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Via E-Mail

Innovation, Science and Economic Development Canada
Senior Director, Spectrum Planning and Engineering
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Re: Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band, SMSE-014-20, Canada Gazette, Part I, November 2020,

Dear Madam/Sir:

Qualcomm is pleased to provide these comments strongly supporting the efforts of Innovation, Science and Economic Development Canada (“ISED”) to authorize licence-exempt operations in the 5925-7125 MHz (“6 GHz”) frequency band.¹ ISED should open this critically important, 1.2 GHz-wide swath of mid-band spectrum as soon as possible so it can be used by 5G and Wi-Fi technologies to enable faster, better mobile broadband connectivity. As the ISED Consultation notes, the pressure on existing licence-exempt spectrum bands is exponentially increasing, driven by Canada’s universal adoption of mobile wireless technology; therefore, maintaining an ongoing stream of new spectrum for 5G NR-Unlicensed (“5G NR-U”), Wi-Fi, and other licence-exempt communications technologies is vitally important to Canada’s continued economic growth in the 21st century.

Summary

Qualcomm strongly encourages ISED Canada to permit licence-exempt Low Power Indoor (“LPI”) operations throughout the entire 6 GHz band. Qualcomm also supports the authorization of fixed standard-power RLANs in the 5925-6425 MHz sub-band, the 6425-6525 MHz sub-band, and the 6525-6875 MHz sub-band.

In addition, Qualcomm supports ISED authorization of portable Very Low Power (“VLP”) devices in the 6 GHz band, so long as these VLP devices, and any other 6 GHz licence-exempt devices, that could operate inside of a moving vehicle are required to implement additional protections of Intelligent Transportation Service (“ITS”) (*i.e.*, Cellular Vehicle-to-Everything (“C-V2X”)) operations in the adjacent 5.9 GHz band, as discussed herein.

¹ Qualcomm also is submitting comments as a member of the multi-company coalition that includes Apple, Inc., Broadcom, Inc., Cisco Systems, Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, Microsoft Corporation, Qualcomm Incorporated, and CommScope, Inc.

Discussion

The Entire 6 GHz Band Is Needed To Support The Full Realization Of Next Generation Licence-Exempt Services. ISED's 6 GHz Band Consultation rightly recognizes the massive growth in wireless communications services that have driven the Canadian economy and the concomitant need to make additional mid-band spectrum available for next generation 5G and Wi-Fi technologies. To deliver highly reliable, ultra-low latency, multi-gigabit connectivity that 5G portends, spectrum for 5G services needs to include low-, mid-, and high-bands, including bands that are subject to licensed, licence-exempt, and shared regulatory paradigms.

Thus, Qualcomm strongly supports timely ISED action to open the entire 6 GHz band for licence-exempt wireless broadband use. The 6 GHz band and other mid-band spectrum, together with low-band (sub-1 GHz) and high-band (millimeter wave) spectrum, will play a key role in the successful deployment of 5G technology, and the Canadian government's efforts to maintain a steady flow of new spectrum for broadband services is essential to achieving and maintaining its 5G leadership.

The 5 GHz licence-exempt bands, which unleashed unprecedented innovation and development of both broadband Wi-Fi and Gigabit LTE networks, can serve as a useful regulatory framework to extend licence-exempt broadband access into the 6 GHz band. The new 6 GHz band can use a similar framework to support next-generation Wi-Fi, *i.e.*, IEEE 802.11ax and 802.11be (EHT), and the 5G NR technologies for licence-exempt spectrum, 5G NR in unlicensed spectrum ("5G NR-U"), as well as future technologies that improve overall system throughput, reliability, and network responsiveness. All this innovation can be accomplished while protecting incumbent 6 GHz licensed services and future 5.9 GHz C-V2X services from interference.

Qualcomm encourages ISED to move forward as soon as possible to open the entire 6 GHz band for licence-exempt use. As explained in this filing and in the comments submitted today by the ten-company coalition that includes Qualcomm,² low-power-indoor licence-exempt operations should be allowed in the entire 6 GHz band. Low licence-exempt device transmit power levels and a 20 - 30 dB reduction in RF signal power due to building materials provide sufficient protection from interference to outdoor fixed incumbent licensed operations and all other incumbents that operate outdoors. As the ISED Consultation recognizes, indoor licence-exempt communications needs and spectrum demands will continue to grow as business and consumer communications applications improve and expand.³ Low-power-indoor only licence-exempt operations throughout the 6 GHz band is critically important to serving this need.

ISED Should Adopt Technology-Neutral Regulations. Qualcomm requests that ISED adopt technology-neutral rules like those the U.S. FCC has adopted to enable the successful deployment of new spectrum access techniques that have been standardized in 3GPP (*i.e.*, 5G NR in unlicensed spectrum or 5G NR-U) and in IEEE (*i.e.*, 802.11be (EHT)). Working together with many industry stakeholders in 3GPP and in IEEE, Qualcomm has developed sharing

² See Comments of Apple, Inc., Broadcom, Inc., Cisco Systems, Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, Microsoft Corporation, Qualcomm Incorporated, and CommScope, Inc. on ISED Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band, SMSE-014-20 (filed Jan. 19, 2021).

³ See, *e.g.*, ISED Consultation at ¶¶ 6-9.

techniques to enable much more efficient and intensive spectrum use, and we are excited by the possibilities these enhanced tools offer in enabling better and faster mobile broadband. Highly efficient use of the 6 GHz band can be realized where licence-exempt wireless systems are time synchronized. Indeed, 5G NR-U technology and 802.11be Extremely High Throughput (“EHT”), an upcoming version of Wi-Fi, can be deployed to provide enhanced broadband connectivity for all users via advanced techniques that take advantage of time synchronization.

ISED Canada Should Adopt A -27 dBm/MHz OOB RMS Level For Low-Power-Indoor and Fixed Standard Power Licence-exempt Equipment And Prohibit Portable VLP Use Of The Lowermost 6 GHz Channel To Protect ITS/C-V2X Services Until Additional Protective Measures Are Implemented. Canada should adopt the same -27 dBm/MHz out-of-band emissions (“OOBE”) level, measured using root-mean-square (RMS) detector, the U.S. FCC adopted for LPI and AFC-controlled fixed standard power licence-exempt operations below the 5925 MHz lower band edge. To protect Cellular Vehicle-to-Everything, so-called C-V2X, operations in the adjacent 5.9 GHz band, Qualcomm requests that ISED Canada implement further protection – beyond the -27 dBm/MHz OOB level – to ensure OOB from VLP devices (or any other mobile devices allowed in the new 6 GHz licence-exempt band) operating inside of a moving vehicle do not cause harmful interference to C-V2X receivers in the adjacent 5.9 GHz band.

The 5G Automotive Association has demonstrated that there is insufficient isolation between a C-V2X receiver and a portable VLP (or mobile hotspot) device operating on-board a vehicle necessary to protect C-V2X reception. 5GAA has shown in-vehicle operations of a 6 GHz band licence-exempt device meeting a -27 dBm/MHz rms OOB level at the 5925 MHz edge reduces C-V2X communications range by 81% in some use cases, rendering it unusable for vehicle safety communications.⁴ In the U.S., the FCC has allocated the 5895-5925 MHz band for C-V2X services, and Qualcomm and its automotive industry partners are actively working to widely deploy C-V2X technology.⁵ Thus, it is critically important that ISED not permit licence-exempt operations that would severely impair future Canadian C-V2X vehicle safety communications in the adjacent 5.9 GHz band.

Specifically, ISED Canada should initially require VLP devices to avoid the lowermost 6 GHz U-NII-5 channels and impose a power spectral density limit on VLP operations to encourage licence-exempt use of channels of 160 MHz and wider. ISED should implement these protections when it initially opens the band for licence-exempt RLANs, and explore, in a further proceeding, means of allowing expanded VLP device access to the U NII 5 band while protecting the new 5.9 GHz C V2X band. Some potential means include requiring licence-exempt VLP devices in the U-NII-5 band to detect the absence of one of the following before operating in the lowermost U-NII-5 channel and emitting -27 dBm/MHz OOB into the adjacent

⁴ See, e.g., 5G Automotive Association Ex Parte Filing (dated Nov. 16, 2020) in U.S. FCC 6 GHz Proceeding ET Docket No. 18-295 (linked [here](#)). 5GAA has submitted into the U.S. FCC 6 GHz band docket extensive testing demonstrating the need to provide greater protection of C-V2X beyond the -27 dBm/MHz OOB level at the 5925 MHz edge for portable VLP devices and mobile hotspots.

⁵ See *Use of the 5.850-5.925 GHz Band*, First Report and Order, Further Notice of Proposed Rulemaking, and Order of Proposed Modification, FCC 20-164, ET Docket No. 19-138 (Nov. 20, 2020).

5.9 GHz band: (i) energy from adjacent channel C-V2X operations, (ii) vehicle motion, and (iii) location on or close to an active roadway.

To the extent ISED authorizes unrestricted portable VLP operations in the 6 GHz band, limiting the lowermost channel will not curtail important VLP applications because they can still access the massive amount of 6 GHz licence-exempt spectrum away from the 5925 MHz edge. And the full 6 GHz band would be available for low-power-indoor only and fixed standard power licence-exempt equipment, to the extent ISED authorizes such operations.

Responses to ISED Questions

Qualcomm's responses to the Questions in the Consultation are provided below:

QI: 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

Last year, Qualcomm announced the availability of its Wi-Fi 6E chipsets that operate in the 6 GHz band,⁶ and we are actively working with industry partners to finalize NR-U standards and will quickly implement 5G NR-U in upcoming chipsets. These chipsets will provide 6 GHz connectivity in access points and small cells as well as a whole host of devices from smart phones, televisions, and security cameras to game controllers and AR/VR headsets.

As explained above, ISED's 6 GHz band regulations for these new licence-exempt operations should be technology neutral – like those adopted by the U.S. FCC – to enable and encourage the deployment of any and all technologies.

The IEEE has extended the 802.11ax standard (also known as “Wi-Fi 6”) to include the 6 GHz band, and U.S. FCC regulators are approving 802.11ax equipment for sale. In addition, Europe's ETSI BRAN EN 303 687 has reached a “stable draft” status, supporting standards-based deployments in Europe.

3GPP-based 5G NR-U technology⁷ will be deployed in the 6 GHz band in conjunction with mobile operator 5G deployments in licensed and other shared bands, such as 5 GHz U-NII bands.⁸ 5G NR-U makes the advanced features of 5G NR available for use in licence-exempt spectrum. When used in combination with licensed or shared spectrum, anchored 5G NR-U helps mobile operators deliver 5G with better, faster mobile broadband for consumers. Standalone NR-U deployments extend the benefits of 5G to private networks without requiring any licensed spectrum at all. In addition, 5G NR-U with semi-static synchronous channel access in controlled, localized environments unlocks more advanced 5G capabilities to support greatly improved Industrial IoT applications with ultra-reliable, low latency needs.

⁶ See [Qualcomm launches six new Wi-Fi 6E networking & mobile platform chipsets](#) (May 29, 2020) Wi-Fi NOW.

⁷ See 3GPP Technical Specification Group Radio Access Network; NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone (Release 16), 3GPP TS 38.101-1 V16.5.0 (2020-09) (NR operating bands in Table 5.2-1 lists NR band class n96 covering the entire 6 GHz band – 5925 to 7125 MHz).

⁸ See Xiaoxia Zhang, Qualcomm OnQ Blog, [How does support for licence exempt spectrum with NR-U transform what 5G can do for you?](#) (June 11, 2020).

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

Qualcomm strongly supports ISED's proposals to allow licence-exempt operations in the 6 GHz band, as explained in these comments and in Qualcomm's joint filing with nine other technology companies. As explained above, it also is important that future C-V2X operations in the 5.9 GHz band be protected from 6 GHz licence-exempt OOB.

Q3: *ISED is seeking comments on the proposed footnote to Table 2: "Licence-exempt RLAN applications in the 5925-7125 MHz band must operate in accordance with the established spectrum policy and technical framework; and must not cause harmful interference to, or claim protection from, licensed systems operating in the band".*

The technical proposals in the ISED Consultation, e.g., low power indoor, very low power portable, and standard power licence-exempt operations under the control of an AFC system, will protect incumbent systems in the 6 GHz band from harmful interference.

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.*

Qualcomm supports ISED's technical proposals above to enable standard power RLANs in the 5925-6875 MHz frequency range.

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.*

Qualcomm supports allowing licence-exempt standard power operations in the 6425-6525 MHz sub-band for the reasons ISED notes in the Consultation.

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.*

Qualcomm's chipsets support standard power, LPI, and VLP operations throughout the entire 6 GHz band, including the 6425-6525 MHz sub-band. The enablement of standard power operations in this sub-band can be readily incorporated into AFC systems for Canada.

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.*

Qualcomm supports ISED's above technical proposals to enable low-power-indoor-only RLANs throughout the entire 6 GHz band. Qualcomm also believes that the maximum permitted power spectral density limit can be increased to 8 dBm/MHz PSD without increasing the interference risk to 6 GHz incumbent operations in Canada. This level will more effectively

support the distribution of multi-gigabit service throughout homes, educational institutions, libraries, businesses, and other indoor locations where most licence-exempt use occurs today.

The thorough and accurate analysis in the U.S. FCC's 6 GHz Report and Order showed that low-power-indoor-only operations will not cause harmful interference to licensed incumbent operations included a substantial amount of interference protection margin, on the order of 9 dB in Table 4 of the FCC's 6 GHz Report and Order. The FCC found that the probability of low-power-indoor-only operations causing harmful interference was so low as to be "insignificant" and confirms the conclusions of many studies already in the record of this proceeding demonstrating that allowing 3 dB more power for LPI devices will not create a material risk of harmful interference to licensed incumbent operations. Allowing 3 dB more power also will more closely align the link budget capabilities of 6 GHz equipment with that of equipment that uses the 5 GHz U-NII-1 and U-NII-3 bands. When combined with the wide bandwidths available in 6 GHz, authorizing 3 dB higher power via increasing the allowable PSD limit to 8 dBm/MHz will substantially improve the market adoption of the 6 GHz band for indoor mesh networks.

***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.*

Qualcomm supports ISED authorization of very low-power RLAN devices to operate in the 6 GHz band under the proposed technical operating parameters. Qualcomm also requests that ISED provide adequate protections for C-V2X on-board vehicle receivers that will experience harmful interference from VLP devices operating inside vehicles at an out-of-band emissions ("OOBE") level of -27 dBm/MHz. Indeed, one of the key uses ISED notes for very-low power devices is in-vehicle entertainment, *see* ISED Consultation at ¶ 62, which Qualcomm supports so long as the C-V2X receiver is protected from harmful interference.

As explained above, Qualcomm requests that ISED not permit VLP operations in the lowermost channel in the 6 GHz 5925-6425 MHz sub-band in order to ensure that the OOBE levels from 6 GHz licence-exempt very low-power devices are substantially below the -27 dBm/MHz level that ISED should apply to fixed standard power and low-power-indoor only devices. If ISED decides to permit VLP licence-exempt use of the lowermost channel, the OOBE level from VLP devices should be -60 dBm/MHz to provide the unwanted signal isolation necessary to protect C-V2X vehicle safety communications.

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

Qualcomm recommends that ISED offer as much flexibility as possible regarding business models for AFC administrators.

***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.*

Qualcomm supports allowing multiple third party AFC systems to be developed and deployed in Canada.

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.*

Qualcomm recommends that any AFC administrator for Canadian licence-exempt operations who decide to cease operation be required to ensure that all of their managed licence-exempt operations are transitioned to another available, functioning AFC system unless such licence-exempt operations cease when the AFC administrator ceases operation.

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.*

Qualcomm strongly supports ISED implementing an AFC system model and rules that are harmonized with the U.S. approach because doing so will reduce time and costs, ensuring the swiftest possible availability of AFC-enabled standard power equipment.

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.*

Qualcomm refers ISED to the joint filing by Qualcomm and nine other technology companies.

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.*

Qualcomm refers ISED to its other responses in this letter filing and to the joint filing by Qualcomm and nine other technology companies.

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.*

Because the locations and frequencies of these incumbent operations are known, an AFC system can and will protect them.

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

Qualcomm has no comments on the sample agreement.

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

Qualcomm refers ISED to the joint filing by Qualcomm and nine other technology companies.

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.

While Qualcomm appreciates this question, we recommend that ISED align its rules for 6 GHz licence-exempt operations with those in the U.S. to the greatest extent possible. Enabling sharing in new bands necessitates sharing with diverse existing incumbent and other users in those new bands. Because of this, identifying synergies between diverse bands can be challenging.

Qualcomm applauds ISED for issuing a comprehensive Consultation on opening the full 6 GHz band for new licence-exempt operations, and Qualcomm encourages ISED to issue final regulations in accordance with these comments.

Respectfully submitted,

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Dean R. Brenner
Senior Vice President, Spectrum Strategy &
Technology Policy

A handwritten signature in purple ink, appearing to read "John W. Kuzin", with a large, stylized initial "J" and a long horizontal flourish extending to the right.

John W. Kuzin
Vice President and Regulatory Counsel