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Subject: **Consultation SMSE-014-20, Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band – Comments**

BCE Inc. is pleased to submit the attached Comments to the Department's above-noted consultation.

Yours truly,

[Original signed by M. MacInnis]

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Attachment

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CANADA GAZETTE NOTICE NO. SMSE-014-20

**CONSULTATION ON THE TECHNICAL AND
POLICY FRAMEWORK FOR LICENCE-EXEMPT USE
IN THE 6 GHZ BAND**

**PUBLISHED IN THE CANADA GAZETTE, PART 1
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**COMMENTS
OF
BCE INC.**

19 JANUARY 2021

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1.0 **INTRODUCTION**

1. In accordance with the procedure set out by Innovation, Science and Economic Development Canada (the Department or ISED) in Notice No. SMSE-014-20, *Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band* (the Consultation), issued in the Canada Gazette, Part 1 on 5 December 2020, we are providing our Comments on behalf of BCE Inc. on the proposed license-exempt use in the 6 GHz band (5925 – 7125 MHz).

2. It is timely that the Department is consulting on the use of this spectrum given a number of key international (U.S., Europe, U.K. and South Korea) developments in the 6 GHz band. The above noted countries have all decided to move forward with either making the entire frequency range (i.e., 5925 – 7125 MHz) or a subset of the range available for a variety of different licence-exempt use cases.

3. While we support the use of this band for new licence-exempt services, it is heavily used by existing services including Fixed Services (FS), Fixed Satellite Services (FSS) and radio astronomy. Other licensed and licence-exempt applications such as Licensed Wireless Microphones and other low-power apparatus (e.g., cameras), which are used primarily by broadcasting and media companies and which can be licensed, also utilize the 6 GHz spectrum.

4. As existing licensees of FS for backhaul, FSS and broadcasting applications such as Electronic News Gathering (ENG) and other low-power devices (i.e. wireless microphones/cameras etc.), we concur with the Department that the future availability and use of additional licence-exempt spectrum in this frequency range must ensure protection of all existing licenced systems. It is important that these systems, including FS, FSS, television auxiliary systems and radio astronomy are protected and any interference risks are mitigated or resolved in a timely manner.

5. An Automated Frequency Coordination (AFC) system intended to facilitate the sharing of spectrum with existing users could, in principle, be effective. However, given the early stage of development of AFC systems and uncertainty as to how effective they will be in protecting existing incumbent services, the Department should postpone the decision regarding standard-power operation. This is particularly important given the number of incumbent systems operating in the band, which include many public safety systems. A decision should be made after the Department has had an opportunity to observe and evaluate AFC system implementation in the U.S. and has a better understanding of its overall effectiveness in protecting existing users. We are also

concerned about the potential interference from very low power systems to incumbent operations given that these systems are proposed to operate outdoors without relying on an AFC. As a result, the Department should also postpone the decision related to very low power operations until a decision is made in the U.S.

6. As the Department indicated in the Consultation¹ the International Telecommunications Union (ITU) is currently studying, as part of this study cycle, as Agenda Item 1.2 of the 2023 World Radiocommunication Conference (WRC-23) whether parts of the 6 GHz band could be identified for International Mobile Telecommunications (IMT) to support commercial mobile broadband services. Specifically, the WRC agenda item is considering whether to identify spectrum for IMT in the upper portion (6425 – 7025 MHz) of the 6 GHz band as well as in the 7025 – 7125 MHz band globally. While we recognize the benefit of making additional licence-exempt spectrum available, we recommend that the Department consider delaying any decision on the use of the upper 6 GHz band (6425 – 7125 MHz) until more clarity on the global ecosystem is achieved following the decision at WRC-23.

7. We believe that 500 MHz from the lower half of the band will provide sufficient spectrum for licence-exempt use cases. We recommend that the Department delay the decision on the upper half of the band until the outcome of WRC-23 is known. This provides a unique opportunity to balance the requirement of licence-exempt and licensed spectrum and provide maximum economic and societal benefits to Canadians.

8. As noted by the Department² a viable equipment ecosystem is emerging for Radio Local Area Networks (RLAN) in the 6 GHz band, focusing on two technologies: Wi-Fi 6E and 5G New Radio-Unclassified (NR-U). In the future, it is likely that additional technologies that operate in the band will be developed. Therefore, we encourage the Department to adopt a technology neutral approach and allow additional compliant technologies to be deployed in the band as they become available.

9. Currently, the Canadian Table of Frequency Allocations (CTFA) listing for the 5925 – 7125 MHz band is not consistent with the allocation of the band in the International Radio Regulations (RR). We therefore recommend that the Department update the CTFA by allocating 5925 – 7125 MHz to the MOBILE service in accordance with the RR.

¹ Consultation, paragraph 21.

² Consultation, paragraph 30.

10. In the remainder of the Comments, we respond to the Department's questions in the order in which they appear in the Consultation.

2.0 DEVELOPMENT OF THE 6 GHZ LICENCE-EXEMPT ECOSYSTEM

Q1. ISED is seeking comments on the timelines for the availability of:

- a) low-power equipment ecosystems, both Wi-Fi 6E and 5G NR-U**
- b) standard-power equipment ecosystems, both Wi-Fi 6E and 5G NR-U, under the control of an AFC**
- c) AFC**

11. While it is recognized that there are two leading candidate technologies emerging for use in the 6 GHz band (i.e., Wi-Fi 6E and 5G NR-U) we encourage the Department to adopt a technology neutral approach and allow any compliant technology to be deployed for use in the band.

12. The device and equipment ecosystem for licence-exempt use in 6 GHz band is at its very early stages. The development of the ecosystem began with the Federal Communications Commission (FCC) decision in April of 2020³ to allow unlicensed use in the band. The Wi-Fi Alliance, a worldwide association of companies responsible for certifying Wi-Fi equipment, has since expanded its Wi-Fi certified 6 certification⁴ to include Wi-Fi 6E⁵. The Third Generation Partnership Project (3GPP) introduced band n96, which covers the entire 1200 MHz from 5925 – 7125 MHz, for 5G licence assisted use in the unlicensed spectrum. The FCC authorized the first Wi-Fi device using this band recently on 7 December 2020⁶.

13. The indoor low power Wi-Fi access points and devices are expected to become available in the U.S. market in 2021 following recent developments as a result of the FCC's April 2020 decision. However, the AFC controlled standard power equipment ecosystem is expected to lag the availability of low power equipment. The standard power equipment ecosystem depends on the AFC for its operation, as it will receive the list of permitted frequencies from the AFC. The development of standard power equipment will follow the finalization of the AFC operational details such as the communication interface and security protocols.

³ FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses <https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses>.

⁴ Wi-Fi 6E expands Wi-Fi® into 6 GHz https://www.wi-fi.org/download.php?file=/sites/default/files/private/Wi-Fi_6E_Highlights_20200423.pdf.

⁵ Wi-Fi 6E is the industry name for users to identify Wi-Fi devices that will operate in 6 GHz.

⁶ Chairman Pai statement on FCC authorization of first 6 GHz Wi-Fi device <https://docs.fcc.gov/public/attachments/DOC-368593A1.pdf>.

14. The 3GPP equipment ecosystem is expected to develop because of the interest that U.S. Mobile network operators take in the use of band n96 for 5G NR-U. Additionally, suppliers of the 5G NR-U ecosystem and Wi-Fi ecosystem will need to conduct co-existence studies and develop protocols in order to address issues related to co-existence. The absence of such studies and uncertain AFC specifications indicate that significant work remains in the development of an ecosystem for standard power licence-exempt use in this band. In early 2021, 3GPP will discuss the need for a new band for NR-U operations in the 5925 – 6425 MHz band in accordance with European regulations. Another alternative being considered for the 5925 – 6425 MHz band is updating the existing 3GPP band n96 with appropriate network signaling.

15. The U.K. has allowed indoor low power unlicensed use in the lower part (5925 – 6425 MHz) of the band and South Korea has allowed it across the entire 1200 MHz. We expect that this will lead to further development of the Wi-Fi low power ecosystem. The development of 5G NR-U is dependant on the interest that the mobile operators show in utilizing this band for 5G unlicensed use. At this time, we have significant concerns about the economic and technical feasibility of deploying 5G NR-U in low and standard power configurations due to the limited coverage that results from the low permissible power and lack of coexistence protocols with Wi-Fi.

16. AFC systems are currently only being developed in the U.S. after the recent FCC decision. It is important to note that the initial interest in developing the AFC system is coming from existing Citizens Broadband Radio Service (CBRS) Spectrum Access System (SAS) administrators⁷. We expect that further development in the AFC ecosystem will take place after the finalization of operational parameters in the U.S.

17. In summary, we believe that the ecosystem for indoor low power Wi-Fi devices and access points will develop in the near term and we expect to see products becoming available starting in 2021. However, the standard power ecosystem is dependent on the finalization of the AFC operational parameters, the availability of AFC systems and the business case of operators planning to deploy standard power networks. Additional factors such as co-existence studies leading to protocol development will lead to 5G NR-U equipment development only if it makes it a viable business case for mobile operators. We do not see definitive timelines for any equipment other than Wi-Fi based indoor low power at this time.

⁷ Federated Wireless Extends Spectrum Controller to the 6 GHz Band to Accelerate Wi-Fi 6 and 5G Service Delivery <https://www.federatedwireless.com/federated-wireless-extends-spectrum-controller-to-the-6-ghz-band-to-accelerate-wi-fi-6-and-5g-service-delivery/>.

3.0 CHANGES TO THE SPECTRUM UTILIZATION FOR THE 6 GHZ BAND

Q2. ISED is seeking comments on its proposals to allow licence-exempt RLAN use in the 5925-7125 MHz band.

18. We have major concerns with the Department's proposals to allow licence-exempt use in the 5925 - 7125 MHz band and do not agree with these proposals. The band is not only being used by a number of incumbent services, which need to be protected, but also presents the last available possibility to free up mid-band spectrum for licensed fixed and mobile 5G services in Canada.

19. The band is being used by FS, FSS and TV auxiliary services. As per ISED's Spectrum Management System (SMS) database, there are presently 17,225 licensed FS links and 892 licensed FSS earth stations across the 5925 – 7125 MHz band. The point-to-point fixed links in the band provide critical services across Canada including public safety, data and voice connectivity. The propagation characteristics of the band make it ideal for long haul point-to-point links and it is extensively used for providing voice and data connectivity to communities across Canada. The lower portion of the band (5925 – 6425 MHz) is used to transmit C-band signals from earth stations to satellites. The C-band provides essential connectivity to communities and users across the north of Canada in places where no other form of connectivity is available. These satellite dependent areas rely on C-band for their connection to the rest of the world. The upper portion of the band (6590 – 6770 MHz and 6930 – 7125 MHz) is used for TV auxiliary services for ENG and video transmission.

20. ISED's proposals to allow outdoor use of standard and very low power licence-exempt devices in this band present a major concern for incumbent users. We make extensive use of point-to-point microwave links, FSS earth stations and TV auxiliary services in the band. The licence-exempt devices have the potential to cause harmful interference to incumbents resulting in disruption of critical services. Although ISED's proposal addresses the protection of incumbent services through the use of AFC for standard power devices, we believe that the proposed measures⁸ are insufficient at this time for the protection of incumbent services. Below, we provide our views on the three proposed licence-exempt applications.

⁸ The use of AFC for protecting incumbents from standard power operations and use of maximum power limits for low and very low power operations to protect incumbents. Consultation paragraphs 55, 61 and 63.

Standard power licence-exempt use

21. We are opposed to standard power licence-exempt use in the band because there is a significant risk that such use could cause harmful interference to incumbent operations when operating at the proposed power levels. We are also concerned, for the reasons explained below, that the AFC would be unable to provide the protection needed by incumbents.

22. First, the effectiveness of an AFC system to protect incumbents in the 6 GHz band has not yet been established. Incumbent users in the U.S. have expressed concerns that the protection offered by the proposed AFC, which is based on averages and statistical propagation models, will be insufficient⁹. Specifically, the design of the AFC in the U.S. is based on activity factors¹⁰ of licence-exempt Wi-Fi devices and relies on probabilistic data¹¹. While propagation models are generally used with certain probabilistic assumptions for planning purposes, we question their ability to protect critical incumbent services at all times, e.g., public safety and voice and data connectivity. Even intermittent service disruptions, which would be expected based on probabilistic modelling assumptions, are not acceptable for certain incumbent applications.

23. Second, the FCC decision does not enforce the use of any technology or protocols for licence-exempt devices to avoid interference and provides no plan to mitigate the interference once it occurs.¹² This is a major concern for incumbents because the standard power devices may be mobile and could have a line of sight to incumbent receivers while operating at the proposed power levels. If not coordinated and mitigated, these operations could degrade or interfere with the incumbents' links.

24. Third, while the U.S. has had some experience with SAS in the CBRS band, Canada does not have the same starting point. The presence of long-haul links in the 6 GHz band also makes frequency coordination very different from CBRS. Canada has yet to develop such an ecosystem and we expect the introduction of AFC systems in Canada to be initially experimental in nature, rather than affecting a significant portion of a band that contains critical incumbent operations.

⁹ See section III of AT&T reply comments In the Matter of Unlicensed Use of the 6 GHz Band <https://ecfsapi.fcc.gov/file/10318438414200/ATT%206%20GHZ%20Reply%20Comments.pdf>.

¹⁰ FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses_paragraphs_121_to_124.

¹¹ FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses_paragraphs_65_and_66.

¹² FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses <https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses>.

25. In consideration of the above issues, we recommend that the Department monitor the development and deployment of AFC systems in the U.S. and internationally but not implement such systems in Canada at this time. The implementation of AFC systems in the 6 GHz band and the development of effective interference mitigation measures are key factors to protecting the incumbents in the band. It is clear that a considerable amount of work is still required and it is too early to adopt the proposed measures.

Low power indoor licence-exempt use

26. Low power indoor licence-exempt use in the 6 GHz band offers an opportunity for Wi-Fi and other low power applications to gain access to incremental spectrum. We are in principle supportive of the proposal if certain conditions are implemented to protect incumbent operations. However, we have a strong objection to allocating the entire spectrum range from 5925 – 7125 MHz for licence-exempt low power indoor use. Repurposing the 6 GHz band provides a unique opportunity to balance the needs for licence-exempt and licensed spectrum. A failure to balance these needs will result in sub-optimal economic and societal benefits to Canadians, which is contrary to the Department's spectrum policy objectives.

27. The importance of mid-band spectrum for 5G is widely recognized as it provides an excellent balance between coverage and capacity. Canada seems to be on track to make 450 MHz of mid-band spectrum available for 5G in the coming years (i.e., 3500 MHz¹³ and 3800 MHz¹⁴). However, the amount of mid-band spectrum being released in Canada is significantly less than countries such as Japan (1000 MHz), U.K. (790 MHz) and South Korea (600 MHz) as identified in a report by Analysys Mason¹⁵. Some of the key findings of that report are that "while the U.S. is expected to have assigned 350 MHz of licensed mid-band spectrum by 2022, it will still lag behind several of the leading markets" and "to remain a 5G leader, making more licensed mid-band spectrum available beyond the CBRS (3.55 – 3.65 GHz range) and 3.7 – 3.98 GHz bands remains an urgent goal for U.S".¹⁶ The 6 GHz band is being considered as a candidate for IMT in WRC-23 as per Agenda Item 1.2 of Resolution 245 of WRC-19¹⁷. The

¹³ Decision on Revisions to the 3500 MHz Band to Accommodate Flexible Use and Preliminary Decisions on Changes to the 3800 MHz Band <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11437.html>.

¹⁴ Consultation on the Technical and Policy Framework for the 3650-4200 MHz Band and Changes to the Frequency Allocation of the 3500-3650 MHz Band <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11627.html>.

¹⁵ 5G Mid-band Global Spectrum Update <https://api.ctia.org/wp-content/uploads/2020/03/5G-mid-band-spectrum-global-update-march-2020.pdf>.

¹⁶ Page 1 of 5G Mid-band Global Spectrum Update <https://api.ctia.org/wp-content/uploads/2020/03/5G-mid-band-spectrum-global-update-march-2020.pdf>.

¹⁷ Resolution 245 (WRC-19) https://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A00000D0002PDFE.pdf.

resolution identifies 6.425 – 7.025 GHz for IMT use in Region 1 and 7.025 – 7.125 for IMT use globally.

28. In consideration of these factors, the Department should postpone the decision to allocate the entire 1200 MHz to licence-exempt use and consider delaying any decision on the use of the upper part of the band (i.e., 6425 – 7125 MHz) until there is more clarity on the global ecosystem and a decision on the band is reached at WRC-23. Allocating a portion of the 6 GHz band for licensed use could provide Canada with the ability to become a leader in mid-band spectrum for 5G, which undoubtedly will provide significant benefits to the Canadian economy. The lower part of the band still provides 500 MHz (5925 – 6425 MHz) for licence-exempt use, which will provide sufficient spectrum for low powered indoor applications in the band. It will also allow Canada to benefit from the U.K. ecosystem and we are confident that the U.S. ecosystem can also be adapted through software changes to operate within the lower part of the band.

Very low power licence-exempt use

29. The very low power licence-exempt RLANs are proposed to operate indoors and outdoors. The outdoor operation of such equipment is a cause of concern for incumbent operations. Furthermore, the very low powered equipment will operate without the use of an AFC system, which increases the chances of it causing harmful interference. Based on the assessment above related to the other two licence-exempt use cases we do not support outdoor operations or the use of very low power RLANs in the upper portion of the band.

30. It is also important to note that the FCC has not allowed very low powered licence-exempt use and has kept this as an item for further study¹⁸. The main reasons for not allowing very low powered licence-exempt use are that outdoor operations and devices could be mobile. This can create a number of situations where such very low power devices create harmful interference to incumbent operations. In response to the FCC's further notice for rulemaking, the CTIA conducted field tests for the use of unlicensed very low power devices. The CTIA concluded: "as unlicensed devices are deployed on a wide scale, the probability of interference from a single device transmission increases considerably, as does the potential for an aggregation of multiple simultaneously transmitting devices"¹⁹. Therefore, we are concerned about any type of licence-exempt outdoor operations even if they are very low power.

¹⁸ FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses <https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses>, paragraph 233.

¹⁹ CTIA 6 GHz Field Test Report <https://ecfsapi.fcc.gov/file/1114220689440/201113%20Final%206%20GHz%20Field%20Test%20Report.pdf>.

Q3. ISED is seeking comments on the proposed footnote Cxx and the changes to the CTFA as shown in table 2.

31. The Department should defer implementation of footnote Cxx until AFC systems have been successfully deployed in the U.S. and WRC-23 Agenda Item 1.2 regarding licensed use of the 6 GHz band has been decided. At that time, the proposed changes to the CTFA, which would allow the use of licence-exempt RLAN applications in the 5925 – 7125 MHz band (or a subset of this band), could also proceed.

32. We also recommend that the Department update the CTFA to allocate the band 5925 – 7125 MHz to the MOBILE Service in accordance with the ITU Radio Regulations. Specifically, we suggest that the following footnote be added to the CTFA:

ADD Dxx: In Canada, the band 5925 – 7125 MHz is also allocated to the MOBILE service on a primary basis.

4.0 PROPOSALS FOR THE INTRODUCTION OF LICENCE-EXEMPT OPERATION IN THE 6 GHZ BAND

- Q4. ISED is seeking comments on the proposed rules for standard-power RLANs:**
- a) indoor and outdoor operation would be permitted**
 - b) RLAN access points would only be permitted to operate under the control of an AFC system in the 5925-6875 MHz frequency range**
 - c) maximum permitted e.i.r.p. would be 36 dBm**
 - d) maximum permitted power spectral density would be limited to 23 dBm/MHz**
 - e) use of a vertical elevation mask, with a maximum e.i.r.p. of 125 mW at elevation angles above 30 degrees over the horizon, would be required**

33. As already mentioned in our response to Q2, we are opposed to allowing licence-exempt standard power RLANs. However, if the Department decides to allow standard power RLANs it should only do so under the control of an effective AFC and only in the lower part of the band (5925 – 6425 MHz). The operation of such high-powered RLANs without a control mechanism will lead to harmful interference to incumbent operations and may impede incumbent links leading to disruption in services that Canadians rely upon. It is also imperative that the AFC operates on updated and accurate information regarding incumbent operations.

34. If the Department permits licence-exempt RLANs it is noteworthy that the FCC only allowed 36 dBm for standard power access points and restricted the clients connected to these access points to have maximum permitted power of 30 dBm. While this change in power level is not enough to protect incumbent operations, it is nevertheless a step in the right direction and we

encourage the Department to follow the same guidelines. We support 23 dBm/MHz maximum power spectral density (PSD) for access points that corresponds to channel bandwidth of 20 MHz at maximum permitted power of the access point. We recommend that the client PSD for standard power RLANs be limited by the Department to 17 dBm/MHz, which corresponds to a 20 MHz channel at maximum e.i.r.p. of 30 dBm. Furthermore, we strongly recommend that standard power clients should be mandated to operate only under the control of the access points. This will ensure that the clients do not transmit on any frequency that causes interference to incumbent operations.

35. In the event that the Department allows operations of standard power RLANs, which we do not recommend, design parameters must be put in place for access point antennas to ensure an e.i.r.p. of less than 125 mW at elevation angles of 30 degrees and above. We believe that such restrictions are necessary to protect FSS earth stations from harmful interference.

36. Finally, we are concerned about the lack of procedures and measures for interference mitigation in the FCC's framework. The FCC order seems to have no measures for identifying and mitigating the source of interference at incumbent FSS earth stations and fixed stations.²⁰ The Department should take this into consideration when making a decision on permitting licence-exempt standard power RLANs.

Q5. ISED is seeking comments on allowing access to the additional 100 MHz of spectrum in the 6425-6525 MHz sub-band for standard-power operation.

Q6. ISED is seeking comments on the equipment availability of standard-power RLANs in the 6425-6525 MHz band and the impact on the development of AFC systems for Canada due to a potential lack of international harmonization for that sub-band.

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

37. We are opposed to the use of standard power operations under the control of the AFC due to concerns about the protection of incumbent licensed operations as highlighted in our response to Q2. We urge the Department to delay the decision until further information is available from the experience internationally. In the event that the Department were to permit standard power operations, we believe that access to the additional 100 MHz would lead to cross

²⁰ FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses <https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses>.

border interference problems considering that the operations will be at standard power. It is too early to provide comments on the equipment ecosystem as it will follow the AFC development in the U.S. Lastly, even though we have concerns about the functioning of the AFC systems as highlighted in our response to Q2, we believe that AFC systems will be able to adapt to the additional 100 MHz due to the nature of their flexible design.

Q7. ISED is seeking comments on the proposed rules for low-power indoor-only RLANs:

- a) operation would be permitted indoor only across the 5925-7125 MHz band**
- b) the use of a contention-based protocol (e.g. listen-before-talk) would be required**
- c) maximum permitted e.i.r.p. would be 30 dBm**
- d) maximum permitted power spectral density would be limited to 5 dBm/MHz**

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

38. We support licence-exempt low power indoor-only RLANs in the lower part (5925 – 6425 MHz) of the band as explained in our response to Q2. We agree with the use of a contention-based protocol being mandatory for low-powered indoor-only equipment, as it will reduce the possibility of such equipment causing interference with incumbent operations. We also recommend that the Department mandate that low power clients should only be allowed to operate under the control of the access point. This would ensure that clients only operate in the lower part of the band (as per our proposal) even if they have the capability to operate across the entire 5925 – 7125 MHz band. The Department can require that all access points used in Canada only operate within 5925 – 6245 MHz through ISED's certification and audit processes, thus allowing Canada to take advantage of the U.S. client ecosystem while not making a decision on the upper part of the band at this time.

39. The FCC set the maximum permitted e.i.r.p. for low power clients to be less than the maximum permitted e.i.r.p. for the access points in order to reduce the possibility of interference. We recommend that the Department adopt similar rules and restrict the maximum permitted e.i.r.p. of low power clients to 24 dBm. We agree with the FCC's approach to set the maximum PSD of 5 dBm/MHz, which will allow a 320 MHz wide channel to operate at maximum power and recommend that the Department revise the PSD to -1 dBm for clients. Due to concerns for protection of incumbent operations, we support the proposed conservative PSD value of 5 dBm/MHz for now, however we recommend that the Department monitors the ongoing discussion in the U.S. around revising the PSD limit to 8 dBm/MHz. The maximum width of Wi-Fi

6E channels is proposed to be 160 MHz,²¹ and revising the limit to 8 dBm/MHz would allow the 160 MHz channels to operate at maximum power.

40. The FCC also mandated a number of other measures for low power indoor-only equipment such as that it cannot be weatherproof, it must have integrated antennas, and must be prohibited from operating on battery power.²² We recommend that the Department adopt these measures as they are necessary to ensure that such access points are only operated indoors.

41. The CTIA field study conducted in the U.S. clearly shows the potential of unlicensed indoor devices causing interference to microwave links²³. It shows that even low power indoor use has the potential to cause harmful interference to incumbent operations. We urge the Department to monitor the developments in the U.S. with regards to low-power use and adapt to any future measures with regards to the protection of incumbents from low power indoor-only operations.

Q8. ISED is seeking comments on the proposed rules to allow very low-power RLAN devices:

- a) operation would be permitted indoors and outdoors across the frequency range 5925-7125 MHz band**
- b) the use of a contention-based protocol (e.g. listen-before-talk) would be required**
- c) maximum permitted e.i.r.p. would be 14 dBm**
- d) maximum permitted power spectral density would be limited to -8 dBm/MHz**

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

42. As explained in our response to Q2 we are concerned about outdoor operations even if they are very low powered and recommend delaying the decision on the use of licence-exempt RLANs in the upper portion (6425 – 7125 MHz) of the band. There is a significant risk of interference from a single device as well as aggregate interference from multiple very low power devices.²⁴ We urge the Department to follow the developments in the U.S. with regards to the measures and guidelines for the operation of very low power RLANs and propose that the Department delay the decision regarding very low power RLANs until the FCC's final decision.

²¹ <https://www.wi-fi.org/discover-wi-fi/wi-fi-certified-6>.

²² See 107 of FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses <https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses>.

²³ CTIA 6 GHz Field Test Report <https://ecfsapi.fcc.gov/file/1114220689440/201113%20Final%206%20GHz%20Field%20Test%20Report.pdf>.

²⁴ CTIA 6 GHz Field Test Report <https://ecfsapi.fcc.gov/file/1114220689440/201113%20Final%206%20GHz%20Field%20Test%20Report.pdf>.

This will allow the Department to take into consideration the full record of the FCC proceeding and any additional measures or rules resulting from it.

43. The use of contention-based protocols, maximum permitted e.i.r.p. of 14 dBm and PSD of -8 dBm/MHz are proposed by proponents of very low power use to the FCC and are being studied as part of further notice of proposed rulemaking²⁵. We therefore recommend that the Department monitor the developments regarding the proposed parameters in the U.S. before making any decision.

5.0 PROPOSALS RELATED TO THE AUTOMATED FREQUENCY COORDINATION SYSTEM

44. We believe the AFC ecosystem is not mature enough for the Canadian market and the development of an AFC ecosystem for the 6 GHz spectrum band requires rigorous testing before it can be put into commercial use. Therefore, we recommend that the Department delay the decision on standard power operations and monitor international developments, particularly in the U.S., before permitting the use of AFC systems in Canada. We are nevertheless providing responses to the following questions in the event the Department decides to proceed with the use of AFC systems in Canada.

Q9. ISED is seeking comments on potential business models for AFC administrators to operate their AFC systems in Canada.

45. We believe that a number of potential business models can emerge for AFC administrators. At this time, we see the following high-level potential business models.

1. 3rd Party AFC: A 3rd party (independent of standard power service providers and equipment manufacturers) AFC system provides the frequency coordination service at a fee. Such a business model will rely on the AFC service for its revenues. The administrators of such independent AFC systems will possibly choose to cover the entire country or part(s) of it based on the business case. The AFC administrator could use of a number of billing models such as a fee for each query from a standard power access point/base station, monthly fee per registered access points/ base stations, etc.
2. Associated AFC: A standard power service provider or equipment manufacturer could administer the AFC itself. The primary purpose of such an AFC system would be to

²⁵ FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses_paragraph234.

facilitate the deployment of the standard power service provider or facilitate the sale of the standard power equipment. Such an AFC administrator may choose to offer AFC services to other operators.

3. Common/Joint AFC: An AFC system funded by standard power service providers could lead to the development of a single central AFC system for Canada, which is jointly administered by all standard power service providers. However, this model could also lead to multiple common/joint AFC systems administered by groups of service providers and covering all or parts of Canada.

46. We believe that the Department should consider implementing measures to encourage business models that lead to a competitive market for AFC systems and facilitates standard power deployment. In our view, the Department should take into consideration the following points with respect to the development of AFC system business models in Canada.

1. Rely on market forces to the greatest extent possible: The Department should permit a variety of business models for AFC administrators, as the business case of AFC systems in Canada is still unclear. The Department should also allow AFC administrators and service providers to negotiate the fees/rates rather than impose a specific billing structure such as a fee per transaction. Furthermore, the rates should be market driven rather than regulated in order to allow AFC administrators to effectively operationalize their business models. We also encourage the department to allow the AFC administrators to serve selected geographic areas based on their business case.
2. Harmonization with international markets: The Department should try to achieve the highest level of harmonization with international markets, particularly the U.S., with regards to the specifications of the AFC systems. This will encourage entry into the Canadian market. The Department should, however, ensure that Canadian laws remain applicable to AFC administrators and the AFC data. This is necessary to ensure that the required data is available to resolve interference issues and protect the incumbents from any issues that may arise from the operations of the AFC systems.
3. Business continuity: The AFC administrators are expected to play a key role in not only enabling standard power service providers but also in protecting incumbent licensed users. Therefore, it is essential to minimize the disruption caused by the exit of an AFC operator. We do not recommend the use of overly restrictive measures to control the exit of AFC administrators, as they will act as a barrier for entry into the AFC market. However, certain reasonable measures should be put in place to ensure business continuity and we address these measures in Q11.

47. We address the Department's role in the following response to ensure that the AFC systems adequately protect the incumbents.

Q10. ISED is seeking comments on its proposal to permit the approval of multiple, third party AFC systems, taking into account the potential for the development of a sustainable market for AFC systems in Canada.

48. We support the Department's proposal to permit multiple third party AFC systems. This would facilitate the development of a competitive market for AFC systems while relying on market forces to the maximum extent possible as set out in ISED's policies. In this instance, ISED has an important role to play by establishing the industry's requirements to manage the efficient and effective use of Canada's spectrum assets. In addition, the Department is also ultimately responsible for implementing rules that minimize and quickly resolve interference issues where commercial discussions are not effective.

49. AFC systems will make use of detailed geographic information, such as terrain data and buildings, as well as information on incumbent users. This information will need to be updated regularly for the AFC to provide meaningful assessments of available frequencies for the use of licence-exempt users. It is possible that this will make it difficult for an AFC system to cover a larger geographic area or support all use cases. Therefore, we support the Department's proposal to allow multiple third parties to operate AFC systems in Canada.

50. The operation of multiple third party AFC systems should be enabled by a Department-led certification and approval process. We recommend that the certification and approval process for third party AFC systems should be developed at a multi stakeholder group where incumbents are represented. The multi-stakeholder group should include the Radio Advisory Board of Canada (RABC) and all other interested entities such as aspiring AFC administrators, standard power service providers and standard power equipment and device manufacturers. An AFC system should only be certified after it conforms to all of the Department's requirements and demonstrates its ability to successfully protect incumbent operations in field tests. Additionally, the certification to operate as an AFC administrator should have a fixed term and only be renewed upon meeting conditions that ensure the AFC system's compliance to the Department's operational guidelines. We provide our views on the operations of the AFC systems in response to Q13.

Q11. ISED is seeking comments on potential exit strategies if the AFC administrator decides to cease operation in Canada.

In providing comments, respondents are requested to include supporting arguments and rationale.

51. If there are multiple AFC administrators providing competing services in a given market there is no need for ISED to take any action in the event one of the administrators wishes to exit the market. Presumably, demand for the exiting AFC administrator's services would be satisfied by the competitors who remain in the market.

52. The situation would be more complicated where there is only one AFC administrator serving a particular market and that entity exits. Such a scenario would be a major concern for all incumbents as it could lead to a situation where existing licence-exempt access points are no longer able to use the AFC's functionality, leaving licensed incumbent operations unprotected from interference. In such a scenario, affected access points would be forced to cease operations.

53. It is therefore important for the Department to impose business continuity conditions when licensing AFC administrators. One mechanism could be a mandatory notice period of sufficient duration (e.g., 12-24 months) to ensure a smooth transition if an AFC administrator must discontinue or wishes to discontinue providing the service. This would give sufficient time for new AFC administrators to enter the market and maintain the provision of AFC services on an uninterrupted basis. The Department should develop guidelines to facilitate the transfer of data from an exiting AFC operator to an interested AFC operator for a reasonable fee as also proposed by the FCC.²⁶

Q12. ISED is seeking comments on adopting an AFC system model that is harmonized to the maximum extent possible with the AFC system model being implemented in the U.S. and other international markets.

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

54. Harmonization of Canada's AFC model with those used in international markets, especially the U.S., will enable Canada to benefit from the economies of scale of AFC systems developed for those markets. As noted above, however, we are concerned about the ability of

²⁶ FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses_paragraph54.

the systems proposed for use in the U.S. to adequately protect incumbent users. We have therefore recommended that the Department delay its decision on allowing standard power use until international developments are more certain. We recommend that protection of incumbent users through appropriate functionality should be prioritized over harmonization of the AFC system with international markets.

Q13. ISED is seeking comments on the implementation considerations for the operation of an AFC system, specifically:

- a) information required from licensed users**
- b) interference protection criteria for computation of exclusion zones**
- c) information required from standard-power APs**
- d) frequency of AFC update of licensee information**
- e) security and privacy requirements**

Q14. ISED is seeking comments on any additional considerations, limits or general concerns that should be taken into account in setting detailed standards and procedures for AFC operation.

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

55. As noted above, we recommend that the Department enlist a multi-stakeholder group to consider the international best practices for an AFC and adapt them to the Canadian context. The views below on the implementation considerations of the AFC are based on the FCC decision as that is the only reference available for a proposed AFC system in the 6 GHz band. We reserve the right to revise our position during the proposed multi-stakeholder stage to ensure protection for our licensed incumbent operations.

56. The FCC requires that its AFC systems have access to the following information: incumbent transmitter and receiver locations, frequencies, bandwidths, polarizations, transmitter e.i.r.p., antenna height and the make and model of the antenna used.²⁷ Access to these data elements appear to provide sufficient information for an AFC system to perform its interference analysis. In Canada, this information is available in the Department's SMS database, which is accessible by all licensed users. However, the data in the SMS database may not always be accurate or up to date. We agree that it is the primary responsibility of licensees to keep the data updated but we also urge the Department to take the necessary measures to ensure the accuracy of the database and make the updated information available on a timely basis. Incumbent

²⁷ FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses_paragraph30.

licensees should be given adequate time to review and update their information in the SMS database prior to the AFC becoming operational. We also recommend that information regarding new licensed stations be loaded into the AFC system prior to them becoming operational.

57. We recommend that the Department implement a model where every access point is required to query an AFC system in order to get the list of permitted frequencies. The AFC system will be certified by the Department and will be required to update the incumbent user data on a periodic basis. This is commonly referred to as a centralized model. On the other hand, a de-centralized model, which allows access points to have stand-alone integrated AFC systems will provide no guarantee that incumbent information is being updated regularly and the AFC is performing its function as per the Department's requirements. In our view, mitigating interference with the use of an AFC as proposed in the U.S. is insufficient to safeguard incumbent users but it is better than a de-centralized AFC model, which is simply unworkable. Therefore, we recommend that the Department only allow the use of a centralized AFC model.

58. The FCC adopted a -6 dB interference to noise ratio (I/N) to protect against interference²⁸ and the use of three propagation models depending on the separation distance from the incumbent station²⁹. While the FCC adopted the use of a free-space propagation model for interference analysis for distances less than 30 metres, it adopted the use of WINNER II for medium distances and Irregular Terrain Models (ITM) for longer distances. The interference analysis and its results are a key concern and require detailed analysis as well as feedback from the U.S. where it is being implemented. For these reasons, we urge the Department to delay any decision on the use of an AFC system in Canada. Finally, if the Department decides to implement an AFC system for the 6 GHz band it will require an industry-wide multi-stakeholder group to agree upon the interface analysis parameters and their implementation. As highlighted in our response to Q12 we recommend that protection of incumbent users be prioritized over harmonization to international markets. This implies that specific measures may need to be adopted for the implementation of AFC systems in Canada and the Department should remain open to such additional measures in order to protect incumbent users.

59. The requirement of integrated geolocation capability, antenna height above ground information and periodic frequency availability re-check are necessary capabilities as mandated

²⁸ CC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses_paragraph_71.

²⁹ FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses_paragraph_63.

by the FCC for access points³⁰. We strongly recommend that all access points be mandated to share their location information and antenna height with the AFC periodically to get an updated list of permitted frequencies. This would be the minimum information required and we will only be able to comment on any additional information required (e.g., access point antenna type, gain) from access points during the development of the AFC system operational guidelines. The FCC mandated the use of integrated geolocation capabilities in access points and allowed the use of external geolocation devices in cases where the access point may be indoors and is unable to receive GPS signals. With regards to the antenna height, the FCC allowed it to be entered manually by an installer. We are particularly concerned about the accuracy of antenna height information and recommend that measures be developed to ensure the accuracy of this information as it is a key element in interference analysis. The measures could include certification for installers to ensure that they accurately measure the antenna height using standard procedures developed for this purpose.

60. We recommend that the frequency of updates for both access points and AFC systems should be 24 hours. This is aligned with both the FCC's proposal and ISED's whitespace database specifications³¹. We believe that a 24-hour interval allows sufficient flexibility to access points from an operational point of view and the necessary protection for incumbent users. Furthermore, additional measures should be mandated that address situations where an access point is unable to contact the AFC system or the AFC system is unable to contact the Department's database. We expect that access points will cease operations if they are unable to contact the AFC system.

61. Security must be an essential element of AFC systems. As the systems will be providing essential authorizations to access points in order to operate on certain frequencies, it is important that these communications be secure. Furthermore, it should not be possible to change or modify the AFC database through any unauthorized access. The security framework should be established through the multi-stakeholder group and address the concerns of all parties involved. We also support all necessary privacy measures in accordance with Canadian laws. Additionally the information regarding the location and ownership of an access point will be essential for interference resolution. We recommend that the Department create a framework for interference resolution that is efficient while keeping the necessary information private and secure.

³⁰ FCC Opens 6 GHz Band to Wi-Fi and Other Unlicensed Uses https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses_paragraph_38_to_47.

³¹ DBS-01 — White Space Database Specifications <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10928.html>.

Q15. ISED is seeking comments on its proposal to require AFC systems to protect the following types of licensed stations from standard-power APs:

- a) fixed microwave stations**
- b) fixed point-to-point television auxiliary stations**
- c) radio astronomy stations**

In providing comments, respondents are requested to include supporting arguments and rationale.

62. We support the Department's proposal to require the AFC to protect the fixed microwave, fixed point-to-point television auxiliary stations and radio astronomy stations. This only leaves out FSS earth stations from the list of incumbents that will be protected by the AFC system. While we believe that FSS earth stations can be protected with the 125 mW e.i.r.p. restriction above 30-degree elevation, we are concerned about the lack of measures if licensed FSS earth stations experience interference. We recommend that the Department include the FSS earth stations in the broader framework that should be developed for interference mitigation.

Q16. ISED is seeking comments on the sample agreement related to the designation and operation of an AFC system in Canada.

63. Due to the lack of clarity on the type of AFC systems and business models to be used in Canada, it is premature to provide comments on a sample agreement. We anticipate providing detailed comments on the agreement during the development process of AFC systems in Canada through a multi-stakeholder group as we have proposed in our comments.

Q17. ISED is seeking comments on the proposed approach to incremental implementation of an AFC system in Canada.

64. We are generally supportive of an incremental approach as it allows the different types of business models to flourish and will facilitate entry in the Canadian AFC market. However, we are concerned about AFC systems covering partial geographic areas such as a part of an urban area. Such partial AFC system implementations could lead to interference in adjacent geographic areas and other unforeseen problems. Therefore, we believe that a more detailed framework is required for allowing incremental implementation and there is not enough available information at this time to allow us to comment on this point. We recommend that this matter also be addressed in a multi-stakeholder group.

Q18. ISED is seeking comments on the objective to maximize the potential for synergies, where possible, in defining the technical and administrative requirements for the respective databases addressing different bands under different technical regimes.

65. We support the Department's proposal to maximize the potential for synergies for administrative and technical purposes where possible. However, the characteristics of different bands and the nature of incumbent operations in those bands may lead to significantly different administrative and technical requirements.

6.0 CONCLUSION

66. We support the Department's proposal to make additional spectrum available for licence-exempt use, however the Department should balance the requirements of licensed and unlicensed spectrum to maximize the economic and societal benefits to Canadians. A balanced approach offers a unique opportunity for Canada to establish leadership in releasing mid-band spectrum for 5G while balancing the requirements for licence-exempt spectrum. The Department should delay the decision on allowing any licence-exempt use in the upper half (6425–7125 MHz) of the band until the outcome of WRC-23.

67. We are also concerned about the proposals that involve outdoor licence-exempt use particularly the standard power operation. The use of high power operations outdoors has the potential to cause harmful interference and we are not confident that the proposed measures and AFC systems will be able to mitigate it. CTIA reports clearly show the potential of interference from licence-exempt operations. We recommend that the Department delay the decision regarding standard power operations under the control of AFC and very low power operations. The Department should follow the developments in the U.S. with regards to both these proposals and take advantage of these experiences before making a decision.

68. We recognize the benefits of releasing licence-exempt spectrum but strongly recommend the Department balance that with the ever-growing need for mid-band spectrum for 5G. We are confident that the requirements for licence-exempt and licensed spectrum can be balanced within the 1200 MHz of 6 GHz spectrum under consideration. Finally, the incumbents in the band are providing critical services that Canadians rely upon on a daily basis and the decision to allow licence-exempt use must take into account all necessary measures to protect licensed incumbent users.