



**COMMENTS OF TELESAT CANADA**

**In response to:**

*Canada Gazette, Part I, June 16, 2018, Addendum to the Consultation on Releasing Millimetre Wave Spectrum to Support 5G, SLPB-005-18*

**TELESAT CANADA**

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## COMMENTS OF TELESAT CANADA

1 Telesat appreciates the opportunity to provide these comments in response to the *Addendum to the Consultation on Releasing Millimetre Wave Spectrum to Support 5G*, SPLB-005-18 (Addendum)<sup>1</sup> issued by Innovation, Science and Economic Development Canada (ISED).

### I. INTRODUCTION

2 In SLPB-001-17, *Consultation on Releasing Millimetre Wave Spectrum to Support 5G* (mmWave Consultation), ISED sought comments on, amongst other things, its proposal to develop a flexible use licensing model for fixed and mobile services in the 27.5-28.25 GHz band (28 GHz band). By way of the Addendum, ISED seeks comments on flexible use licensing of fixed and mobile services in the 26.5-27.5 GHz band (26 GHz band) as well.

3 In its comments and reply comments in the mmWave Consultation, Telesat did not oppose ISED's proposal to introduce flexible use licensing in the 28 GHz band, provided adequate measures are taken to enable reasonable siting of earth stations and protection of satellite receivers from harmful interference. The principles identified in Telesat's previous submissions on the mmWave Consultation are applicable to the 26 GHz band. Accordingly, Telesat's comments and reply comments in response to the mmWave Consultation apply, *mutatis mutandis*, to the Addendum.

4 It is important to recall that the mobile industry is in the early stages of exploring services and business models to exploit millimeter wave technologies, whereas Ka-band satellite technologies have already been deployed for a number of years providing innovative and high-

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<sup>1</sup> Published in the *Canada Gazette*, Part I, June 16, 2018 [Addendum].

capacity broadband services across Canada. Telesat and other operators are also deploying and planning highly innovative and sophisticated non-geostationary and geostationary satellite networks that rely on access to Ka-band spectrum for both gateway earth stations and end user terminals. This satellite infrastructure is poised to play a critical role in the 5G “network of networks”.

5 As in the case of the 28 GHz band, co-existence of flexible mobile and terrestrial and satellite feeder links in the expanded 26.5-28.35 GHz band should be possible. However, the applicable sharing principles and methodologies need to be carefully considered. Otherwise, there is a significant risk that rules designed primarily around terrestrial applications could severely handicap (or, in the worst case, prevent) the development of innovative satellite infrastructure.

6 Telesat therefore recommends that:

- already-licensed earth stations and those for which applications were received prior to the release of the mmWave Consultation should be grandfathered, and not subject to any additional constraints due to the deployment of terrestrial flexible use stations in the 26.5-28.35 GHz band;
- future earth stations in these bands should continue to be individually licensed on a case-by-case basis, considering their unique circumstances and characteristics;

- once the Department determines that a proposed earth station is compliant with the policy and grants a licence for it, that station should not be subject to any additional constraints as a result of future deployment of terrestrial flexible use stations; and
- the Department should continue to study the requirement to impose limits on skyward transmissions from terrestrial base stations in the 26.5-28.35 GHz band to prevent harmful aggregate interference into satellite receivers.

7 The mmWave Consultation and Addendum refer to potential triggers for coordination between terrestrial stations and earth stations and the possibility of geographic restrictions on the location of earth stations. Trigger mechanisms and guidelines will be helpful in determining when coordination will be required, but the associated threshold values and other conditions require careful technical study. As each earth station will have different characteristics and therefore a different ability to cause interference to flexible use terrestrial stations, site-by-site coordination is required, rather than universally applied rules. Furthermore, while siting restrictions may be necessary, careful study is required to ensure that of any such restrictions are properly defined. Unnecessary barriers to the deployment of earth stations will jeopardize the extension of innovative new communications services to Canadians.

## **II. DETAILED COMMENTS**

8 Telesat's responses to a number of specific issues raised in the Addendum are set out below. For convenience, the questions identified in the Addendum are highlighted in grey, with Telesat's comments on each issue following.

## A. BACKGROUND AND CONTEXT

Question A1: ISED is seeking comment on the development of a flexible use licensing model for fixed and mobile services in the 26 GHz band (in addition to the bands currently under consultation through the mmWave Consultation), taking into account the timing of WRC-19, 5G technology standards development, international ecosystems and harmonization of spectrum use with other countries.

9 Telesat does not oppose the proposed introduction of flexible licensing in the 26 GHz band, provided that adequate measures are taken to enable reasonable siting of Earth exploration-satellite service (EESS) and fixed-satellite service (FSS) earth stations in the 26 GHz band, as well as operation of licensed FSS earth stations and protection of satellite receivers in the adjacent 27.0-28.35 GHz band. As ISED is aware, Telesat already has four licensed feeder link earth stations in the 28 GHz band, and Telesat's planned GSO and NGSO satellites will require additional gateway earth stations in this band. As also noted in the Addendum, Telesat is licensed to use the 26 GHz band for the operation of its Polarsat satellite.

## B. CHANGES TO SPECTRUM UTILIZATION POLICIES

Question A2: ISED is seeking comments on the changes proposed above to introduce flexible use licensing in the 26 GHz band, including the ensuing changes to the CTFA Canadian footnotes and the policy on this band contained in SP 3-30 GHz, *Revisions to Spectrum Utilization Policies in the 3-30 GHz Frequency Range and Further Consultation*.

10 Telesat continues to support modification of footnote C47C to reflect a need for individual licensing of FSS earth stations in the 27-28.35 GHz band, with due consideration of their unique circumstances and technical characteristics. In addition, the phrase "large antennas", which appears in MOD C47A, is imprecise and needs review.<sup>2</sup>

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<sup>2</sup> ITU practice typically refers to the ratio of antenna diameter to wavelength when characterising antenna size; one relevant size threshold would be 100 wavelengths that, at 30 GHz, would correspond to about 1 m. See, for example Rec. ITU -R F.1245 2, drawing the distinction in paras 2.1 ( $D/\lambda > 100$ ) and 2.2 ( $D/\lambda \leq 100$ ). To similar effect, see

### C. COEXISTENCE IN THE 26.5-27.0 GHz BAND

Question A6:

A. ISED is seeking comments on the proposal to require site-by-site coordination between proposed flexible use terrestrial stations and EESS/SRS earth stations in the 26.5-27.0 GHz band when a pre-determined trigger threshold is exceeded.

B. If the proposed site-by-site coordination is supported, what coordination trigger and value would be the most appropriate (e.g. power flux density or distance threshold)?

C. ISED is also inviting proposals for specific additional technical rules for flexible use terrestrial stations and EESS/SRS earth stations (e.g. site shielding) that could facilitate more efficient sharing between terrestrial and earth stations.

11 Telesat supports a policy that requires coordination of individual earth stations in the 26.5 - 27 GHz band. Once an earth station has been licensed, the first-come-first-served principle should apply.

12 A trigger mechanism for coordination may be useful to avoid needless calculations, provided that the relevant framework acknowledges that coordination is, ultimately, a site-specific problem. Further study is required to establish an appropriate trigger.

13 Site shielding may be a useful means of enabling coordination in some cases. However, it will not be the only way to achieve coordination. Where lower cost measures are equally effective, it would be counter-productive to require shielding. Accordingly, mandated use of site shielding is not appropriate.

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also Rec. ITU-R S.465-6, Note 4. Other threshold sizes apply for other purposes. For example, Rec. ITU-R S.580-6, considering emission limits for GSO earth station antenna side lobes, applies where  $D/\lambda > 50$ .

Question A7:

A. ISED is seeking comments on whether there should be restrictions on the geographic areas in which new EESS and SRS earth stations can be deployed in the 26.5-27.0 GHz band.

B. If geographic restrictions on EESS and SRS earth stations are proposed, ISED is inviting detailed proposals on how they could be implemented, and what areas should be targeted.

14 Some geographic restrictions on earth stations may be appropriate, but technical study is necessary before the specific parameters of such restrictions could be properly defined and applied.

**D. COEXISTENCE IN THE 27.0-28.35 GHz BAND**

Question A8:

A. ISED is seeking comments on the proposal to require site-by-site coordination between proposed flexible use terrestrial stations and FSS earth stations in the frequency band 27.0-28.35 GHz band when a pre-determined trigger threshold is exceeded.

B. If the proposed site-by-site coordination is supported, what coordination trigger and value would be the most appropriate (e.g. power flux density or distance threshold)?

C. ISED is also inviting proposals for specific technical rules on flexible use terrestrial stations and FSS earth stations (e.g. site shielding) that could facilitate more efficient sharing between terrestrial and earth stations.

15 Telesat supports coordination of individual earth stations in the 27.0-28.35 GHz band. Specifically, new FSS earth stations would coordinate with flexible use terrestrial stations that, as of the application date for the earth station, i) have been previously licensed by the Department; ii) are the subject of a pending licensing application to the Department; iii) are required to be installed due to a build-out requirement imposed pursuant to a licence previously issued by the Department.

16 Once licensed, the first-come-first-served principle should apply and the earth station should be protected against subsequently licensed facilities using the 27.0-28.35 GHz band

and/or the adjacent 26.5-27.0 GHz band. Operators should not face an indefinite prospect that they may have to change the technical characteristics of a licensed earth station in order to accommodate new terrestrial flexible use.

17 As Telesat has previously stated, adoption of a trigger mechanism would be useful to avoid needless calculations. Site shielding may be an appropriate mechanism to facilitate coordination in some cases, but will not always be the best option and should not be mandated.

18 The determination of an appropriate trigger value and specific technical rules is a complex matter. Telesat continues to support a technical study, initiated and led by the Department, of these issues.

Question A9:

A. ISED is seeking comments on whether there should be restrictions on the geographic areas in which new FSS earth stations can be deployed in the frequency band 27.0-28.35 GHz.

B. If geographic restrictions on FSS earth stations are proposed, ISED is inviting detailed proposals on how they could be implemented, and what areas should be targeted?

19 While Telesat recognizes that some geographic restrictions may be necessary, any such restrictions must be based on robust technical analysis that reflects Canadian geography and demographics. There are already practical restrictions on where a gateway earth station can be located, including the requirements for access to fibre optic links, reliable power and staff. Overly restrictive siting limitations will drive up the costs of new satellite networks or, in the worst case, deny FSS use of the band. In either case, there would be a direct negative impact on the delivery of innovative satellite services to Canadians, including those that are un-served and under-served by terrestrial networks.

20 As Telesat, the Radio Advisory Board of Canada and a number of other parties stated in response to the mmWave Consultation, a technical study is required before the specific parameters of any earth station siting restrictions could be properly defined and applied. This study should be initiated and led by ISED.

Question A10:

A. ISED is seeking comments on whether it should impose any limits on the aggregate emissions of the terrestrial services in the 27.0-28.35 GHz band to ensure coexistence with FSS space stations.

B. If limits are imposed, ISED is inviting detailed proposals on why they could be implemented, and what the limits should be.

21 While Telesat's primary concern remains to ensure that the 27.0-28.35 GHz band is available for use for FSS feeder links, it will also be important to avoid interference with satellite receivers operating in the adjacent 28.35-28.6 GHz band. In the absence of constraints on terrestrial transmitters (especially base stations), there is a risk that aggregate interference at the satellite receiver could seriously impair these uses.

22 Since submission of comments on the mmWave Consultation, Telesat has conducted a preliminary study of the potential for terrestrial stations operating in the 27.0-27.5 GHz band to cause harmful aggregate interference into satellite receivers. The study showed that using the base station EIRP density of 48.1 dBm/200 MHz as provided by ITU WP5D to TG 5/1, harmful

aggregate interference is not likely. However, when power levels are increased to 66.1 dBm/200 MHz or more, aggregate interference into satellite receivers exceeds the 6%  $\Delta T/T$  threshold.<sup>3</sup>

23 The Telesat study is being refined to address longer-term statistics. This will provide a basis for identifying specific parameters required to address aggregate interference into satellite receivers. Ultimately, it may be appropriate to impose an EIRP density mask as a function of elevation angle for all terrestrial base stations. Given that the characteristics of terrestrial 5G transmitters (e.g. narrow beam antennas, indoor use) will tend to limit naturally skyward transmissions, an appropriately defined mask should pose minimal constraints on terrestrial flexible use of the band.

#### **E. LICENSING CONSIDERATIONS**

Question A11:

A. Further to section 9 of the mmWave Consultation, are there any new considerations or suggested approaches regarding the licensing of flexible use mmWave spectrum, given the addition of the 26 GHz band?

B. ISED is also seeking comments on licensing considerations in the 26 GHz and 28 GHz bands that would encourage innovative use cases while also supporting competition for existing mobile network services.

24 Telesat continues to be of the view that given shared use and the corresponding need for coordination, use of the 26 and 28 GHz bands should be licensed. In addition, licensing of terrestrial use should not conflict with siting of individually licensed earth stations, as discussed in previous responses. Accordingly, any area licence should be subject to coordination

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<sup>3</sup> The FCC adopted a base station power limit of 75 dBm/100 MHz EIRP (*Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, et al.*, Report and Order and Further Notice of Proposed Rule Making, 31 FCC Rcd 8014 (2016) para. 277.) At this power limit, harmful aggregate interference into satellite receivers will occur.

requirements based on a first-come, first-served principle, as described above in response to Questions A6 and A8.

### **III. CONCLUSION**

25 In view of the foregoing, Telesat submits that the Department should:

1. permit only licensed terrestrial use of the 26 and 28 GHz bands;
2. license future earth stations on a case-by-case basis in these bands, considering their unique circumstances and characteristics;
3. not mandate site shielding for all earth stations, when other coordination measures may be less restrictive and more effective;
4. require coordination of new earth stations with flexible use terrestrial stations only where the terrestrial station has been previously licensed, an application has previously been made to the Department to licence the terrestrial stations or where they must be built because of a terrestrial build-out requirement established pursuant to a licence previously issued by the Department;
5. ensure that newly licensed earth stations which have completed such coordination will not thereafter be subject to any additional constraints as a result of future deployment of terrestrial flexible use stations in the vicinity; and
6. initiate and lead a technical study (or studies) to determine:
  - a. appropriate trigger mechanisms for coordination in the 26 and 28 GHz bands, to facilitate the determination of compatibility between earth stations and terrestrial 5G without performing unnecessary calculations;

- b. appropriate restrictions on the geographic areas in which an earth station that transmits in the 26 or 28 GHz band may be located, taking into account Canadian geography, demographics and telecommunications needs;
- c. appropriate limits on skyward transmissions from terrestrial base stations in the 26 and 28 GHz bands to prevent excessive interference into satellite receivers resulting from aggregate terrestrial emissions.

All of which is respectfully submitted on behalf of TELESAT CANADA

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