 29.5-30 GHz band.

The GURL model is a time-tested and effective way to enable widespread and low cost deployment of satellite user infrastructure, consistent with light-touch regulatory policy successfully adopted in New Zealand telecommunications regulation. The GURL model allows mandatory equipment technical conditions to ensure there are protections against harmful interference and to maximise efficient spectrum use, whilst avoiding the need for excess licensing and administration activities for ubiquitous, low power and high quantity consumer-level satellite user terminal equipment and ESIMs.

Departing from this approach and instead requiring individual licensing (even at the geographic level across each TLA) would significantly increase the administrative licensing burden on operators, and would serve as a real barrier to the deployment of relevant user equipment, potentially slowing the roll-out of communications products and services to the New Zealand market.

Question 47: Starlink broadly agrees with the proposed approach in respect of the 17.7 GHz to 20.2 GHz range.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Wisaam', with a long, sweeping horizontal line extending to the right.

Wisaam Farhat