COMMENTS OF TELESAT

In response to the Consultation:

Implementation of the Spectrum Pricing Review – Consultation 07/2020

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Introduction

Telesat is grateful for the opportunity to provide its comments on the Consultation *Implementation of the Spectrum Pricing Review* and appreciates the ACMA's forward-thinking attitude towards reassessing the taxation framework and keeping pace with technological development. Telesat position is generally aligned with the Communication Alliance Satellite Services Working Group (SSWG) and this submission focusses on aspects specific to the Telesat LEO system in Ka-band, and in particular, spectrum pricing for:

- antenna farms comprising multiple and identical full motion antennas on the same site using the same spectrum; and
- fixed/ubiquitous and mobile user terminals and the associated space station apparatus license.

1. Telesat LEO

Telesat https://www.telesat.com/ is launching Telesat LEO, a revolutionary satellite constellation of highly advanced satellites in low-earth-orbit (~1,000 km from earth; ~35 times closer than traditional satellites) https://www.telesat.com/services/leo/why-leo. The global network will deliver fiber quality throughput (Gbps links; low latency) anywhere on earth. This is also a future-proof solution for backhaul cellular/5G traffic and will provide high-speed broadband access to rural and remote communities, planes, ships, enterprise and government users. Furthermore, as a highly advanced and efficient system with unparalleled economies of scale (multiple Tbps of usable capacity with global coverage), Telesat LEO will deliver to target markets at significantly lower cost vs traditional alternatives.

The frequency bands of the Telesat LEO Constellation include the 17.8 – 18.6 GHz and 18.8 – 20.2 GHz bands in the space-to-Earth direction, and the 27.5 – 29.1 GHz and 29.5 – 30.0 GHz bands in the Earth-to-space direction.

Telesat LEO is a highly flexible system that will dynamically allocate capacity based on demand, thus maximizing system efficiency. Each satellite in the constellation will be designed for maximum flexibility in terms of coverage, by means of steerable beams and inter-satellite links, and in terms of bandwidth and power assignment, by means of onboard processing.

Specifically:

- Direct Radiating Array – Will provide independent agile beams, each with steering and forming capabilities, allowing beams to be generated where and when required based on traffic demand;

- On-board Processing – Will perform signal regeneration (i.e., demodulation and re-modulation), routing of traffic;

- Optical Inter-Satellite Links (ISL) – Multiple ISL beams on each satellite will connect to other satellites in the Telesat LEO Constellation enabling a highly resilient mesh network.

Satellite user beams will be formed using active array antennas with state-of-the-art beam-forming capability. Each Telesat LEO satellite will have multiple independently steerable beams that allow between 8 and 15-times frequency reuse. In order to serve user terminals, which may be randomly scattered across the entire field of view of the satellite, each satellite beam may hop more than 20 different beam locations at a rate fast enough that all user terminals share full access to the satellite. Beam hopping is a powerful capability that will allow the Telesat LEO Network to efficiently serve both highly distributed and highly concentrated demand.

For maximum flexibility, each beam can be assigned variable spectrum and power, in order to adjust for the local demand and spectrum regulatory constraints.

A wide variety of user terminals will access the Telesat LEO Constellation, both electronically steered antennas terminals and mechanically tracking reflector antenna terminals.

Feeder link connectivity to all satellites will be ensured via *Landing Stations* consisting of sites with 8 to 15 full motion ~4 meter antennas to access the satellites in that Landing Station's field of view. Approximately fifty Landing Stations are planned to be deployed around the world, at least two of which in Australia.

Minimum discrimination angles between GSO satellites and Telesat's NGSO satellites have been calculated based on limits defined by the ITU, where applicable. These will be adjusted based on coordination agreements, as required. Steerable beams on each Telesat NGSO satellite allow handover to an adjacent satellite before the minimum discrimination angle is reached. Interference management will be carried out through the operation of Telesat's Radio Resource Management

system, which will manage the overall radio resource allocation of the entire constellation and ensure proper handling of in-line events.

2. Reply to the issues for comment

Focus area 1 – Question 6 and 7

Novel satellite systems like Telesat LEO will provide an unprecedented amount of capacity, at low latency with a subsequent drastic reduction of cost for the user (order of magnitude) as compared to existing marketplace offerings. This reduction should also be reflected on the cost of spectrum for such service provision. An emergency such as COVID-19 has further highlighted the enormous importance of societal global connectivity, which is not a luxury, but a necessity. Only high throughput satellites will be able to provide global affordable broadband connectivity in remote/rural areas.

Telesat appreciates ACMA's reference to two key issues: large bandwidths and multiple networked devices requirements, with the recognition that these aspects were not a consideration when the tax formula was originally developed.

In particular, the specific example referring to antenna farms operating in the same frequency range is entirely applicable to Telesat LEO. As already mentioned in the text of the consultation, while each antenna will be tracking a different satellite at any one time, the overall range of antenna pointing angles and operating frequency range will be within the same envelope. In other words, additional antennas do not significantly add to the spectrum denial of a single one.

As such, Telesat suggests that, in such cases, a single apparatus licence would apply for multiple identical antennas on one site, operating within the same satellite system and the same frequency range. The principle of "*Reductions in taxes when there are co-located and co-frequency earth/earth receive stations*" is already included in the current "*Apparatus Licence Fee Schedule*" https://www.acma.gov.au/fees-apparatus-licences.

Telesat respectfully suggests that for identical earth stations using the same spectrum and operating within the same satellite system, the amount of tax for earth stations in addition to the first one is zero, based on negligible additional spectrum denial**.**

Furthermore, always in relation to earth stations, Telesat also suggests some reduction in apparatus license fees for high and medium density areas (factor of around 5 and 3 respectively). While the desire to incentivise deployment of gateway earth stations in less inhabited areas is understandable, the proximity to fibre head ends is an essential requirement.

These general principles are already being adopted by other regulators. In relation to this and, more in general, spectrum fees in Ka-band, Telesat will be pleased to share the information it has been gathering in other countries/regions, should the ACMA be interested.

Focus area 2 – Question 8

Telesat commends the ACMA's previous initiative for the taxation in the frequency bands 18.2-18.8 GHz and 19.3-19.7 GHz, where FSS user terminals receive on a non-protection basis.

Focus area 4 – Question 10-14

Telesat's comment is in relation to the apparatus licence taxation for space transmit/space receive, combined with the class license for user terminals.

While the overall licensing framework is clear and very well documented, allowing the general possibility for a "blanket license", Telesat is of the opinion that its application to a satellite system like Telesat LEO would result in disproportionately high fees, also in terms of international comparison, becoming a barrier to entry and potentially rendering the project financially non-viable. A system like Telesat LEO, in order to reach its full potential, will need flexible access over the entire territory of Australia to the following amounts of spectrum:

- 2.1 GHz in the Earth-to-space direction (27.5 – 29.1 GHz and 29.5 – 30.0 GHz). While 27.5-28.1 GHz may not be used in large population centres for all types of user terminals, aeronautical terminals, for instance, may be still able to operate, while ensuring compliance with adequate sharing criteria; and

- 2.2 GHz on the space-to-Earth direction (17.8 – 18.6 GHz, 18.8 – 20.2 GHz) with 18.2-18.6 and 19.3-19.7 GHz at essentially no extra charge. In essence, 1.4GHz at "regular" apparatus license fees.

Using the current apparatus Australia-wide licence fees, this leads to an annual figure of $2,593,150, which would clearly have a major impact on the Telesat LEO business case for Australia. Australia-wide fees may have been envisaged for satellites with large fixed beams, using smaller amounts of spectrum for 100% of the time over the entire territory, which is a very different situation from a system like Telesat LEO.

Also, the taxation division in density areas, while applicable to satellite systems with fixed beams and to satellite earth stations, bears hardly any relevance for a system like Telesat LEO.

As explained in Sec. 1, the entirely flexible way of operation, in terms of beam forming, beam pointing and variable spectrum allocation to each beam, coupled with the beam hopping capability, is such that the "old" concepts of a fixed mesh of beams with a fixed channel allocation covering different density areas is no longer applicable. Spectrum use varies continuously in time and space and, once again, in order not to artificially limit the system capability, flexible/dynamic access to the entire usable spectrum is needed over the entire territory.

While some sort of spectrum "average use calculation" could be envisaged at the end of each year, taking into account how much spectrum has been used, where and for how long, this would be a very complex, non-transparent method which would also assume the system capability of storing all the relevant information.

A significantly lower Australia-wide tax is a simple, transparent and straightforward solution, entirely appropriate and justifiable for satellite systems that have the capability of using portions of spectrum flexibly, in time and space.

Furthermore, spectrum in Ka-band can be shared by multiple GSO and NGSO systems and, rather than the tens of MHz used by systems operating in frequency bands below5 GHz, Ka-band systems will operate in thousands of MHz of spectrum.

Based on all of the above, Telesat suggests a reduction of the Australia-wide tax fee in the 17.3–31.3 GHz range of at least an order of magnitude, with respect to the current one. Telesat recommends a fee for the Australia-wide tax of approximately $0.05 per kHz.

Focus area 6 – Transparency and ease of calculating taxes

Telesat commends the ACMA for the transparency and clarity in the information provided to stakeholders in relation to taxation. At the same time, it is essential that the resulting fees do not artificially impair entry to the market and the deployment of beneficial and competitive services.

3. Conclusions and overall recommendations in relation to spectrum pricing review

Telesat recommendations concerning NGSO systems in Ka-band are based on principles of simplicity, transparency and financial viability and reflect the technological advances/characteristics of the system.

Gateway earth stations

1) A single apparatus licence fee for NGSO antenna farms comprising multiple identical earth stations operating with the same spectrum within the same satellite system (i.e. no additional fees for earth stations in addition to the fist one on the same site); and

2) a reasonable reduction for high and medium density areas (at least a factor of 5 and 3 respectively) to allow proximity to fibre when logistically required.

Space Stations/User terminals

3) A reduction of at least an order of magnitude of the annual Australia-wide license tax in 17.3–31.3GHz, due to a) the sharing capability of satellite systems/networks in this band, b) the large amount of spectrum (typically more than 4GHz) needed, c) the flexible/dynamic manner (in amount, time and space) in which spectrum can be used, d) the reduced availability of the 27.5-28.1GHz.

   Overall, Telesat recommends a fee for the Australia-wide tax of $0.05 per kHz.

To conclude, Telesat most welcomes this opportunity to provide comments on this very important matter. We remain available for possible additional clarifications and look forward to continuing the discussion and collaboration.