

# Response to SLPB-001-17

September 15, 2017

## Scope of RABC Response

1. The RABC has reviewed the *Consultation on Releasing Millimetre Wave Spectrum to Support 5G SLPB-001-17* (the “Consultation”) and commends the Department for the leadership that the Consultation displays as the world becomes increasingly digital.
2. The RABC has determined that it is best suited to answer Questions 4-1, 5-1, 6-1 through 6-7, 7-1, 7-3 through 7-6, 8-1 and 9-1 and to not answer Questions 7-2, 7-7, 9-2, 9-3.

## Answers to Select Questions

***Question 4-1: Given the disruptive nature of 5G, will new business models and network applications develop that may require policy and regulatory consideration from ISED? Please describe potential new business models and network applications as well as their benefits to Canadians.***

3. The RABC supports the Department’s stated policy objectives as per the Consultation<sup>1</sup> (portions thereof repeated below verbatim).
  - a. A robust wireless telecommunications industry drives the adoption and use of digital technologies and enhances the productivity of the Canadian economy and its international competitiveness.
  - b. The development and deployment of 5G is essential to Canada becoming a global centre for wireless innovation, and will bring Canada to the forefront of digital development and adoption through the creation and strengthening of world-leading wireless infrastructure.
  - c. Additional spectrum will allow providers to increase network capacity to meet the traffic demands of higher usage rates, and support the provision of next-generation wireless technologies, such as 5G.

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<sup>1</sup> The Consultation, Section 3, Paragraphs 3, 4, and 6.

- d. Today's economy is digital. The ubiquity of digital technologies and services across sectors is a defining feature of this digital economy. Decisions made arising from this consultation will position Canada at the leading edge of the digital economy through the release of mmWave spectrum to support 5G technologies.
4. The RABC agrees that these policy objectives need timely regulatory consideration by way of permitting terrestrial flexible-use of portions of mmWave spectrum, as proposed.
  5. The Department also notes the context underpinning their policy objectives (repeated below in abridged form using parts verbatim except where square bracketed or emphasised). The RABC agrees with the Department's assessment<sup>2</sup> that:
    - a. Wireless connectivity is driving demand for new services, technologies, and consequently, spectrum. Mobile data traffic is expected to grow seven-fold between 2016 and 2021 and new applications are expected to emerge that require even higher capacity and lower latency networks.
    - b. Increased demand for large data consumption and faster transmission dictates that Canada will need to release more spectrum for wireless services to unlock the potential of new applications enabled by 5G.
    - c. Forecasted use cases include **enhanced/ultra-fast mobile broadband, massive machine type communications, and ultra-reliable/low latency communications**<sup>3</sup> (emphasis added), all of which are predicted to drive increased usage and facilitate deployment of integrated verticals such as healthcare, transportation, and smart cities, while leveraging massive Internet-of-Things (IoT) growth [and virtual and augmented reality].
    - d. More flexible and effective use of mmWave spectrum has the potential to facilitate the development and adoption of 5G technology. Canadian firms have the opportunity to participate in the development and implementation of this new technology.
    - e. Globally, other nations are also facilitating the development and adoption of 5G technology in a timely manner and are in the process of making high frequencies available for this purpose. The FCC adopted new rules on July 14, 2016 that will support the development of 5G wireless networks in the U.S. The new rules aim to facilitate innovation and "allow new technologies and innovations to evolve and flourish without needlessly prescriptive regulations." They are also intended to

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<sup>2</sup> The Consultation, Section 4, Paragraphs 7 through 12.

<sup>3</sup> Please refer to section 4 of Recommendation ITU-R M.2083 for the definition of these three main usage scenarios envisioned for IMT-2020.

balance different uses of the bands, from fixed and mobile services to satellite services as well as between commercial and non-commercial federal use.

- f. The ITU is conducting sharing and compatibility studies on eleven frequency bands between 24.25 and 86 GHz for the future development of broadband mobile services. Canada is leading the group performing the ITU studies for these bands.
  - g. The ITU is not currently studying the 28 GHz band. Nonetheless, the U.S. and South Korea have made a commitment to pursue authorizing mobile operations in this frequency band domestically and Japan is studying 28 GHz in addition to the frequency bands being studied by the ITU.
6. The RABC supports the Department's goals in the Consultation and its programs to promote innovation.
- a. The key innovation in 5G is that it will comprise new radio (NR) access technology<sup>4</sup> featuring orders of magnitude improvements in peak data rates (Gbps capability), user experienced data rates, latency, energy efficiency, and connection density. These improvements will be enabled by orders of magnitude increases in frequency block size, spectral efficiency, beamforming capability and the number of multiple input multiple output (MIMO) antennas feasible at the tiny wavelengths of mmWave spectrum. 5G will enable many new services not feasible with 4G networks. The use of mmWave spectrum will deliver the richest terrestrial 5G experience but will not be economic to deploy across the entire terrestrial network footprint and its use will initially be focused in dense urban markets. Terrestrial 5G will rely on new mid-band large block TDD spectrum such as the 3.5 GHz band to bring 5G to the broader market and 5G will be further supported by the 600 MHz band.
  - b. A new facet of 5G is that it is envisioned to comprise a heterogeneous network of networks. 3GPP is studying<sup>5</sup> the inclusion of satellite within 5G. Satellite systems provide geographic coverage of all of Canada, including territorial waters. Where terrestrial networks are not economic or are temporarily affected by natural disaster, innovative new satellite systems<sup>6</sup> could provide backhaul/transport connectivity and capacity for 5G as well as 5G compatible mobile satellite service/IOT. To this end, the RABC recommends that the Department support, through future policy and

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<sup>4</sup> See, 3<sup>rd</sup> Generation Partnership Project: Technical Specification Group Radio Access Network; Study on Scenarios and Requirements for Next Generation Access Technologies; (Release 14): Technical Report 38.913 v.14.3.0 (June 2017).

<sup>5</sup> See, 3<sup>rd</sup> Generation Partnership Project; Technical Specification Group Radio Access Network; Study on New Radio (NR) to support Non Terrestrial Networks (Release 15), Technical Report, 3GPP TR 38.811 v.0.10 (June 06, 2017).

<sup>6</sup> Ka-band and V-band satellite and constellation designs provide higher throughput and capacities while maintaining nationwide and even global coverage.

regulatory measures in-line with 3GPP developments, the introduction of satellite systems to support and extend 5G terrestrial networks.

7. The RABC also recommends that the Department address via future consultation the policy and regulatory considerations associated with other mmWave bands that are not the subject of this Consultation but which are being studied by the ITU and/or being considered<sup>7</sup> across the border in the U.S.
8. The balance of the RABC response to the Consultation deals with the Department's proposals for the subject bands, 27.5-28.35 GHz, 37-40 GHz and 64-71 GHz.

***Question 5-1: ISED is seeking comments on developing a flexible use licensing model for fixed and mobile services in the 28 GHz and 37-40 GHz frequency bands, and allowing licence-exempt use of the 64-71 GHz frequency band ahead of WRC-19 and before 5G technology standards are finalized.***

#### **28 GHz and 37-40 GHz frequency bands**

9. The RABC believes that to achieve the Department's overarching policy objective to "position Canada at the leading edge of the digital economy through the release of mmWave spectrum to support 5G technologies", a Canadian approach that would move forward on developing a flexible use licensing model for fixed and mobile services in the 28 GHz and 37-40 GHz frequency bands ahead of WRC-19 and before 5G technology standards are finalized is appropriate.
10. The RABC understands that technology often develops at a pace faster than international consensus building. The RABC agrees that Canada should continue to work closely with the international community to harmonize the use of spectrum as much as possible, in order to achieve maximum economic benefits. Ideally, harmonization would enable equipment to be developed for a global telecommunications ecosystem, but the benefits

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<sup>7</sup> The "Spectrum Frontiers R&O and FNPRM" (FCC-16-89) makes further recommendations (beyond the three bands under consideration in the Consultation), proposing to consider additional spectrum bands using the same flexible framework. This proposal is described in the FCC's Spectrum Frontiers "Fact Sheet":

"A Further Notice of Proposed Rulemaking ensures that we continue to dramatically increase the spectrum available for next generation services by proposing to make an additional 18 GHz of spectrum available. It proposes to apply the same licensing, service, and technical rule framework set in the Report & Order, modified to meet the characteristics of a specific band. Specifically, it proposes additional bands for consideration: 24-25 GHz (24.25-24.45/24.75-25.25 GHz), 32 GHz (31.8-33.4 GHz), 42 GHz (42-42.5 GHz), 48 GHz (47.2-50.2 GHz), 51 GHz (50.4-52.6 GHz), 70 GHz (71-76 GHz), and 80 GHz (81-86 GHz). It also seeks comment on how the Commission can provide access to additional spectrum above 95 GHz."

Reference: [https://apps.fcc.gov/edocs\\_public/index.do?document=339990](https://apps.fcc.gov/edocs_public/index.do?document=339990)

of economies of scale can also be gained in the development of both pan-regional (the Americas) and continental telecommunications ecosystems.

11. Regarding the proposed licensing regimes for the bands indicated, the RABC recommends that when spectrum bands are shared (for example, between flexible use terrestrial services and FSS in the 28 GHz and the 37-40 GHz frequency bands), the use should be licensed as opposed to licence-exempt.
12. As the coverage area of a flexible use terrestrial station in the subject bands will be relatively small, a very large number of terrestrial stations will be required to fulfil the customers' expectations for the service. Given this high density of deployment, the RABC notes that a flexible use terrestrial licensing model based on service areas rather than site-by-site licensing could be more suitable in minimizing the administrative burden. The Department should also take into account the need to allow a limited number of 28 GHz and 37-40 GHz earth stations to be licensed as indicated in proposed footnotes C47A, C47C and C51 in the Consultation. It is in this context that the RABC provides its recommendations on such questions of satellite earth station coordination and licensing in response to Questions 6-4, 6-5, 7-4, and 7-5. The RABC's recommendations on terrestrial flexible use licensing are provided in response to Question 9-1.

#### **64-71 GHz frequency band**

13. Given the Department's policy objectives and the current global regulatory context, Question 5-1 also seeks industry input on the proposed Canadian approach to move forward on allowing licence-exempt use of the 64-71 GHz frequency band ahead of WRC-19 and before 5G technology standards are finalized.
14. WRC-19 agenda item 1.13 includes the band 66-76 GHz to be considered for the identification of spectrum for the future development of International Mobile Telecommunications (IMT), which overlaps with the band 64-71 GHz in the Consultation. WRC-19 may identify all, part, or none of the band 66-71 GHz for IMT. Regardless of the outcome, WRC-19 will not address whether the band should be used on a licensed or licence-exempt basis; on the contrary, the decision is the prerogative of individual administrations. The RABC believes that Canada should adopt, consistent with what has occurred in the U.S., a licence-exempt approach ahead of WRC-19. This would facilitate equipment synergies and border-area coordination that would be beneficial to Canadians.

**Question 6-1: ISED is seeking comments on the changes proposed above to introduce flexible use licensing in the 28 GHz band, including consequential changes to the CTFA domestic 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.**

15. The RABC supports the Department's proposed changes to introduce flexible use fixed and mobile services licensing in the 27.5-28.35 GHz band, including consequential changes to the CTFA domestic 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* that includes the use of the 28 GHz band for a small number of individually-licensed satellite earth stations.
16. The RABC will be providing input to Notice No. SMSE-005-17—*Proposed Revisions to the Canadian Table of Frequency Allocations*. In that response the RABC intends to ask the Department to review its consistency in the use of the term “large antennas” in several CFTA domestic footnotes and whether the Department could provide more specificity around the term “large antennas” in such instances. While antenna diameter may be a factor in the creation of interference, it is not necessarily the predominant factor.
17. The RABC recommends that the Department consider improving the clarity of or defining the word “large” in footnotes C47A and C47C. To make it clear that the bands are not to be considered for blanket licensing of earth stations in the 27.5-28.35 GHz band, the addition of “to be individually licensed” would be helpful.
18. The RABC proposes changes to the wording of footnotes and C47A and C47C as shown below for C47C (but applicable to both) where the square brackets around the term “large” indicate a request for more clarity as appropriate:

ADD C47C: In the frequency band 27.5-28.35 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 which 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.
19. The RABC notes that in the U.S., the FCC has made available in its Spectrum Frontiers proceeding the 28 GHz band for Upper Microwave Flexible Use Service (UMFUS). The adoption of flexible use licensing in the 28 GHz band in Canada will allow development of services similar to the services that will be provided in the U.S. under the Spectrum Frontiers proceeding. Further, as detailed in the response to Question 6-3 below, the RABC supports harmonization of the 28 GHz band plan with that adopted in the U.S. The

RABC does not, however, support the introduction in Canada of the FSS earth station siting constraints that formed part of the FCC Spectrum Frontiers Report and Order, which make the selection of a suitable earth station location extremely difficult in some cases<sup>8</sup>. Given the differences in geography and population distribution, the creation of a “made-in-Canada” approach is supported by the RABC. In response to Questions 6-4, 6-5, 6-6 and 6-7, the RABC recommends measures to be taken to enable the limited use of satellite earth stations in the 27.5-28.35 GHz band that pose minimal constraints on terrestrial flexible use.

20. The RABC also notes that some countries such as South Korea and Japan are considering introducing mobile terrestrial service from 27.5 GHz to 29.5 GHz, whereas Europe has focused on the 24.25-27.5 GHz as a pioneer band. This implies that for terrestrial 5G equipment to be standardized worldwide, it will need to be capable of tuning across a frequency range from 24.25 to 29.5 GHz. The RABC notes that provisions in SP3-30 GHz permit the ubiquitous deployment of FSS terminals in the band 28.35 to 29.5 GHz in Canada.
21. The RABC supports the Department’s proposal that airborne and maritime earth stations in motion (ESIMs) continue to be allowed to communicate with geostationary FSS space stations in the 27.5-28.35 GHz band on a case-by-case basis on conditions of no-interference, no-protection and that land-based ESIMs be prohibited from communicating with FSS space stations. The RABC recommends that the Department consider the outcomes of U.S. and international studies in this matter.

***Question 6-2: ISED is seeking comments on the moratorium for new site-specific fixed service licences as described above.***

22. The RABC supports the imposition of a moratorium on new site-specific fixed service licences. Continued licensing in the band could create additional uncertainty prior to auction for flexible use services, resulting in potentially difficult negotiations between future site-specific fixed-only licensees and new flexible use licensees. The deployment of fixed links would also further complicate the sharing between flexible use services and other services, such as the FSS. The RABC concurs with the Department that there will be no detrimental effect as a result of this moratorium, since there have been no FS licences issued to date in this band.

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<sup>8</sup> Petitions for Reconsideration have been filed by the satellite industry and are pending before the FCC. Refer to *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, *Report and Order and Further Notice of Proposed Rulemaking*, FCC 16-89 (Jul. 14, 2016)

**Question 6-3: ISED is seeking comments on its proposal to adopt the band plan (as shown in figure 3 above) in the 28 GHz band.**

23. RABC supports the Department’s proposal to adopt the band plan (as shown in Figure 3 of the Consultation) in the 28 GHz band, harmonizing with the U.S. band plan in order to take advantage of the equipment ecosystem that will be made available for the U.S. market and to simplify coordination between terrestrial services along the Canada-U.S. border.

**Question 6-4 A: ISED seeks comments on its proposal to require site-by-site coordination between proposed flexible use terrestrial stations and FSS earth stations in the 28 GHz band when a pre-determined trigger threshold is exceeded.**

24. The RABC agrees with the Department’s differentiation between two categories of potential earth station to terrestrial interference to deal with in the 28 GHz band: (i) “existing” FSS earth stations into proposed flexible use terrestrial stations and (ii) “future” FSS earth stations into proposed flexible use terrestrial stations.
25. For clarity, in this submission, the term “existing” includes an FSS earth station that is either licensed for operation, as listed in Annex A of the Consultation, or for which a licence application has been received by the Department no later than the date of publication of the Consultation and for which a licence is subsequently granted by the Department.<sup>9</sup> For further clarity the existing category does not include new earth stations associated with existing authorizations, for which applications were received by the Department after the date of publication of the Consultation. The RABC recommends that the “existing” FSS earth stations as so defined be grandfathered as detailed in the response to Question 6-7.
26. All other FSS earth station applications would fall into the “future” category. The RABC recommends that future earth stations should be licensed only if, in the Department’s view, they would comply with the intent of the proposed footnote C47C. In its response to Question 6-5 B, the RABC recommends a specific framework and offers to develop, in the near term via an RABC technical study group, specific geographic restrictions that would guide the Department in assessing applications for future earth stations. Once licensed in accordance with the technical criteria and geographic constraints, such FSS earth stations in the 28 GHz band would have the right to operate in accordance with their licence conditions (as amended from time to time) agreed by the earth station

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<sup>9</sup> Due to the Department’s moratorium on NGSO applications (imposed on June 15, 2016 and lifted on June 26, 2017), for NGSO FSS systems that have been authorized by the Department as of August 9, 2017, the associated feeder link earth stations need also be considered to be existing earth stations.



licensee. As such, the RABC recommends that future earth station siting in the 27.5-28.35 GHz band must consider planned terrestrial flexible use stations as well as deployed flexible use stations.

27. Based on the expected small number of existing and future FSS earth stations, the RABC believes that it is appropriate and manageable to adopt a site-by-site coordination process between proposed flexible use terrestrial stations and existing and future FSS earth stations. The RABC agrees with the Department's proposal to apply, for the purpose of domestic coordination, the existing site-by-site coordination process as described in Paragraphs 31 and 32 of the Consultation and in Annex A "Coordination of Frequency Assignments" of CPC 2-6-01. It is also RABC's view that the use of an appropriate trigger mechanism to initiate coordination is the best way to efficiently manage FSS and flexible use terrestrial stations operators' resources so that detailed interference analysis is required only for cases identified through such a trigger mechanism.
28. Finally, the RABC agrees that this coordination process is independent of the flexible use terrestrial services licensing method that is adopted (i.e. whether on a site-by-site or area basis).

***Question 6-4 B: If site-by-site coordination is proposed, what coordination trigger and value would be the most appropriate (e.g. PFD or distance threshold)?***

29. The RABC believes that the use of a PFD trigger mechanism to initiate the site-by-site coordination process would be appropriate. The RABC proposes that an FSS earth station that generates a PFD equal or greater than some to-be-determined threshold into a deployed or planned flexible use terrestrial station coverage area would require a detailed interference analysis. Such an approach would allow operators to identify flexible use terrestrial stations or FSS earth stations with which detailed coordination would be required, without performing time consuming and detailed calculations every time a new station is planned.
30. Within the coordination zone, where the trigger value may be exceeded, the RABC understands that coordination involving both flexible use terrestrial stations and FSS earth station specific parameters would be required to allow coexistence. (Refer also to footnotes C47A and C47C as well as Paragraph 33 below.)
31. The RABC notes that the Department has cited in the Consultation preliminary studies indicating a separation distance of between 50 meters and 400 meters is required. The FCC has set a PFD of  $-77.6 \text{ dBm/m}^2/\text{MHz}$  at 10 meters above ground level as the threshold at which population coverage is calculated and coordination required. The RABC is not aware of an industry-agreed trigger in the 28 GHz band and therefore proposes to initiate

a study to determine the appropriate PFD coordination trigger for FSS and flexible use terrestrial station operators. The RABC believes that such a study needs to be carried out in the near-term.

***Question 6-4 C: ISED is also inviting proposals for specific technical rules on proposed flexible use stations and FSS earth stations (e.g. site shielding) that could facilitate more efficient sharing between terrestrial and earth stations.***

32. As pointed out in the Consultation, in the 28 GHz band flexible use terrestrial stations may be subject to interference from the emissions of an FSS earth station. The RABC agrees with the Department that site shielding of future earth stations may be an efficient way to limit potential interference to flexible use terrestrial stations, thus providing additional flexibility in potential earth station siting without impacting deployment of flexible use terrestrial stations. However, the RABC believes that the decision to implement site shielding as a means to effect successful coordination should rest with the earth station licence applicant because in some cases it may be more cost effective for the earth station applicant to employ other means to reduce interference and successfully coordinate. Site shielding should not be mandated by the Department for every future earth station.

***Question 6-5 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 28 GHz band.***

33. The RABC notes that the priority of flexible use terrestrial stations over future (as defined in the response to Question 6-4 A) FSS earth stations in the 28 GHz band is provided in proposed footnotes C47A and C47C. In order to provide the most flexibility in fulfilling the requirements of flexible use terrestrial services while at the same time not excessively limiting earth station siting options, the RABC proposes to initiate a study in short order to determine appropriate restrictions on geographic areas in which future earth stations may be located. This will be undertaken concurrently with the study proposed by the RABC in response to Question 6-4 B.
34. The RABC recommends that the Department take into account the results of the study when it adopts earth station siting restrictions and that these restrictions be referenced in SP3-30 GHz.

**Question 6-5 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.**

35. The RABC recognizes that terrestrial flexible use 5G in the 27.5-28.35 GHz band is expected to be deployed in areas with high concentrations of people. Any licensing of proposed future earth stations in populous areas needs to be carefully considered by the Department in order to fulfil the relative priority as proposed in footnotes C47A and C47C of the Consultation. However, the determination *a priori* of simple criteria is difficult, in light of:
- The stochastic nature of propagation and multipath effects and therefore interference levels;
  - The stochastic nature of earth station antenna pointing (and therefore gain towards a victim terrestrial receiver) for earth stations in an NGSO network;
  - The variability of population over the long term and even the short term in response to special events; and,
  - The interference caused by existing earth stations.
36. As noted in response to Question 6-5 A, the RABC proposes to initiate a study to determine appropriate restrictions on geographic areas in which future earth stations may be located. Such a study would facilitate the successful frequency coordination of future FSS earth stations and planned or deployed flexible use terrestrial stations. This study should define recommendations for the following:
- a. The area over which any FSS earth station cannot generate a PFD in excess of various thresholds, each potentially associated with a percentage of time
  - b. The height above ground level at which the PFD thresholds would apply
  - c. The allowable affected population metric in terms of an absolute number per future earth station (calculated as the population of the area where the future earth station exceeds the PFD coordination trigger)
  - d. Specific definitions for exclusion zones containing high transient populations that earth station coverage could not overlap such as:
    - Sport and cultural event venues of a certain size
    - Material urban highways, arterial streets and mass transit system routes based on some form of standardised classification
    - The named (or otherwise defined) major cruise ship ports, railway stations and airports in Canada
  - e. Potentially an allowable affected population metric to account for the effect of multiple authorized earth stations that affect the same Tier 4 Service Area in terms of the percentage of population in a Tier 4 Service Area. As a reference and noting that these metrics were developed for U.S. counties which are different than Canadian Tier 4 Service Areas, the RABC notes that despite the FCC proposing to implement a

flat 0.1% metric, in the U.S., the “Satellite Broadband Companies”<sup>10</sup> proposed a tiered approach which would allow all future FSS earth station in the band in a service area to jointly cover:

- Up to 10% of the population of very low populated service areas containing a population of less than 6,000
- Up to 600 people in service areas containing a population of between 6,000 and 300,000
- And up to 0.2% of the population of highly populated service areas containing a population of 300,000 or more

f. The manner in which to account for the planned deployments of flexible use terrestrial stations in the long term.

37. The first two items listed above (a) and (b) are strictly technical. They are important and they guide the analysis of the balance of the items (c) through (f) which the RABC notes are largely policy driven.
38. The RABC also recommends that if an FSS earth station applicant or licensee in the 27.5-28.35 GHz band enters into an agreement with a flexible use terrestrial stations’ licensee, the operations of both parties’ networks should be governed by that agreement, except when the Department does not accept the agreement.

***Question 6-6: ISED is seeking comments on whether it should impose any limits on the aggregate emissions of the terrestrial services. If limits are proposed, ISED is inviting detailed proposals on why they should be implemented, and what the limits should be.***

39. The RABC agrees with the Department that the 5G technologies contemplated for the 27.5-28.35 GHz band will tend to limit transmissions towards the space stations due to dynamic beamforming with very narrow beam widths. The RABC agrees with the Department that given the operational characteristics of both the new flexible use systems and satellite stations, harmful interference due to aggregate interference from flexible use services to space stations is not likely.
40. The RABC notes that there could be inherent difficulties in attempting to set and enforce aggregate limits across multiple operators as this would imply that there would need to be some mechanism to allot the total allowable flexible use stations among multiple operators. Further, should aggregate interference become a concern it would be extremely difficult to undertake corrective action.

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<sup>10</sup> The “Satellite Broadband Companies” include Boeing Company, Echostar Satellite Operating Corporation, Hughes Network Systems, LLC, Inmarsat, Inc., Intelesat Corporation, O3B Limited, SES Americom, Inc., and Worldvu Satellites Ltd. d/b/a Oneweb.

41. However, as the Department also notes, unlike in the U.S., fixed-satellite services operate on a co-primary basis in Canada. The RABC agrees with the Department to not propose at this time any limits on the aggregate power levels produced by flexible use systems, but the Department may wish to consider applying limits on skyward transmissions from individual terrestrial stations. The RABC proposes to initiate a study to provide guidance on this matter. The RABC notes that the ITU sets limits on terrestrial emissions.

***Question 6-7: ISED proposes that all existing FSS earth stations and those in applications pending approval for operation would be permitted to continue to operate under the current conditions of licence as described above. Comments are sought on this proposal.***

42. The RABC agrees with the Department that existing earth stations (as defined in the response to Question 6-4 A) should be grandfathered. That is, they should have the right to operate in accordance with their licence conditions and under their approved operating parameters without any additional constraints (other than those agreed by the earth station licensee), irrespective of new flexible licensing activity in their vicinity.
43. The existing FSS feeder link earth stations listed in Annex A of the Consultation, operating in accordance with their current licence conditions are seen by the RABC to pose minimal constraints on the deployment of fixed service systems and mobile service systems.
44. There is one LEO application covering the 27.5-28.35 GHz band that the Department has deemed to be in process. If authorized, the RABC agrees that the initial earth station(s) associated with this application be classified as existing earth station(s) and therefore not subject to potential new geographic restrictions on earth station siting. However, the RABC recommends that the Department should approve the siting of such earth station(s) with consideration of the Department's intent for the 27.5-28.35 GHz band. That is, while not explicitly subject to potential new geographic restrictions on earth station siting, the RABC recommends that the Department work with the applicant to determine siting(s) that are likely to pose minimal constraints on the deployment of fixed service systems and mobile service systems.

***Question 7-1: ISED is seeking comments on the proposal to implement flexible use licensing in the frequency band 37-40 GHz, including the consequential changes to CTFA footnote C51, while continuing to allow for fixed-satellite service (space-to-Earth) in the band.***

45. The RABC supports the Department's proposal to introduce flexible use fixed and mobile services licensing in the 37-40 GHz band, including consequential changes to the CTFA domestic footnote C51, while continuing to allow for fixed-satellite service (space-to-Earth) in the band.

46. The RABC recommends that the Department consider improving the clarity of or defining the word “large” in the footnotes. To make it clear that the bands are not to be considered for blanket licensing of earth stations in the 37-40 GHz band, the addition of “to be individually licensed” would be helpful.
47. Following the rationale provided in the response to Question 6-1, the RABC proposes changes to the wording of footnote C51:

MOD C51 (CAN-17) The frequency band 37.5-40 GHz is being licensed for applications in the fixed and mobile services, which will be given priority over fixed-satellite service systems sharing this frequency band on a co-primary basis. Fixed-satellite service implementation in this frequency band will be limited to applications that will pose minimal constraints upon the deployment of fixed and mobile service systems, such as a small number of [large] antennas to be individually-licensed for feeder links

***Question 7-3: ISED is seeking comments on the proposal to adopt the band plan as shown in figure 7 for the frequency band 37-40 GHz.***

48. RABC supports the Department’s proposal to adopt the band plan (as shown in Figure 7 of the Consultation) for the frequency band 37-40 GHz, harmonizing with the U.S. band plan to leverage equipment ecosystem developments in the U.S. and to simplify coordination between terrestrial services along the Canada-U.S. border.

***Question 7-4 A: ISED seeks comments on the proposal to require site-by-site coordination between proposed flexible use terrestrial stations and FSS earth stations in the frequency band 37.5-40 GHz when a pre-determined trigger threshold is exceeded.***

49. The RABC agrees with the Department’s differentiation between two categories of potential interference to deal with in the 37-40 GHz band: (i) flexible use stations into “existing” FSS earth stations and (ii) flexible use stations into “future” FSS earth stations. Please refer to response to Question 6-4 A for the definition of “existing” and “future” earth stations. It is understood that there are no FSS earth stations currently in operation in the 37-40 GHz band and that one application submitted to the Department is being reviewed.
50. Therefore, based on the expected limited number of earth stations and the modified footnote C51 as proposed in the Consultation, the RABC sees as appropriate and manageable the development of a site-by-site coordination process between proposed

flexible use terrestrial stations and FSS earth stations. The RABC agrees with the Department's proposal to apply the existing site-by-site coordination process described in Paragraphs 31 and 32 of the Consultation and in Annex A "Coordination of Frequency Assignments" of CPC 2-6-01 for domestic coordination. It is also the RABC's view that the use of a relevant trigger to initiate coordination is the best way to efficiently manage FSS and flexible use stations operators' resources by requiring detailed interference analysis only for cases identified through such a trigger mechanism.

***Question 7-4 B. If site-by-site coordination is proposed, what coordination trigger and value would be the most appropriate (e.g. PFD or distance threshold)?***

51. RABC believes that the use of a PFD trigger mechanism to initiate site-by-site coordination process would be appropriate. Such an approach would allow identifying flexible use terrestrial stations and FSS earth stations for which detailed coordination would be required, without performing time consuming and detailed calculations every time a new station is planned.
52. Once the PFD trigger value is exceeded, the RABC understands that a detailed coordination involving both flexible use terrestrial station and FSS earth station specific parameters would be required to allow coexistence of both services.
53. Although RABC notes that the Department has cited in the Consultation preliminary studies indicating a separation distance of no more than 2 km would be required, the RABC is not aware of any industry-agreed trigger (either distance or PFD) in the 37-40 GHz band. Therefore, as in the case of the 28 GHz band and as discussed in the response to Question 6-4 B, the RABC proposes to initiate a study to determine the appropriate PFD coordination trigger for FSS and flexible use terrestrial stations' operators. The RABC believes that such a study needs to be carried out in the near-term.

***Question 7-4 C. ISED is also inviting proposals for specific additional technical rules on flexible use stations and FSS earth stations (e.g. site shielding) that could facilitate more efficient sharing between terrestrial and earth stations.***

54. As pointed out in the Consultation, in the 37-40 GHz band, an FSS earth station can be subject to interference from the emissions of flexible use terrestrial stations. RABC is of the view that earth station site shielding could in some cases be an efficient way to facilitate coordination and allow deployment of a future earth station. Similarly, elevation angle restrictions or other measures on new flexible use terrestrial stations could facilitate coordination with an existing FSS earth station. However, the decision to implement such measures as a means to effect successful coordination should rest with

the operators involved and not be mandated, because in some cases it may be more cost effective to employ other means to reduce interference and successfully coordinate.

***Question 7-5 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 37.5-40 GHz.***

55. The RABC notes that the priority of flexible use terrestrial stations over future (as defined in the response to Question 6-4 A) FSS earth stations in the 37-40 GHz band is provided in the proposed footnote C51. In order to provide the most flexibility in fulfilling the requirements of flexible use terrestrial services while at the same time not excessively limiting earth station siting options, the RABC proposes to initiate a study in short order to determine the appropriate restrictions on geographic areas in which future earth stations may be located. This will be undertaken concurrently with the other studies proposed by the RABC.
56. The RABC recommends that the Department take into account the results of the study when it adopts earth station siting restrictions and that these restrictions be referenced in an appropriate Department document.

***Question 7-5 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?***

57. The RABC recognizes that terrestrial 5G flexible use in the 37-40 GHz band is expected to be deployed in areas with high concentrations of people. Any licensing of proposed future earth stations in populous areas needs to be carefully considered by the Department in order to fulfil the relative priority as proposed in footnote C51 of the Consultation.
58. The RABC believes that the spirit and intent of the proposed footnote C51 is to site future (as defined in the response to Question 6-4 A) FSS earth stations in the 37-40 GHz band in geographical areas that would pose minimal constraints on the delivery of flexible use terrestrial services.
59. Although the interferer and victim in the 37-40 GHz band differ from those in the 28 GHz band, the RABC believes that similar issues need to be addressed in both bands. Therefore, the RABC suggests that the study recommended in response to Question 6-5 B include both the 28 GHz and 37-40 GHz bands.
60. A study to determine the appropriate restrictions on geographic areas in which future earth stations in the 37 - 40 GHz band may be located would facilitate the successful



frequency coordination of future FSS earth stations and planned or deployed flexible use terrestrial stations. This study should define the following as related to geographic protection zones for future FSS earth stations in the 37.5-40 GHz band:

- a. The appropriate criteria and methodology to be used to establish protection zones for FSS earth stations
- b. The allowable affected population metric in terms of an absolute number per future earth station (calculated as the population of the area within the protection zone)
- c. Specific definitions for exclusion zones containing high transient populations which protection zones could not overlap such as:
  - Sport and cultural event venues of a certain size
  - Material urban highways, arterial streets and mass transit system routes based on some form of standardised classification
  - The named (or otherwise defined) major cruise ship ports, railway stations and airports in Canada
- d. Potentially an allowable affected population metric in terms of the percentage of population in a Tier 4 Service Area to account for the effect of multiple authorized earth receiving stations that affect the same Tier 4 Service Area. As a reference and noting that these metrics were developed for U.S. PEAs (partial Economic Areas) which are different than Canadian Tier 4 Service Areas, the RABC notes that despite the FCC proposing to implement a flat 0.1% metric, in the U.S., the “Satellite Broadband Companies”<sup>11</sup> proposed a tiered approach which would allow all future FSS earth station protection zones in the band in a service area to jointly cover:
  - Up to 5% of the population of service areas containing a population of less than 60,000
  - Up to 3000 people in service areas containing a population of between 60,000 and 1,500,000
  - And up to 0.2% of the population of highly populated service areas containing a population of 1,500,000 or more
- e. The manner in which to account for the planned deployments of flexible use terrestrial stations in the long term.

61. The first item listed above (a) is strictly technical. It is important and will guide the analysis of the balance of the items (b) through (e) which the RABC notes are largely policy driven.

62. RABC also recommends that if an FSS earth station applicant or licensee in the 37-40 GHz band enters into an agreement with a flexible use terrestrial stations’ licensee, the

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<sup>11</sup> The “Satellite Broadband Companies” include Boeing Company, Echostar Satellite Operating Corporation, Hughes Network Systems, LLC, Inmarsat, Inc., Intelesat Corporation, O3B Limited, SES Americom, Inc., and Worldvu Satellites Ltd. d/b/a Oneweb.

operations of both parties shall be governed by that agreement, except when the Department does not accept the agreement.

***Question 7-6: It is proposed that, should SRS and/or MSS systems be deployed, flexible use licensees in the band 37.6-40 GHz may be subject to technical provisions to facilitate co-existence. Comments are sought. ISED notes that any such technical provisions would be established through a future consultation process.***

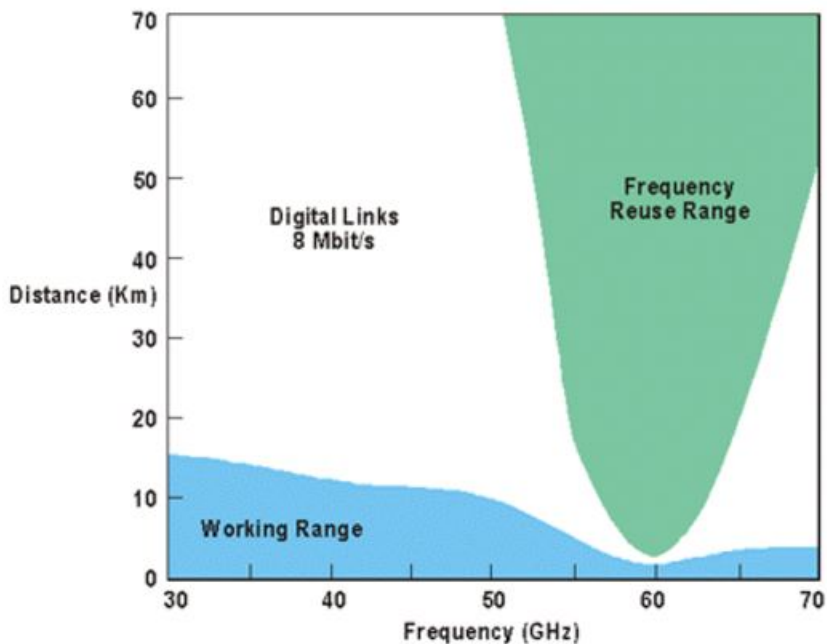
63. The RABC agrees with the Department that, should Space Research Service and/or Government of Canada MSS systems be deployed in the 37.6-40 GHz bands, any measures to facilitate co-existence should be established following a future consultation process.

***Question 8-1: ISED is seeking comments on its proposal to designate the band 64-71 GHz for licence-exempt operations on a no-protection, no-interference basis.***

64. The RABC agrees with the Department's proposal to designate the band 64-71 GHz for licence-exempt operations on a no-protection, no-interference basis, in order to harmonize with the FCC, allowing Canadians to benefit from the large U.S. ecosystem and prevent cross border interference issues.
65. As shown in the figure<sup>12</sup> below, minimum frequency reuse distance is achieved at 60 GHz. In contrast, the improved propagation conditions in 64-71 GHz makes it better suited for supporting licence-exempt mobile services for 5G (when compared to the frequencies around 60 GHz).

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<sup>12</sup> Source: FCC Bulletin 70A, 1999



**Question 9-1 A: ISED is seeking comments on whether flexible use access in these bands should be exclusively licensed or licence-exempt.**

66. The RABC recommends that in the 28 GHz and 37-40 GHz bands, terrestrial flexible use services should be based on exclusively licensed spectrum. This would create a more certain environment for investment and would permit service providers to be more certain about the quality of service that can be offered.
67. In addition, exclusively licensed spectrum will also help facilitate the coordination (as discussed in response to the questions posed in sections 6 & 7 of the Consultation), between flexible use licensees and other services, such as earth station operators in the FSS. Licences should be flexible for service providers to deploy different services including fixed service, mobile service or a dynamically changing combination of fixed and mobile services.
68. There is currently 0.648 GHz of exclusively licensed spectrum for mobile services in Canada while there is roughly 8 GHz of licence exempt spectrum. The Department is proposing to designate 7 GHz (64-71 GHz) of the 10.85 GHz associated with the three bands in the Consultation for licence-exempt use. The RABC supports the designation of roughly 15 GHz of spectrum to licence-exempt use but given all the other reasons noted above recommends that the flexible use licences in the 28 GHz and 37-40 GHz bands be exclusively licensed and not licence-exempt.

**Question 9-1 B: If a licensing approach is proposed, which types of licences (radio licences, spectrum licences with user-defined licence areas, spectrum licences with service areas for competitive licensing, or others) are expected to best lend themselves to licensing flexible use in the 28 GHz and 37-40 GHz frequency bands in order to support a variety of 5G technologies, applications and business cases?**

69. The RABC recommends that the Department issue spectrum licences with service areas for competitive licensing as opposed to any of the other options.
70. As the coverage area of a flexible use terrestrial station in the subject bands will be relatively small, a very large number of terrestrial stations will be required to fulfil the customers' expectations for the service. Given this high density of deployment, the RABC notes that a flexible use terrestrial licensing model based on service areas rather than site-by-site licensing would be more suitable in minimizing the administrative burden. It would be highly inefficient to have to individually licence every small cell with a radio licence. Similarly, spectrum licences with user-defined licence areas (i.e., grid cells) would be slightly less taxing but would still be overly cumbersome and neither of these approaches would be suitable for an auction of 5G mmWave spectrum. Only the Department's service areas for competitive licensing would be appropriate from an administrative perspective and an assignment perspective.

**Question 9-1 C: ISED is seeking comments on whether a licence-exempt dynamic access using data base should be implemented in all, or portions of the 28 GHz, 37-40 GHz, particularly in the band 37-37.6 GHz.**

71. In the case of the 28 GHz and 37.6-40 GHz bands, the RABC does not support licence-exempt dynamic access using a database. Some of the reasons are:
  - a. The main purpose of dynamic access using a database is to protect incumbents that have variable usage conditions (location, time etc.). In this case, there are no such incumbents.
  - b. There are additional costs and complexity associated with dynamic access using a database (devices, development and maintenance of a database etc.).
  - c. A dynamic access system would create uncertainties which would limit investment in 5G mmWave networks.
72. With respect to the 37-37.6 GHz band, since Canada does not have to deal with incumbent government users in this portion of the band, the RABC recommends it should avoid the costs and complexities of using dynamic access. It is noted that if the U.S.

doesn't adopt dynamic access using a database for 37-37.6 GHz, it would almost certainly not be economically viable for Canada to adopt such an approach on its own.

## Annex A

73. While developing the RABC response to SLPB-001-17, RABC committee members identified requirements to study the following:
1. an appropriate coordination trigger in the 28 GHz band;
  2. appropriate FSS transmit earth station geographic restrictions in the 28 GHz band;
  3. an appropriate coordination trigger in the 37-40 GHz band;
  4. appropriate FSS receive earth station geographic restrictions in the 37-40 GHz band;  
and
  5. potential limits, if any, on emissions of terrestrial stations toward the sky to prevent harmful interference to space stations in the 28 GHz band.
74. Specific recommendations regarding the studies can be found in the responses to questions 6-4A, 6-4B, 6-5A, 6-5B, 6-6, 7-4A, 7-4B, 7-5A and 7-5B.
75. RABC has created a technical study working group, comprising of technical experts from RABC members, to study these issues in collaboration with the Department. While the Board is prepared to host the studies, participation by the Department is vital to the success of the activity. RABC believes the studies need to be carried out in the near term.

### End of Submission ####