

Addendum to the Consultation on
Releasing Millimetre Wave Spectrum to
Support 5G
(SLPB-005-18)

Comments of
Ericsson Canada Inc.

July 05th, 2018

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Sent by email to: ic.spectrmauctions-encheresduspectre.ic@canada.ca
Senior Director
Spectrum Licensing and Auction Operations
Innovation, Science and Economic Development Canada
235 Queen Street, 6th floor
Ottawa, Ontario K1A 0H5

cc: Adam Scott, Director General

RE: Canada Gazette, Part I, June 16th, 2018, Notice No. SLPB-005-18 - Addendum to the Consultation on Releasing Millimetre Wave Spectrum to Support 5G

Please find attached the comments of Ericsson Canada Inc. in response to the Canada Gazette, Part I, June 16th, 2018, Notice No. SLPB-005-18 - Addendum to the Consultation on Releasing Millimetre Wave Spectrum to Support 5G (“Addendum”).

The document was created with Adobe Acrobat X Pro Version 10.0.0, using operating system Microsoft Windows 7.

We appreciate the opportunity to provide comments and as always, we are ready to work with Innovation, Science and Economic Development (ISED) Canada in the future on this very important topic.

Sincerely,

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INTRODUCTION

Ericsson appreciates the opportunity to respond to the Addendum to the Consultation on Releasing Millimetre Wave Spectrum to Support 5G (the “Addendum”). Ericsson would like to commend Innovation, Science and Economic Development Canada (ISED) for inviting industry to comment on this very important issue.

Ericsson is a global leader in delivering ICT solutions. In fact, 40 percent of the world's mobile traffic is carried over Ericsson networks. We have customers in over 180 countries and offer comprehensive industry solutions ranging from cloud services and mobile broadband to network design and optimization.

Over the past 140 years, Ericsson has been at the forefront of communications technology. Today, we are committed to maximizing customer value by continuously evolving our business portfolio and leading the ICT industry. Ericsson has one of the industry's strongest patent portfolios with a total count of over 45,000 granted patents. R&D is at the heart of our business and approximately 23,600 employees are dedicated to our R&D activities.

With the mobile industry at the dawn of 5G deployment, led by the North American market, Ericsson has played, and continues to play, a key role in helping carrier partners in their plans to aggressively launch 5G commercially¹.

In Canada, Ericsson has operated since 1953 and serves Canadian operators and enterprises by providing complete communication solutions, including mobile and fixed network infrastructure, professional services, software and broadband.

As one of Canada's ten largest Research and Development (R&D) investors, Ericsson Canada invested over \$310 million CAD in R&D in 2017 and more than \$5 billion CAD to date. Ericsson has more than 2,800 employees and offices across Canada, including Toronto, Ottawa, and Montreal, where Ericsson fulfills worldwide mandates in the development, testing and support of wireless networks.

¹ <https://www.ericsson.com/thinkingahead/the-networked-society-blog/2018/06/22/5g-in-north-america-us-canada/>

Again, Ericsson would like to commend ISED on their plan to auction the 26 GHz band in 2021, and for inviting industry to comment on important aspects of that plan. Below are Ericsson's detailed responses and additional information pertinent to this Addendum.

EXECUTIVE SUMMARY

Ericsson supports ISED's proposal to develop a flexible use licensing model for fixed and mobile services in the 26 GHz band (26.5 – 27.5 GHz) considering the spectrum needs of 5G, the timing of WRC-19, 5G technology standards development, international ecosystems and the harmonization of spectrum use with other countries.

Ericsson urges ISED to engage with industry on further consideration of 24 GHz spectrum as part of the mmWave release and to further consider harmonization of the proposed band plans with ongoing regulatory action as well as standards activities in various parts of the world. This will allow Canada to take advantage of equipment ecosystems addressable across the globe, including the United States and potentially China, Australia, New Zealand and various European countries.

Ericsson supports ISED's proposal to change text in footnote C47A to reflect the fact that, in the band 27.0-28.35 GHz, use of spectrum by the fixed and mobile service will be prioritized over fixed-satellite service systems sharing this band on a co-primary basis. In addition, fixed-satellite service implementation must be licensed on a case-by-case basis for feeder links and limited to applications that pose minimal constraints to the deployment of fixed and mobile service systems.

The 3GPP bands n257 and n258 covering the tuning ranges 24.25-27.5 GHz and 26.5-29.5 GHz respectively are designed to help support various of regulatory decisions in the corresponding ranges. Ericsson proposes to use the 100 MHz nominal channelization or larger, adopt the 3GPP band n257, for the entire 1.85 GHz discussed this Addendum. We provide a comprehensive roadmap to covering the entire range within our response.

Ericsson believes that exclusive licensed spectrum offers the best incentive for the significant investments required to offer the expected level of speed, quality of service and security for a wide range of 5G applications. Shared licensed spectrum, along with its complexity and implementation costs, should be considered only if exclusive licensing is not feasible.

COMMENTS ON SPECIFIC QUESTIONS

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.

Ericsson supports ISED's proposal to develop a flexible use licensing model for fixed and mobile services in the 26 GHz band considering the spectrum needs of 5G, the timing of WRC-19, 5G technology standards development, international ecosystems and the harmonization of spectrum use with other countries.

The June 2018 issue of Ericsson's mobility report indicated that in 2023, percent of mobile data traffic would be carried by 5G networks and that North America, which has the highest monthly usage of mobile data per smartphone at 7.2 gigabytes (GB) today, would witness an increase to 49 GB/month/subscription in 2023². Such an increase in traffic demand must be accompanied by the ability to obtain access to a greater amount of spectrum.

ISED's choice of the 26 GHz and 28 GHz bands is very reasonable for two reasons: (1) the conformity of the 26 GHz band with WRC-19 studies will provide overall global compatibility, and (2) the choice of 28 GHz will keep Canada on par with commercial developments in the United States and will give early access to products for 5G equipment being developed for the United States and Korean markets.

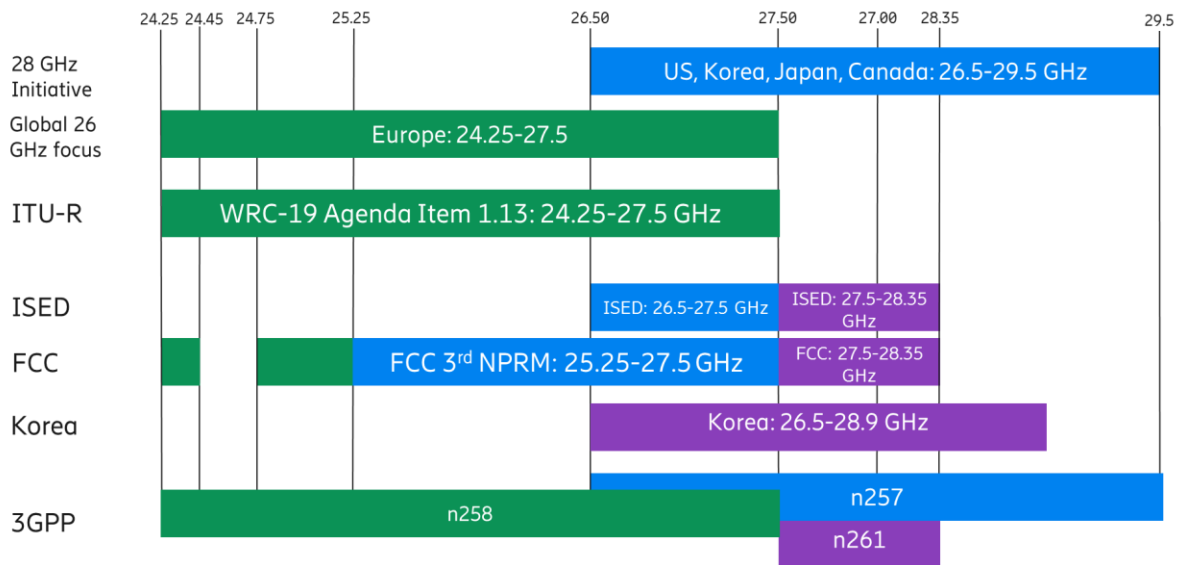
Figure 1 is an illustration of various efforts worldwide by industry participants, standards organizations, and regulatory authorities in the 26 GHz and 28 GHz frequency ranges which are based on two tuning ranges:

- 26 GHz range spanning 24.25-27.5 GHz which is favoured by Europe and generally follows the studies pursuant to agenda item 1.13 for compatibility studies being undertaken by TG 5/1 of the ITU-R towards identification of bands for IMT at WRC-19

² <https://www.ericsson.com/en/mobility-report/reports/june-2018/mobile-data-traffic-growth-outlook>

- 28 GHz range spanning 26.5-29.5 GHz which favoured by the 28 GHz Initiative formed by a coalition of Canada, the United States, Korea, and Japan.

FIGURE 1: Global activities related to the 26 GHz (24.25-27.5 GHz) and 28 GHz (27.5-29.5 GHz)



Also, as denoted in Figure 1, Korea recently concluded auctions of 24 blocks of 100 MHz each in the range 26.5-28.9 GHz. The FCC plans to auction the bands 24.25-24.45 and 24.75-25.25 GHz right after the 28 GHz auction in November 2018³ and followed by another Notice of Public Rule Making addressing the band 25.25-27.5 GHz. With FCC’s plan, the situation for the 24 GHz band in the United States is likely to be known with certainty by 2019. As for Canada, Figure 1 also describes ISED’s plan to auction parts of the 26 GHz and 28 GHz range in 2021⁴.

Ericsson notes that “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)”⁵. However, ISED at the same time, indicated that the 24 GHz frequency range is not suitable for immediate consideration for flexible

³ https://transition.fcc.gov/Daily_Releases/Daily_Business/2018/db0327/DOC-349938A1.pdf

“Announce that the bidding for the 28 GHz band (Auction 101) is scheduled to commence on November 14, 2018, and the bidding for the 24 GHz band (Auction 102) will be scheduled to commence subsequent to the conclusion of bidding in Auction 101”

⁴ [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/Outlook-2018-EN.pdf/\\$file/Outlook-2018-EN.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/Outlook-2018-EN.pdf/$file/Outlook-2018-EN.pdf), page 42

⁵ The Addendum, Paragraph 5, page 1

use because of ongoing international compatibility studies between different radiocommunication systems and because of incumbent terrestrial fixed services in Canada. Even though Ericsson agrees with ISED, we recognize that the ongoing regulatory action in the United States with respect to the 24 GHz band is early and should still be regarded favorably. Therefore, Ericsson urges ISED to start a consultation process addressing the frequency range 24.25-26.5 GHz at the earliest possible time and in a manner that has greatest compatibility with the markets in the United States and the rest of the world. This action would allow Canada to take advantage of the equipment ecosystem available for the United States and potentially for other countries such as China, New Zealand, Australia and in Europe⁶.

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.

Ericsson supports ISED's proposed change to the CTFA. However, similar to the previous consultation on millimetre-wave frequency bands (SLPB-001-17), Ericsson supports the recommendation of RABC to clarify the term "large" in large antennas. More importantly, Ericsson supports RABC's recommendation to add the words "to be individually licensed"⁷ to reflect the idea that the fixed satellite service can only be licensed on a case-by-case basis with minimum impact on the fixed and mobile service. As a result, footnote C47A would read as follows:

MOD C47A: In the frequency band 27.0-28.35 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 to be individually licensed for feeder links.

⁶ [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/Outlook-2018-EN.pdf/\\$file/Outlook-2018-EN.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/Outlook-2018-EN.pdf/$file/Outlook-2018-EN.pdf), page 35

"In March 2018, New Zealand consulted on releasing the frequency band 24.25-28.35 GHz in support of 5G. Europe, China and Australia have expressed intent to use all or parts of the frequency band 24.75-27.5 GHz for 5G services".

⁷ [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-001-17-comments-received-RABC.PDF/\\$file/SLPB-001-17-comments-received-RABC.PDF](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-001-17-comments-received-RABC.PDF/$file/SLPB-001-17-comments-received-RABC.PDF), paragraphe 18

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.

Ericsson proposes harmonization of the 26 GHz band with the international allocations under consideration by the ITU-R for the WRC-19. Due to the shared border between Canada and United States and cross border movement of people and goods, Ericsson proposes harmonization of the 28 GHz band, to the extent possible, between the US and Canada. More details are provided in the next section.

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)?

According to 3GPP technical specifications TS38.101-28, the number of band plans in the frequency range 24 GHz-29 GHz has been defined as indicated in Table 1. These 3GPP band plans support channel bandwidths of 50, 100, 200, 400 MHz. Other combinations such as bandwidths of 150, 250, and 350 MHz can be supported by means of carrier aggregation.

TABLE 1: 3GPP Bands of interest in the range of 24.25 GHz – 29.5 GHz

Operating Band	Uplink (UL) operating band BS receive UE transmit	Downlink (DL) operating band BS transmit UE receive	Duplex Mode
	$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$	
n257	26500 MHz–29500 MHz	26500 MHz-29500 MHz	TDD
n258	24250 MHz–27500 MHz	24250 MHz–27500 MHz	TDD
n261	27500 MHz–28350 MHz	27500 MHz–28350 MHz	TDD

As discussed in the Canadian mmWave consultation, the United States plans to auction the 28 GHz band for flexible use and has adopted a band plan consisting of 2 unpaired blocks of 425 MHz. Using any of the 3GPP bandwidths of 50, 100, 200, 400 MHz there will be two blocks of 25 MHz remaining. Figure 2 below depicts an example with 100 MHz block sizes.

⁸ 3GPP TS 38.101-2 V15.1.0 (2018-03)

FIGURE 2: 28 GHz block structure with 100 MHz channels distributed as 2x425 MHz blocks without spectrum swapping.⁹



Ericsson believes that licensees would not leave those two 25 MHz blocks unused and would eventually trade and aggregate licenses to create one block of 50 MHz that is usable with 3GPP standard based equipment.

To consider the 1.85 GHz of spectrum in 26 GHz and 28 GHz as a whole¹⁰, Ericsson recommends the adoption of 3GPP band plan n257 with a nominal channel size of 100 MHz or more and with the option to trade and aggregate auction blocks up to 400 MHz.

Within the 850 MHz from 27.5 - 28.35 GHz, the resulting elemental channel blocks would be 50, or 100 MHz. With spectrum license trading and aggregation, other channel bandwidths may be supported. It is recommended that operators be allowed to aggregate blocks in a similar manner suggested above. It is also desirable that regulation allow operators to rearrange allocations in a way that maximizes the utilization of spectrum for broadband services.

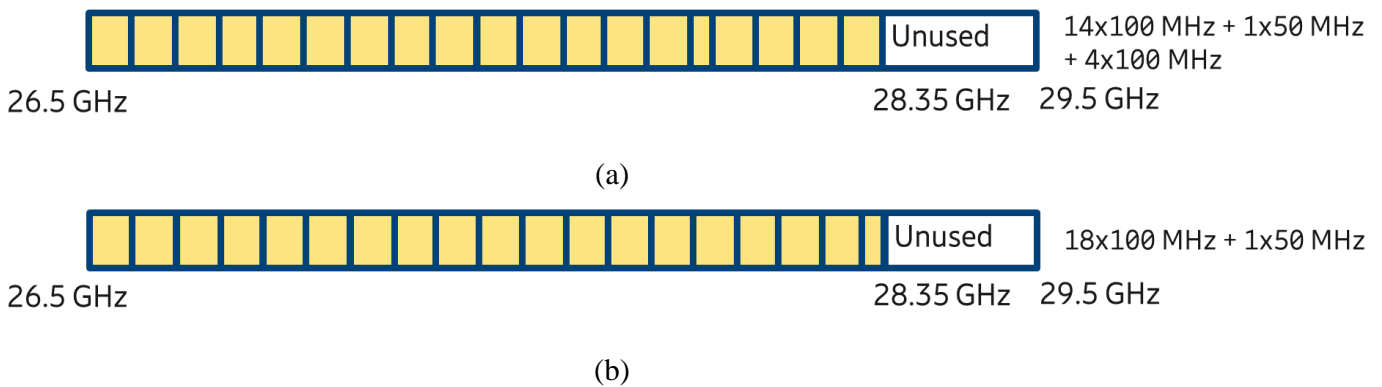
The exact situation in the 28 GHz band will be determined after auction and rearrangement of licenses to create large, contiguous blocks. The plausible scenarios for Canada, using a block size of 100 MHz, are illustrated in Figure 3.

⁹ The white blocks are 25 MHz (not addressable by 3GPP channels) and the blue blocks are 100 MHz. Without rearrangement of the excess allocation, operators will be limited to distributing the 100 MHz blocks along the 60 kHz raster provided by the 3GPP standard.

¹⁰ The Addendum, Para 16

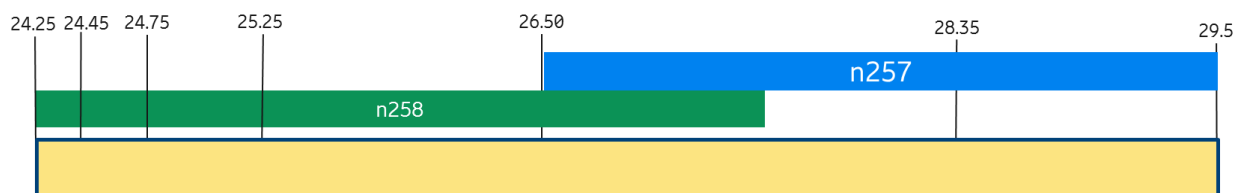
Figure 3(b) is preferred as it affords future allocation of 28.35-29.5 GHz to the mobile service to achieve uniformity of channel size. Two options for constructing 50 MHz blocks, addressable by 3GPP standard based equipment, are provided (a) 50 MHz block at 27.9-27.95 GHz, or (b) 50 MHz block at 28.3 - 28.35 GHz. With a forward-looking view to future compatibility with 26.5-29.5 GHz, option (b) is preferred as it allows future allocation of 28.35-29.5 GHz to enable expanded elemental channel sizes towards a uniform 100 MHz. It is to be noted that operators in the United States will need to agree on possible channel arrangements after the FCC auctions.

FIGURE 3: Possible scenarios for Canadian 26 GHz and 28 GHz with 100 MHz blocks



Looking even further in the future, it may be also possible to establish a band plan as shown in Figure 4 for the whole range from 24.25 – 29.5 GHz. There would be 52 channel blocks of 100 MHz and one channel block of 50 MHz identified for global mobile broadband use compatible with IMT. The resulting arrangement would make full use of 3GPP bands n257 and n258 across two overlapping tuning ranges and enable a globally compatible 5G band plan for a number of mobile network operators and non-traditional users of mobile broadband services including industries and enterprises, depending on licensing conditions.

FIGURE 4: A possible consolidated band arrangement for Canada (24.25 – 29.5 GHz)



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.

Ericsson supports the view of not proposing any limits on the aggregate power levels produced by flexible use systems, as studies in the ITU have not indicated any difficulties in coexistence between such systems and the ISS (*Report on the fifth meeting of Task Group 5/1 (Geneva, Switzerland, 2-11 May 2018)*)¹¹.

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

N/A

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.

Ericsson believes that site-by-site coordination between flexible use terrestrial stations and EESS/SRS earth station is most effective.

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)?

As in the case of other millimetre wave spectrum bands, Ericsson proposes appropriate PFD limits at a suitable height above the ground as the coordination trigger. We suggest that this coordination trigger be matched with an aggregate I/N value in the range -6 to -8 dB. An excessively restrictive PFD value for coordination trigger would result in unnecessary coordination calculations. On the other hand, a too-relaxed PFD value for coordination trigger would result in undetected interference scenarios.

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.

Ericsson proposes that, as long as the conditions of footnote C47A are adhered to, service providers not be mandated by any specific rules or methods and instead have the flexibility to work out arrangements

¹¹ <https://www.itu.int/md/meetingdoc.asp?lang=en&parent=R15-TG5.1-C-0406 - Chairman, TG 5/1>

that facilitate sharing, which may include site shielding. Experienced system designers and operators will adjust where required, without the need for prescriptive regulations.

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.

Terrestrial services will likely focus more on higher density population areas than will satellite services. Therefore, Ericsson believes that future EESS/SRS earth stations need to be carefully assessed for compliance with the relative priority proposed in footnote C47A in relation to existing and planned terrestrial stations.

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.

N/A

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.

With future earth stations licensed only if they comply with the intent of the proposed footnote C47A, Ericsson agrees with 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.

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)?

Similar to the response above, Ericsson proposes appropriate PFD limits at a suitable height above the ground as the coordination trigger. We suggest that this coordination trigger be matched with an aggregate I/N value in the range -6 to -8 dB. An excessively restrictive PFD value for coordination trigger would result in unnecessary coordination calculations. On the other hand, a too-relaxed PFD value for coordination trigger would result in undetected interference scenarios.

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.

Ericsson believes that service providers need not be mandated by any specific rules or methods and instead have the flexibility to work out arrangements that facilitate sharing, which may include site shielding, without the need for prescriptive regulations

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.

Please refer to question 7A.

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.

Please refer to question 7B.

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.

Please refer to question 5A.

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

Please refer to question 5B.

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?

As discussed above, there are two tuning ranges covering 26 GHz (24.25-27.5 GHz) and 28 GHz (26.5-29.5 GHz) matching with 3GPP bands n258 and n257, respectively. Ericsson proposes that ISED start considering the whole frequency range from 24.25 – 29.5 GHz for flexible fixed and mobile terrestrial services. With ongoing activity in the United States and other countries related to the 24.25–26.5 GHz, the initial step is to address this 24.25–26.5 GHz frequency range at the earliest time possible and in a manner that has greatest compatibility with the markets in the US and the rest of the world. This action

would allow Canada to take advantage of the equipment ecosystem available for the United States and potentially for other countries such as China, New Zealand, Australia and in Europe.

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.

Ericsson believes that exclusive licensed spectrum offers the best incentive for the significant investments required to offer the expected level of speed, quality of service and security for a wide range of 5G applications. Shared licensed spectrum, along with its complexity and implementation costs, should be considered only if exclusive licensing is not feasible.

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