Innovation, Science and Economic Development Canada
Innovation, Sciences et Développement économique Canada

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Spectrum Management and Telecommunications

Addendum to the Consultation on Releasing Millimetre Wave Spectrum to Support 5G

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Canada

Contents

1. Intent

1. This document is an addendum to SLPB-001-17, *Consultation on Releasing Millimetre Wave Spectrum to Support 5G* (mmWave Consultation), published in June 2017. Through the release of this document, Innovation, Science and Economic Development Canada (ISED) is initiating a consultation on releasing millimetre wave (mmWave) spectrum in the 26.5–27.5 GHz band (26 GHz band) in addition to the bands identified in the initial mmWave Consultation. This additional 1 GHz of spectrum in the 26 GHz band could result in a total of 11.85 GHz of mmWave spectrum being released to support the deployment of advanced communication systems, such as 5th generation (5G) wireless networks and systems. Comments are being sought on all aspects related to the release of this additional spectrum. After this addendum consultation is completed and decisions are made, ISED will consult further on a technical, policy and licensing framework for the 26 GHz band.

2. Background and context

2. Stakeholder comments received in response to the mmWave Consultation for the 27.5–28.35 GHz, 37–40 GHz and 64–71 GHz frequency bands were generally supportive of ISED's proposed approach, with some stakeholders further suggesting that ISED should consider releasing additional frequency bands above 24 GHz.

3. Since the publication of the mmWave Consultation, there has been growing international momentum in the development of a 5G equipment ecosystem in the 24.25–29.5 GHz frequency range. Within this frequency range, the 26 GHz band is on the agenda for the World Radiocommunication Conference 2019 (WRC-19), which will consider identifying frequency bands for the future deployment of mobile broadband services. ISED notes that preliminary international studies suggest that sharing among mobile broadband services and satellite services in the 26 GHz band may be feasible.

4. The international industry standards group 3rd Generation Partnership Project (3GPP) supports two band classes for the 26 GHz band, which has been identified as a pioneer band for 5G services by the European Union. Other nations such as China, Japan and Korea have also shown significant interest in releasing this band, noting that various pilot projects have already taken place or are currently underway. Deployment of 5G commercial networks and systems in some mmWave bands is expected to begin in 2019. ISED believes that there are opportunities for Canada to take advantage of this emerging international ecosystem.

5. ISED has considered the possibility of also opening other portions of the 24.25–29.5 GHz frequency range for flexible use (for mobile and fixed services); however, current international compatibility studies between different radiocommunication systems are not as mature as in the 26 GHz band. In addition, portions of the 24.25–26.5 GHz frequency range are currently licensed to terrestrial services in Canada. ISED is currently reviewing the potential to release additional spectrum through SLPB-006-17, *Consultation on the Spectrum Outlook 2018 to 2022* (Spectrum Outlook Consultation).

6. Combined with the 28 GHz band already under consultation, the proposed release of the 26 GHz band for flexible use would provide Canadians with access to 1.85 GHz of contiguous spectrum to support the deployment of 5G networks and systems. Through this addendum consultation, ISED is seeking stakeholder feedback on releasing additional spectrum in the 26 GHz band for flexible use to

support 5G networks and systems, in addition to the frequency bands currently under consultation through the mmWave Consultation.

Question A1: ISED is seeking comments 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.

3. 26 GHz frequency band (26.5–27.5 GHz)

3.1 Current Canadian allocations and utilization

7. ***Canadian allocations:*** The 26.5–27.0 GHz band is currently allocated to the fixed service, mobile service, Earth exploration-satellite service (EESS) (space-to-Earth), inter-satellite service (ISS), and space research service (SRS) (space-to-Earth) on a co-primary basis. The frequency band is also allocated to the standard frequency and time signal-satellite service (Earth-to-space) on a secondary basis.

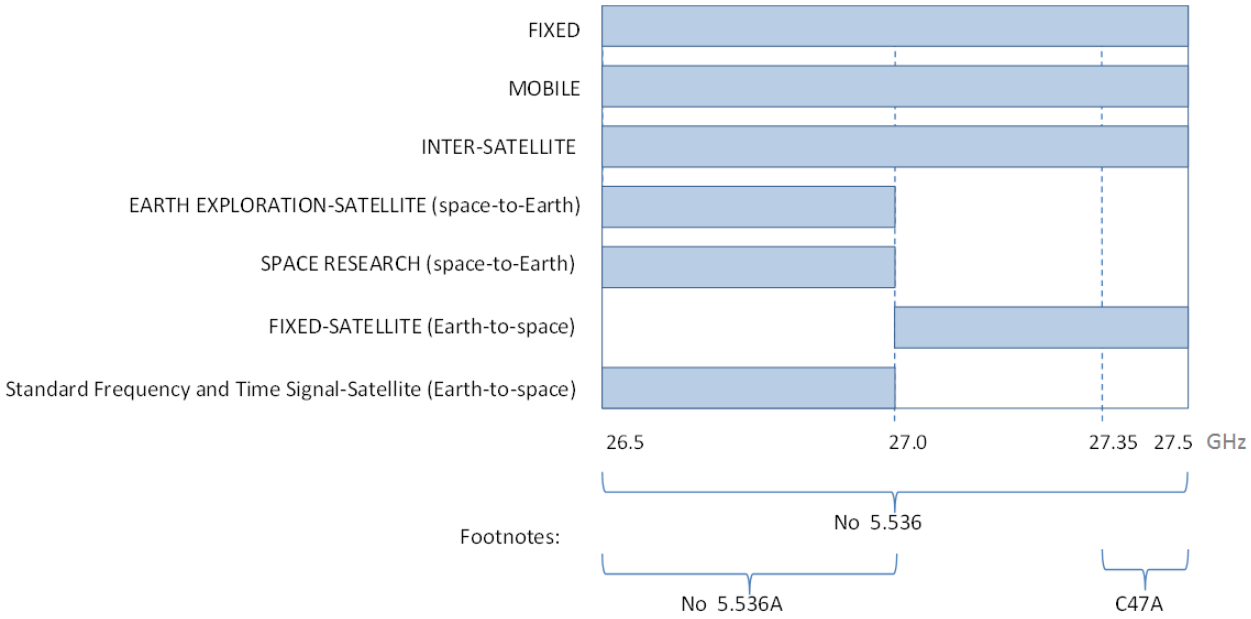
8. The 27.0–27.5 GHz band is allocated to the fixed service, mobile service, ISS and fixed-satellite service (FSS) (Earth-to-space) on a co-primary basis.

9. Further to the allocations mentioned above, Canada has adopted several international footnotes in the 26 GHz band in the Canadian Table of Frequency Allocations (CTFA). Specifically, footnote No. **5.536** indicates that the use of the 26.5–27.5 GHz band by the ISS is limited for space research and Earth exploration-satellite applications, and also transmission of data originating from industrial and medical activities in space. Footnote No. **5.536A** indicates that in the 26.5–27.0 GHz band, administrations operating earth stations in the EESS or the SRS shall not claim protection from stations in the fixed and mobile services operated by other administrations. Earth stations in the EESS or in the SRS should be operated taking into account the most recent version of Recommendation ITU-R SA.1862, *Guidelines for efficient use of the band 25.5–27.0 GHz by the Earth exploration-satellite service (space-to-Earth) and space research service (space-to-Earth).*

10. In addition to the international footnotes, ISED's CTFA also includes a Canadian footnote (C47A) specifying that in the 27.35–28.35 GHz band, the fixed service is given priority over the FSS sharing this spectrum. FSS implementation in this band is limited to applications that pose minimal constraints upon the deployment of fixed service systems.

11. An illustration of the Canadian frequency allocations in the 26 GHz band is shown in figure 1 below.

Figure 1 — Canadian frequency allocations in the 26 GHz band



12. ***Current use:*** Within the 26 GHz band, there is currently one EESS satellite licence issued to Telesat for the operation of the Polarsat satellite in the 26.5–27.0 GHz band for weather monitoring in the Artic region. No earth station application has been submitted to ISED and no earth station licence has been issued in this band.

13. At this time, there is no licence issued under any other service in the 26 GHz band, including fixed service, mobile service, ISS, SRS and FSS. However, licence-exempt ultra-wide band vehicular radar devices[1] can operate anywhere within the 22–29 GHz band. These vehicular radars operate on-board vehicles and are permitted on a no-protection, no-interference basis. They are used for applications such as backup aids and collision warning. Recently, vehicular radar systems have been migrating globally to the 76–81 GHz band, where they can operate with wider bandwidth and provide clearer pictures and higher resolution. This will improve the accuracy of safety applications in vehicles such as lane change warnings and blind spot detection. Consequently, in order to take advantage of the global ecosystem for vehicle radars, ISED is currently carrying out a separate consultation to discontinue the certification, manufacturing and sale of vehicular radars in the 22–29 GHz band, and instead allowing them in the 76–81 GHz band.

3.2 Changes to spectrum utilization policies

14. As with the 28 GHz band, ISED is of the opinion that the sharing of spectrum between different services is achievable in the 26 GHz band. Given this, ISED plans to continue facilitating the deployment of satellite earth stations while ensuring that minimal constraints are imposed on the future deployment of fixed and mobile services. In order to facilitate flexible use of the 26 GHz band for terrestrial services, ISED is proposing to incorporate any relevant changes into SP 3-30 GHz, *Revisions*

[1] Refer to Radio Standards Specification RSS-220, *Devices Using Ultra-Wideband (UWB) Technology*.

to Spectrum Utilization Policies in the 3-30 GHz Frequency Range and Further Consultation, as well as the following changes into the CTFA, which would replace the proposed footnotes stated in paragraph 25 of the mmWave Consultation:

> **MOD C47A:** In the frequency band 27.0~~27.35~~-28.35 GHz, use of spectrum for fixed service systems and mobile service systems will be given priority over fixed-satellite service systems sharing this spectrum on a co-primary basis. Fixed-satellite service implementation in this band will be limited to applications that will pose minimal constraints upon the deployment of fixed service systems and mobile service systems, such as a small number of large antennas for feeder links.
>
> **ADD CXX:** In the frequency band 26.5-27.0 GHz, use of spectrum for fixed service systems and mobile service systems will be given priority over Earth exploration-satellite service systems and space research systems sharing this spectrum on a co-primary basis. Earth exploration-satellite service and space research service implementation in this band will be limited to applications that will pose minimal constraints upon the deployment of fixed service systems and mobile service systems.

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*.

3.3 Block size and harmonization of band plan

15. ISED recognizes that in general a band plan that is harmonized with other countries allows for economies of scale in equipment manufacturing, providing Canadians access to the latest technologies at affordable prices. Harmonization also facilitates cross-border coordination, and more efficient planning and use of the spectrum near the border. In addition, in some cases a harmonized band plan could facilitate roaming between Canadian and international operations.

16. As discussed in the mmWave Consultation, the United States has released the 28 GHz band for flexible use and adopted a band plan consisting of 2 unpaired blocks of 425 MHz. The 26 GHz band is currently not available for flexible use in the United States. However, there is international interest in releasing various portions of the 26 GHz and 28 GHz bands to support 5G services, and the 26 GHz band has the potential to be a global roaming band. If the 26 GHz band is also made available for flexible use in Canada, it is important that the entire 1.85 GHz of contiguous spectrum in both the 26 GHz and 28 GHz bands be reviewed and considered as a whole.

17. The transmission ranges in the millimetre wave bands are typically short, which facilitates frequency reuse and could ease coordination with other services as well as across international borders. ISED is seeking comments on the importance of harmonization with the U.S. band plan.

Question A3: ISED is seeking comments on the importance of harmonizing the Canadian band plan with the United States in the 26 GHz and 28 GHz bands, recognizing that the 26 GHz band is not available for 5G services in the United States at this time.

18. The 3GPP has identified 2 band classes in the 24.25–29.5 GHz frequency range for the development of 5G systems: band class n257 for the 26.5–29.5 GHz band, and band class n258 for the 24.25–27.5 GHz band. These 2 band classes overlap in the 26 GHz band (26.5–27.5 GHz) and equipment made for both band classes would be able to operate with channel bandwidths of 50 MHz, 100 MHz, 200 MHz and 400 MHz. ISED is seeking comments on the importance of adopting a Canadian band plan based on multiples of 3GPP channel bandwidths in the 26.5–28.35 GHz band, noting that the U.S. 28 GHz band plan is not a multiple of the 3GPP channel bandwidths, but rather 2 blocks of 425 MHz each.

19. In the comments and reply comments received in response to both the mmWave Consultation and the Spectrum Outlook Consultation, some stakeholders stressed the need for different spectrum bandwidth requirements depending on the service they intended to provide. Some stakeholders indicated a need for block sizes as small as 50 MHz, and others for block sizes as large as 400 MHz or more. ISED is seeking comments on the minimum block size that should be made available.

Question A4: ISED is seeking comments on the minimum block size that should be made available for the 26.5–28.35 GHz band. Is it necessary that the frequency blocks be multiples of the 3GPP channel bandwidths (50 MHz, 100 MHz, 200 MHz and 400 MHz)?

3.4 Band sharing with other services

3.4.1 Coexistence between flexible use terrestrial stations and inter-satellite service in the 26.5–27.5 GHz band

20. The 26.5–27.5 GHz band is allocated to ISS on a co-primary basis. As discussed in the mmWave Consultation, ISED expects that 5G technologies considered for the mmWave bands will employ dynamic beam forming with very narrow beamwidths, which will lessen the potential of interference to ISS.

21. ISED notes that the International Telecommunication Union (ITU) has been actively studying the impact of 5G systems on ISS. Preliminary results indicate that harmful interference to space stations due to aggregate emissions from 5G systems is not likely. Therefore, ISED is not proposing any limits on the aggregate power levels produced by flexible use systems. However, if necessary, ISED may decide to review whether to apply technical measures to ensure coexistence between flexible use systems and inter-satellite service in this frequency band in the future.

Question A5:

A. ISED is seeking comments on whether it should impose any limits on the aggregate emissions of the terrestrial services in the 26.5–27.5 GHz band to ensure coexistence with ISS.

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

3.4.2 Coexistence between flexible use terrestrial stations and earth stations in the Earth exploration-satellite (space-to-Earth) and space research (space-to-Earth) services in the 26.5–27.0 GHz band

22. To date no EESS or SRS earth stations have been deployed in Canada and it is expected that the overall deployments will be limited in number. Also, the proposed modification to the CTFA to add Canadian footnote **CXX** limits the applications of such stations to those that will pose minimal constraints upon the deployment of fixed and mobile service systems. As a result, the coordination of flexible use stations with EESS and SRS earth stations is expected to be manageable.

23. The considerations for coexistence and deployment of flexible use terrestrial stations and EESS/SRS in the 26 GHz band are very similar to those related to flexible use terrestrial stations and fixed-satellite service earth stations in the 38 GHz band, as both satellite services operate in the space-to-Earth direction. In both cases, a sharing mechanism would be required to ensure coexistence between receiving satellite earth stations and flexible use stations. Given this similarity, the sharing mechanism in both bands could be very similar, even if the specific parameters (e.g. specific value of separation distance) to enable coexistence may be different. Therefore, ISED proposes to adopt sharing mechanisms and geographic restrictions in the 26 GHz band that are similar to those in the 38 GHz band to address coexistence between EESS/SRS and the flexible use terrestrial service.

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.

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.

3.4.3 Coexistence between flexible use terrestrial stations and the fixed-satellite service (Earth-to-space) in the 27.0–27.5 GHz band

24. Through the mmWave Consultation, ISED sought comments on whether a trigger for coordination should be established to facilitate coordination between flexible use stations and FSS earth stations in the 27.5–28.35 GHz band (Question 6-4). ISED also sought comments on whether there is a need to prescribe specific rules to limit the deployment of FSS earth stations in core urban areas and near major infrastructure where the deployment of flexible use systems would be most desirable (Question 6-5). In addition, ISED sought comments on whether it should impose limits on the aggregate emissions of the terrestrial services to ensure coexistence with FSS space stations (Question 6-6). Since the FSS allocation extends down to 27.0 GHz (i.e. 27.0-28.35 GHz), ISED proposes that these questions be extended to include the entire range from 27.0 to 28.35 GHz. Consequently, comments are sought on the following questions.

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 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 for proposed flexible use terrestrial stations and FSS earth stations (e.g. site shielding) that could facilitate more efficient sharing between terrestrial and earth stations.

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 27.0–28.35 GHz band.

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.

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 proposed, ISED is inviting detailed proposals on why they should be implemented, and what the limits should be.

3.5 Treatment of existing users and interim use of the 26 GHz band

25. The current use of the 26 GHz band is discussed in paragraphs 12 and 13 above. Existing licensees would continue to operate within their current parameters and conditions of licence. Licence-exempt ultra-wide band devices would continue to operate on a no-protection, no-interference basis, as per the relevant technical specifications (RSS-220); however, ISED is currently consulting on discontinuing the certification and sale of these devices in Canada, as discussed in section 3.1 above

26. All new licences (terrestrial or satellite services) issued after the date of the release of this addendum consultation would be subject to the proposed sharing mechanism or other sharing mechanism, as discussed in section 3.4 above, that will be developed as a result of this addendum consultation.

27. Until the sharing mechanisms discussed in section 3.4 are finalized, ISED may impose conditions of licence on earth stations to facilitate coexistence with other services in the band. For example, geographic restrictions on satellite earth stations may be imposed.

4. Licensing considerations

28. Considering the characteristics of mmWave spectrum, and the potentially emerging services and deployment models in the context of 5G networks and systems, it is expected that new use cases, beyond the existing mobile network services, are likely to need access to spectrum to meet their diverse needs. This introduces an opportunity to consider licensing approaches that will facilitate the potential for innovative uses in this spectrum, while also supporting a competitive wireless market in Canada.

29. Given the contiguous 1.85 GHz of flexible use spectrum being proposed, ISED is considering whether a small portion of the spectrum could be made available for shared use. For example, a number of large blocks could be made available through a competitive licensing process, while a smaller portion could be reserved for a shared use approach, such as an all-come, all-served licensing model. In such a model, licensees could be required to follow specific coordination principles that would allow the most efficient use of the spectrum in a given area. Comments are sought on whether alternative approaches to licensing are warranted for a portion of the 1.85 GHz of spectrum now being proposed.

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.

5. Additional information

5.1 Next steps

30. ISED will consider all comments received in regards to the mmWave Consultation and this addendum consultation before publishing a decision on releasing spectrum in the 26 GHz and 28 GHz bands. ISED will then consult further on the related technical, policy and licensing framework(s), as well as the technical standards, as appropriate.

31. ISED intends to publish a spectrum release plan indicating which frequency bands it considers a priority for release over the next five years (2018-2022) through the Spectrum Outlook Consultation process. Release of additional mmWave spectrum will be considered within that context.

5.2 Submitting comments

32. Respondents are requested to provide their comments by email in either Microsoft Word or Adobe PDF format.

33. In addition, respondents are asked to specify question numbers for ease of reference and provide supporting rationale for each response.

34. Paper submissions should be mailed to the following address:

Innovation, Science and Economic Development Canada
c/o Senior Director, Spectrum Licensing and Auction Operations
235 Queen Street, 6th Floor
Ottawa, Ontario K1A 0H5

35. All submissions should cite the *Canada Gazette*, Part I, the publication date, the title and the notice reference number (SLPB-005-18). Parties should submit their comments no later than July 5, 2018, to ensure consideration. Soon after the close of the comment period, all comments received will be posted on ISED's Spectrum Management and Telecommunications website.

36. ISED will also provide interested parties with the opportunity to reply to comments from other parties. Reply comments will be accepted until July 31, 2018.

37. All comments and reply comments will be published, so those making submissions are asked not to provide confidential or private information in their submissions.

5.3 Obtaining copies

38. All spectrum-related documents referred to in this paper are available on ISED's Spectrum Management and Telecommunications website.

39. For further information concerning the process outlined in this addendum consultation or related matters, contact:

Senior Director
Spectrum Licensing and Auction Operations
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