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

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I. Executive Summary

Licensed incumbent use for fixed links, fixed-satellite services (FSS) and other uses, coupled with a robust licence-exempt underlay, is the best combination to advance Canada's goals for universal broadband, innovation, and maximizing both economic and social benefits through the use of smart spectrum policy. The Joint Filers, representing an important cross section of the world's leading silicon, hardware, software and application vendors, describe in this comment how consumer demand is forcing an acceleration toward faster broadband, and why changing use cases are compelling the industry to evolve its technology to meet rising demand and new use cases in licence-exempt spectrum. That technology, including Wi-Fi 6E and 5G NR-U, requires broad channels and contiguous spectrum, and is driving the need to open the whole of the 6 GHz band to licence-exempt use. We also highlight the economic and societal benefits that can be realized by promoting licence-exempt sharing in the band. As proposed in the consultation document and described in this comment, licence-exempt technology is ready to successfully co-exist with licensed or authorized incumbents on a non-interference basis provided that ISED sets the correct regulations.

Regulators globally are recognizing the benefits of a licence-exempt underlay in the 6 GHz band and the importance of maximizing economic activity in the spectrum band:

(a) as the consultation document acknowledges, with the pandemic forcing remote learning and telework, technologies such as Wi-Fi represent a low-cost, consumer-friendly means of connecting multiple users in a household to a broadband connection;
(b) more spectrum, and new technology that can utilize it, promotes an improved user experience not marred by congestion;
(c) innovative uses and devices will be coming to market in 2021 across the consumer segment, as well as across the business sector, that will advance education, healthcare, and the economy generally;[1] and
(d) a robust 5G future requires a spectrum policy approach that includes a plentiful supply of both licensed and licence-exempt spectrum as each complements the other.

In fact, an overwhelming number of countries in the Americas region, representing 85.7 percent of the population of North and South America,[2] and 90.6 percent of its GDP, have adopted rules

[1] A description of how licence-exempt technology can positively impact the economy was the topic of United States Federal Communications Commission (U.S. FCC) Chairman Ajit Pai's remarks to the Wi-Fi Alliance in 2020. *See* FCC Remarks by Ajit Pai, Chairman, Federal Communications Commission, WiFi Alliance Executive Plenary, June 2, 2020, *available at* https://www.youtube.com/watch?v=4bNSwt4SoQY&feature=youtu.be (video of remarks) ("*FCC Chairman Pai Wi-Fi Alliance Address*").

[2] Based on estimated 2020 population of North and South America of 1.022 billion. *See* Wikipedia, *List of South American Countries by Population, available at*

or launched consultations to declare the 6 GHz band to be open to licence-exempt use. The vast majority of these countries have opened or are in the process of opening the entire band. Collectively, regional regulators are evidencing a sophisticated understanding of opening the band to licence-exempt uses.

The Joint Filers enthusiastically support:

- Introducing a new footnote to the Canadian Table of Frequency Allocations to introduce licence-exempt RLAN use to 5925-7125 MHz.
- The three device categories as proposed in the consultation document: Standard Power, Low Power Indoor (LPI), and Very Low Power (VLP). With limited modification, we also support the technical rules proposed for these device classes.
- Consideration of a rules framework for an Automated Frequency Coordination (AFC) database mechanism to deliver permissible frequencies to Standard Power devices.

The Joint Filers request consideration of:

- For Standard Power devices, requiring an elevation antenna mask for outdoor products only.
- For Standard Power devices, recognition in the final decision that reservation of 6875-6930 MHz may be unnecessary in the long term due to the increasing availability of 5G technologies on licensed service provider spectrum that can deliver the same functionality.
- For LPI devices, recognition in the final decision that Contention-Based Protocol is a mitigation technique that best addresses indoor mobile incumbent use cases, as this feature of licence-exempt equipment ensures deferred transmissions in the presence of an always-on mobile transmission.
- Consideration of Subordinate devices in the context of LPI access points (APs) and Standard Power APs if such devices abide by all the requirements associated with an LPI AP (e.g., indoor only, internally integrated antenna, connected to mains power).
- Consideration of Client-to-Client (C2C) communication when clients have the ability to receive an LPI AP enabling signal (in which case any frequency can be used) or standard power AP (in which case only the same frequency as the AP is using can be used).
- Rejection of any form of partial approach to implementation, whether spectrally or geographically, as harmful to Canadian consumers, businesses, and the economy generally.

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https://en.wikipedia.org/wiki/List_of_South_American_countries_by_population (*Wikipedia South America Population Page*) (last visited Jan. 15, 2021); Wikipedia, *List of North American Countries By Population*, *available at* https://en.wikipedia.org/wiki/List_of_North_American_countries_by_population (*Wikipedia North America Population Page*) (last visited Jan. 15, 2021).

As discussed below, the industry is ready – as soon as rules are completed and test requirements specified – to deliver products using licence-exempt 6 GHz frequencies to the Canadian market. By opening this proceeding, ISED has put Canada in a leadership position to deliver tremendous benefits to Canadians, and we request prompt action on this consultation.

II. Turbocharging Canada's use of 5925-7125 MHz through a licence-exempt underlay is the right spectrum policy

The Joint Filers enthusiastically support ISED's proposal to add licence-exempt spectrum to the 5925-7125 MHz band, while continuing its existing approach to authorizing licensed point-to-point, geostationary satellite uplinks, broadcasting auxiliary stations and radio astronomy observatories. The benefits of amending the Canadian Table of Frequency Allocations (CTFA) to support licence-exempt Radio Local Area Networking (RLAN) technologies is enormous, particularly in addressing Canada's broadband goals. Smart choices about how to regulate these RLAN technologies will ensure that incumbent systems can continue to be licensed, operate and evolve. The Joint Filers therefore support ISED's proposed device classes and technical rules,[3] which have been devised to address the diverse market for licence-exempt equipment that exists today in Canada, as well as the fundamental need to protect incumbent uses.

The Joint Filers also agree that this proposed change to make more spectrum available for licence-exempt equipment fully supports Canada's policy goals as outlined in the Spectrum Policy Framework for Canada,[4] Spectrum Outlook 2018-2022,[5] High-Speed Access for All: Canada's Connectivity Strategy,[6] Canada's Digital Charter: Trust in a Digital World,[7] and the Telecommunications Act.[8]

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[3] A few minor exceptions, modifications and additions are noted in response to each consultation question.

[4] *See* Government of Canada, *Spectrum Policy Framework for Canada*, June 2007, https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08776.html.

[5] *See* Government of Canada, *Spectrum Outlook 2018-2022*, June 6, 2018, https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11403.html.

[6] *See* Government of Canada, *High-Speed Access for All: Canada's Connectivity Strategy*, 2019, https://www.ic.gc.ca/eic/site/139.nsf/eng/h_00002.html.

[7] *See* Government of Canada, *Canada's Digital Charter: Trust in a Digital World*, available at: https://www.ic.gc.ca/eic/site/062.nsf/eng/h_00108.html.

[8] *See* Telecommunications Act, (S.C. 1993, c. 38), as amended, https://laws-lois.justice.gc.ca/eng/acts/T-3.4/index.html; Radiocommunications Act, (R.S.C., 1985, c. R-2), as amended, https://laws-lois.justice.gc.ca/eng/acts/R-2/index.html.

The Spectrum Policy Framework is particularly pertinent to this consultation, as it states as its sole objective "…that the spectrum program objective is to maximize the economic and social benefits that Canadians derive from the use of the radio frequency spectrum resource." The Enabling Guidelines further support action here, including but not limited to: making available spectrum to serve a range of services that benefit Canadians, ensuring spectrum is available to support security and public safety needs, minimizing administrative burdens while being responsive to changing technology and marketplace demands, ensuring that appropriate interference protection measures are in place, and reallocating spectrum where appropriate, while taking into account the impact on existing services.

The consultation also correctly notes the pertinency of the recently-created Digital Charter to this issue, as it calls for policies that support Canadian innovation and universal ability to participate in the digital world and have the necessary tools to do so, including access, connectivity, literacy and skills. Licence-exempt RLAN technologies serve these purposes well. Licence-exempt RLAN facilitates advance broadband access at the edge of any broadband network, whether wired, terrestrial wireless or satellite. As a broadband access tool, RLAN facilities have been widely used to provide access by businesses such as Wireless Internet Service Providers or Internet cafes, but have also been broadly used by public institutions such as schools, libraries, and local governments to provide connectivity to those who lack a broadband connection at home. Licence-exempt RLAN technologies also are key building blocks of business and public IP networks, and are continually being applied in innovative new ways to business processes and capabilities. As a result, using the wireless tools that would be authorized by this proceeding, economies can be made more productive through innovation and competition, and even in a public use case, the value delivered by the public entity to consumers can improve. Innovation and investment, choice and affordability, and ensuring that Canada remains at the forefront of innovative developments in wireless technologies are all served by adopting the rules proposed in this consultation.

The Joint Filers agree with ISED that existing authorizations in this spectrum band address important use cases. Existing uses will not suffer adverse effects from the introduction of licence-exempt devices. As described in the consultation, existing users operate three different types of networks – (1) fixed point-to-point networks, (2) earth-to-space satellite links for C-band satellite services, and (3) broadcast auxiliary services including mobile newsgathering or electronic news gathering (ENG). In addition, the consultation notes the presence of two satellite downlink facilities serving a Mobile Satellite Service provider – one primary and the other back up and a single radioastronomy observatory. The Joint Filers understand from the consultation and our examination of ISED's SMS database, that the following services are active in the 6 GHz band:

- Fixed service (FS) licencees operating point-to-point microwave systems are the largest user group, with nearly 10,000 licences across Canada and operating in a broad range of frequencies (5925-6930 MHz). Uses include telecommunications backhaul, electric grid operations, and public safety communications. Television auxiliary services (TAS) use TV-studio-transmitter links (STL), which support the transmission of television programs

from a studio to a television broadcasting station, TV inter-studio program links, and CATV studio-headend links. TAS are also authorized at the 6590-6770 MHz band for TV pick-up services (i.e., ENG).

- FSS includes more than 500 licenses corresponding to a few hundred earth station sites across Canada, and operating mostly in the 5925-6425 MHz band. These uplink stations support three Canadian satellites and over 20 foreign satellites, providing broadband Internet services, voice communications, enterprise communications, and distribution of television and radio broadcast content.

- Radio astronomy service is authorized in the 6650-6675.2 MHz band for observing the 6668.518 MHz methanol spectral line.[9] One observatory is currently authorized, located in Kaleden, British Columbia, and uses this band for methanol observations.

- Two MSS space-to-earth gateway facilities exist, operating in the 6875-7055 MHz range - one in Smiths Falls, Ontario (primary), and the other in High River, Alberta (back-up).

These types of uses, including the potential need for high-reliability and high-availability fixed links, are typical of the use cases the Joint Filers have seen in the countries that have, or are in the process of, opening the 6 GHz band for licence-exempt use. With the right regulatory conditions on licence-exempt equipment, these systems will be able to continue their operations unimpeded by licence-exempt use, and can continue to grow and evolve their networks technologically. In fact, a key reason to open 5925-7215 MHz to licence-exempt use is that these existing uses can continue and grow at the same time that Canadian consumers reap the benefits of new wireless broadband technologies to enhance their broadband experiences.

In response to Question 2 below, we describe the principal reasons for our view that ISED should proceed with its proposal to open 5925-7125 MHz to licence-exempt use under technical conditions that support coexistence. We explain how consumer demand is forcing an acceleration toward faster broadband, and why changing use cases are compelling industry to evolve its technology. The response describes new innovations, such as Wi-Fi 6E, that depend on licence-exempt spectrum to meet demand, and why these technologies require broad channels and contiguous spectrum.

Regulators globally are recognizing the benefits of a licence-exempt underlay in the 6 GHz band including in increasing remote learning, telework, and healthcare; augmenting more cost-effective, consumer-friendly means of connectivity; and improving user experiences and network performance. Most importantly, these benefits are available at a very low transactional cost because licence-exempt devices do not require existing licenced users to be moved from the band, and licence-exempt use enables those existing users to continue to grow and evolve their networks.

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[9] Although the rest frequency of the spectral line is 6668.518 MHz, it can be observed throughout the 6650-6675.2 MHz band due to the effects of redshift and blueshift caused by radial motion of the observed cosmic sources away from and towards the observer.

The vast majority of countries in the Americas region, representing 85.7 percent of the populations of North and South America,[10] and 90.6 percent of its GDP,[11] have either adopted rules or initiated consultations to open the 6 GHz band to licence-exempt use,[12] with most of these countries opening the entire band.[13] Collectively, regional regulators are evidencing a sophisticated understanding of opening the band to licence-exempt uses. Both Canada's and Brazil's consultations propose technical rules modeled on those adopted by the U.S. Federal Communication Commission (U.S. FCC), while many of the consultations ask for specific information on device classes and how those classes should be regulated. These countries recognize the opportunity created by licence-exempt spectrum, whether standalone or to complement licensed portions of 5G networks.

The situation in ITU Region 1 is somewhat different, but highly encouraging. The European Commission (E.C.) issued a mandate for CEPT to determine if 5925-6425 MHz could

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[10] *See Wikipedia North America Population Page* and *Wikipedia South America Population Page*, *supra* note 2.

[11] *See* International Monetary Fund, *World Economic Outlook*, Oct. 2020, https://www.imf.org/en/Publications/WEO/weo-database/2020/October (using information found in the database in PPP and international dollars).

[12] The U.S. and Chile acted to open the 6 GHz band to licence-exempt technologies. Other national regulators with open consultations are Mexico's IFT, Brazil's ANATEL, Colombia's ANE, Argentina's ENACOM, Honduras' CONATEL, and Costa Rica's MICITT. *See* IFT, *El IFT Abre Consulta Publica Sobre Uso De La Bands De 6GHz en Mexico,* Nov. 6, 2020, http://www.ift.org.mx/comunicacion-y-medios/comunicados-ift/es/el-ift-abre-consulta-publica-sobre-uso-de-la-banda-de-6-ghz-en-mexico-comunicado-852020-06-de; ANATEL, *CONSULTA PÚBLICA Nº 82*, Dec. 10, 2020, https://sistemas.anatel.gov.br/SACP/Contribuicoes/TextoConsulta.asp?CodProcesso=C2427&Tipo=1&Opcao=andamento; ANE, *MINTIC y ANE consultan a los interesados sobre los posibles usos de la banda de 6 GHz*, Dec. 16, 2020, https://www.ane.gov.co/SitePages/det-noticias.aspx?p=232&Source=https%3A%2F%2Fwww%2Eane%2Egov%2Eco%2FSitePages%2Fnoticias%2Easpx; ENACOM, *JEFATURA DE GABINETE DE MINISTROS SECRETARÍA DE INNOVACIÓN PÚBLICA, Resolución 102/2020 RESOL-2020-102-APN-SIP#JGM,* Dec. 10, 2020, https://www.enacom.gob.ar/multimedia/normativas/2020/res102_20%20SIP.pdf; CONATEL, *CONATEL les recuerda que continua la consulta pública del Anteproyecto PNAF hasta el 23 de diciembre del 2020*, Dec, 23, 2020, http://www.conatel.gob.hn/index.php/2020/12/08/conatel-les-recuerda-que-continua-la-consulta-publica-del-anteproyecto-pnaf-hasta-el-23-de-diciembre-del-2020/; MICITT, *Consultas Públicas, available at* https://www.micit.go.cr/transparencia/consultas-publicas.

[13] Countries in the Americas region that have, or are proposing to, open the entire 6 GHz band to licence-exempt use are the United States, Chile, Canada, Mexico, Brazil, Colombia, Costa Rica, and Honduras. Argentina has specifically asked about acting in two phases to open the band, with the result that the entire band would be opened in 2023.

be used for RLANs.[14] CEPT completed its work on this frequency range and issued an ECC Decision with the technical requirements for coexistence in this band for LPI use and VLP portable use.[15] The E.C. is in the final stages of issuing a decision for the E.U., with an expected publication in early spring 2021. Individual E.U. members will then be invited to incorporate the rules into their national regulatory regimes. Nothing prohibits CEPT members from moving forward before the E.C. Decision is published. In 2020, for example, the United Kingdom's (U.K.) Ofcom became the first European regulatory body to move forward to open licence-exempt spectrum in the 6 GHz band, and is currently taking comments on implementation rules that align with its decision.[16] Other Region 1 countries, such as Jordan, have announced a national consultation to open the entire 6 GHz band 5925-7125 MHz[17] for licence-exempt use; the UAE has already opened 5925-6425 MHz range for such purposes.[18]

Europe can serve as an important exemplar for ISED. RLANs in Europe would coexist with the same incumbent services that operate in the 6 GHz band in Canada. Studies in Europe concluded that properly-regulated licence-exempt equipment should be allowed to operate throughout the band.

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[14] The E.C. chose to focus on the bottom part of the band for RLANs because, among other reasons, narrowband FS was in the process of being relocated to the upper part of the 6 GHz band, and some European Administrations have higher availability fixed links in the upper part of the 6 GHz band. While Region 1 is considering IMT designation in the 6425-7125 MHz range, having participated in the CEPT WRC-19 preparatory work, we note that an IMT designation is not supported by most of CEPT. While the examination of the upper portion of the band remains opened and unresolved, in Joint Parties' view, it is not a foregone conclusion how Region 1 will resolve the question of 6425-7125 MHz.

[15] *See* ECC, *ECC Decision 20(01): On the harmonised use of the frequency band 5945-6425 MHz for Wireless Access Systems including Radio Local Area Networks (WAS/RLAN)*, Nov. 20, 2020, https://docdb.cept.org/download/50365191-a99d/ECC%20Decision%20(20)01.pdf.

[16] OFCOM, *Notice of Ofcom's changes to licence exemption for Wireless Telegraphy Devices and consultation on licensing equipment in 57 to 71 GHz: Making more spectrum available for Wi-Fi, Data Networks, Short-Range Devices and proposals to license higher power equipment in the 57 to 71 GHz band*, Dec. 7, 2020, https://www.ofcom.org.uk/__data/assets/pdf_file/0030/208857/licence-exemption-notice-2020-condoc.pdf (comments are due on January 29, 2021 and will include advocacy on questions raised in this consultation on the 6 GHz band).

[17] *See* Government of Jordan, *Questionnaire regarding the availability of the 6G band for using Wi-Fi Technology*, Dec. 6, 2020, https://trc.gov.jo/DetailsPage/NewsDetails?ID=3013.

[18] Emirates News Agency, *TRA adds additional 500 MHz of 6 GHz band for the Wi-Fi radio frequency spectrum*, Dec. 28, 2020 (the UAE Telecommunications Regulatory Authority statement on the decision to designate 5925-6425 MHz for Wi-Fi access), http://wam.ae/en/details/1395302898209.

In ITU Region 3, the Republic of Korea has opened 5925-7125 MHz for licence-exempt use, focusing first on VLP and LPI device classes to enable immediate deployment. Korea is also considering opening the band for indoor and outdoor standard power use using an AFC as AFC technologies and processes become more mature.[19] Other nations in Region 3, including India, Australia, Japan and Taiwan are actively gathering technical data in support of a determination. Australia's ACMA Five-Year Spectrum Outlook 2020-24 referenced the FCC rules on the 5925–7125 MHz band, and ACMA is now monitoring global progress in the existing 5 GHz and new 6 GHz bands.[20] Japan's MIC revised its Frequency Reorganization Action Plan to include technical studies for wireless LANs operating in 5925-7125 MHz with regard to sharing conditions with other wireless systems, in order to achieve wireless LAN systems capable of handling increased traffic in future mobile communications and various uses.[21] Taiwan's MOTC sought inputs on (i) spectrum planning and R&D status of technologies and wireless equipment related to Wi-Fi 6E or 5G NR-U, and (ii) sharing and releasing methods for the 5925-7125 MHz range.[22]

III. Consultation Questions

Question 1

Question 1: 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

[19] Korea Ministry of Science and ICT, *Supplying 6 GHz band as unlicensed broadband frequency – Enabling Next Generation Wi-Fi at the performance level of 5G*, Oct.15, 2020.

[20] Australian Communications and Media Authority, *Five-year spectrum outlook 2020-24*, 30 Sept. 30, 2020, https://www.acma.gov.au/publications/2020-09/publication/five-year-spectrum-outlook-2020-24.

[21] *See* Japan Ministry of Internal Affairs and Communications, *Announcement of Frequency Reorganization Action Plan (2nd. revised version in FY 2020)*, Nov. 13, 2020, https://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/pressrelease/2020/11/13_01.html.

[22] Ministry of Transportation and Communications R.O.C., *MOTC's Consultation Paper on the Plan to Use 5925-7125MHz as the Harmonized Band*, June 19, 2020, https://www.motc.gov.tw/ch/home.jsp?id=15&parentpath=0,2&mcustomize=multimessages_view.jsp&dataserno=202006180001&aplistdn=ou=data,ou=bulletin,ou=chinese,ou=ap_root,o=motc,c=tw&toolsflag=Y&imgfolder=img%252Fstand.

Licence-exempt Wi-Fi 6E routers and client devices are already certified for use in the U.S. and will be imminently available for purchase.[23] ISED should act in the best interests of Canadian consumers to open the band to licence-exempt use as promptly as possible to generate and enjoy the benefits of Wi-Fi 6E and 5G NR-U.

1. Standards are ready

The IEEE has extended the latest Wi-Fi standard, 802.11ax (also known as "Wi-Fi 6") to include the 6 GHz band. The standard – Wi-Fi 6E – is in the final stages of completion with an expected publication date of very early in 2021.[24] In addition to the IEEE standard, Europe's ETSI BRAN EN 303 687 has reached a "stable draft" status,[25] providing further support for standards-based deployments.

3GPP-based standards focused on licence-exempt technologies are also maturing.[26] It should be noted that, at this point in time, n96 is applicable in the USA only subject to FCC Report and Order [FCC 20-51] as stated in Note 14 in Table 5.2-1 of 3GPP specification 38.101-1 V16.5.0 (2020-09). We anticipate that the n96 band class will be extended to other countries that also designate the entire 6 GHz band for licence-exempt use.

2. Interoperability testing is ready

The Wi-Fi Alliance has named Wi-Fi 6 products capable of operating in the 6 GHz band as "Wi-Fi 6E" devices, and recently announced a certification plan for global interoperability.[27]

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[23] *See, e.g.,* Stephen Silver, *Wi-Fi 6E: What Is It and When Can You Buy It?*, The National Interest, Jan. 9, 2021, https://nationalinterest.org/blog/techland/wi-fi-6e-what-it-and-when-can-you-buy-it-176115.

[24] The IEEE Standard is in the final stage of standards development known as the "SA ballot phase" and should be completed in February 2021. *See generally* IEEE P802.11*, Status of Project IEEE 802.11ax*, *at* https://www.ieee802.org/11/Reports/tgax_update.htm.

[25] ETSI, *Details of 'DEN/BRAN-230021' Work Item*, *at* https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=58036.

[26] *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). We anticipate that the n96 band class will be extended to other countries that also allocate the entire 6 GHz band.

[27] *See* Wi-Fi Alliance, *Wi-Fi Alliance® delivers Wi-Fi 6E certification program*, Jan. 7, 2021, https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-delivers-wi-fi-6e-certification-program.

Interoperability testing has become the hallmark of technologies that use licence-exempt spectrum, because it ensures that consumers can purchase devices with the confidence that the consumer device will work with their router and other devices. According to the announcement, "Multiple product vendors are already announcing Wi-Fi 6E devices that make use of the superwide 160 MHz channels and uncongested bandwidth in 6 GHz to deliver multigigabit, low latency Wi-Fi. Wi-Fi CERTIFIED™ provides a standards-based approach for product vendors to introduce secure and interoperable Wi-Fi 6E products throughout the world, helping to create a diverse device ecosystem."

3. 6 GHz equipment is poised to enter the market

The U.S. FCC has published its test requirements for LPI 6 GHz equipment,[28] and the first AP and client devices have completed test review and approval.[29] While equipment approvals usually do not draw much comment from FCC leadership, FCC Chairman Ajit Pai marked the occasion with the following statement:

> We expect Wi-Fi 6[E] to be over two-and-a-half times faster than the current standard. This will offer better performance for American consumers at a time when homes and businesses are increasingly reliant on Wi-Fi. During the COVID-19 pandemic, we've all seen how Wi-Fi has enabled everything from work-at-home to telehealth to remote learning to streaming and gaming. Wi-Fi 6[E] will turbocharge each of these and more, and will also complement commercial 5G networks. Bottom line: The American consumer's wireless experience is about to be transformed for the better.[30]

ISED can take advantage of this same momentum for Canadians, with the same benefits.

Similarly, with the ETSI standard reaching the stable stage and assuming the European process remains on track for completion in early 2021, equipment can enter the European market in 2021. In addition, UK's Ofcom – the first regulator in Europe to proceed to open licence-exempt spectrum in the 6 GHz band ahead of the ECC decision – is currently taking comments

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[28] FCC Office of Engineering and Technology, Knowledge Data Base (KDB) 987594, Dec. 10, 2020, https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?id=277034&switch=P.

[29] FCC, *Chairman Pai Statement on Authorization of First 6 GHz Wi-Fi Device*, Dec. 10, 2020, https://docs.fcc.gov/public/attachments/DOC-368593A1.pdf (*Chairman Pai Statement*). Broadcom, MediaTek, and Samsung have received approval of LPI devices, while ASUS has received approval of an AP. Silver, *supra* note 23. Samsung has now announced the availability of the first Wi-Fi 6E enabled Smartphone. https://news.samsung.com/global/samsung-galaxy-s21-ultra-the-ultimate-smartphone-experience-designed-to-be-epic-in-every-way

[30] *See* *Chairman Pai Statement*, *supra* note 29.

on implementation rules that align with its 2020 spectrum policy decision.[31] Korea's National Radio Research Institute has announced its revision of the test method for conformity assessment of radio equipment for the 6 GHZ band, which includes certification requirements for both LPI and VLP.[32]

The Wi-Fi Alliance projects that 316 million Wi-Fi 6E devices will be sold in 2021 globally. The vast majority of such devices are expected to be capable of operating over the entire 6 GHz band pending regulatory approval. While the move to open the band is global, in the Americas region, the trends are very clear in that regulators are seeking to unlock the entirety of 5925-7125 MHz to RLAN technologies for their citizens. The broad movement toward allowing a licence-exempt underlay is yet another reason ISED can be certain that equipment will quickly be presented for certification shortly after release of its ruling.

The situation with VLP devices is quite similar to that for LPI devices. In Europe, assuming timely publication of the relevant authorizations in the Official Journal of the European Union, VLP equipment can enter the market in 2021. Final technical rules are in place in the Republic of Korea and are anticipated in the U.K. Moreover, operations of VLP devices have been proposed in most jurisdictions including in ITU Region 2. These developments, together with the stable draft on test processes now at ETSI, virtually ensure that VLP devices will make their commercial debut in 2021.

4. AFC development is proceeding

While AFCs supporting Standard Power equipment are on a longer development track, the question is not "whether" Standard Power devices will come to market, it is "when." The U.S. FCC has provided a final rules framework that will promote speedy development of AFCs, by eliminating whole categories of implementation topics that do not need to be the subject of industry negotiation.[33] Some topics of AFC testing and how to test that Standard Power devices work with an AFC remain to be decided. The U.S. FCC has asked for recommendations from a Multi-Stakeholder group on these and other topics, and it is anticipated that the fruits of this

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[31] Ofcom, *Notice of Ofcom's changes to licence exemption for Wireless Telegraphy Devices and consultation on licensing equipment in 57 to 71 GHz: Making more spectrum available for Wi-Fi, Data Networks, Short-Range Devices and proposals to license higher power equipment in the 57 to 71 GHz band*, Dec. 7, 2020, https://www.ofcom.org.uk/__data/assets/pdf_file/0030/208857/licence-exemption-notice-2020-condoc.pdf (comments on this consultation, which includes questions on the 6 GHz band, are due on Jan. 29, 2021).

[32] Official Gazette No. 19856 (Notification No. 2020-585, No 2020-586, No. 2020-587 of the Ministry of Science and ICT.

[33] FCC, In the Matter of Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 3852, Appendix A, 47 C.F.R. §§ 15.407(k), (l), (m) and (n) (2020) (*FCC Report & Order*).

work will yield recommendations sometime in late 2021.[34] AFC technology, however, is similar to existing TV White Spaces database technology, and is far simpler than Citizens Broadband Radio Service (CBRS) database technology that supports commercial service in the U.S. Database providers already active in these other band sharing regimes are participating in or closely monitoring the Multi-Stakeholder group's activities. This will enable them to discuss final testing rules with the FCC as the Multi-Stakeholder group produces its recommendations and to be ready for commercial implementation as promptly as the FCC's decisions permit, most likely in late 2021 or 2022.

Both the Wi-Fi Alliance (for IEEE 802.11) and the technology-agnostic Wireless Innovation Forum (WinnForum) have committees focusing on development of 6 GHz AFC standards. More specifically, the Wi-Fi Alliance AFC Task Group is engaged in projects to develop an AFC to AFC device interface specification, and the development of certification tests for AFC systems and AFC devices. Standardization of the AFC interface helps to accelerate the availability of AFC devices and AFC systems. As a result, there is a built-in incentive for AFCs to utilize the standards. The interface standard also helps device manufacturers and users because Standard Power APs can be manufactured and used with the confidence that the equipment will interface with any AFC using the standard.[35] The compliance test specifications are addressing compliance of AFC devices, including Standard Power Access Points and Fixed Client Devices, under control of AFC as well as compliance of the AFC Systems to the target regulatory domains. The Wi-Fi Alliance specifications are flexible to comply with various National Regulatory Authorities requirements and databases for protection of incumbent services against harmful interference.

ISED can monitor these AFC-related activities and ultimately decide if the FCC certification rules for AFCs and Standard Power APs are suitable for Canada. With jurisdictions such as Mexico proposing Standard Power devices subject to AFC,[36] ISED would be well served to indicate its preference for a Standard Power device class to better leverage discussions with potential vendors as early implementation decisions are occurring.

Question 2

[34] *Id.* ¶¶174-180.

[35] In contrast, standardization of AFCs themselves should not be attempted. Outcome-oriented rules frameworks for AFCs are critical, as discussed in response to questions 10-15, but AFCs themselves should be able to innovate and differentiate offerings above the regulatory minimums.

[36] *See* IFT, *El IFT abre Consulta Pública sobre uso de la banda de 6 GHz en México (Comunicado 85/2020)*, Nov. 6, 2020, http://www.ift.org.mx/comunicacion-y-medios/comunicados-ift/es/el-ift-abre-consulta-publica-sobre-uso-de-la-banda-de-6-ghz-en-mexico-comunicado-852020-06-de.

Question 2: ISED is seeking comments on its proposals to allow licence-exempt RLAN use in the 5925-7125 MHz band.

In this response, the Joint Filers discuss the most important reasons why ISED should open 5925-7125 MHz to licence-exempt RLAN use. We begin with a discussion of how consumer demand is evolving, and driving the need for faster broadband. We then highlight how changing licence-exempt use cases have created a need for new, more powerful technologies. Next, we discuss how Wi-Fi 6E and 5G NR-U address those changing use cases and how these technologies utilize spectrum differently than prior generations of licence-exempt RLAN. We then highlight how access to the entire band will improve coexistence with incumbent users, by spreading licence-exempt radio energy throughout the band. Finally, we address the economic and societal benefits of opening the entire 6 GHz band to licence-exempt use.

A. Consumer demand is accelerating toward faster broadband

As recognized by the consultation, the global pandemic of 2020 has thrown into focus the critical need for households to have robust broadband connections. Almost every nation, including the U.S., lacked the universal connectivity urgently needed to address remote education and telework. Licence-exempt technologies like Wi-Fi[37] play an enormous role in delivering that connectivity, because once a wired or wireless broadband connection is available, Wi-Fi enables multiple devices in a household to be connected at the same time. Even when schools are closed, Wi-Fi networks at schools and libraries or installed in school buses[38] that can be driven to outlying areas, have played an important role in keeping students online. It is no surprise that both the U.S. FCC and U.K. Ofcom decisions opening the 6 GHz band to licence-exempt use cited the ongoing pandemic as highlighting the compelling need to do so.

Prior to the growing wave of global regulators opening the 6 GHz band for licence-exempt RLAN devices, there had been no new licence-exempt spectrum made available since the early 2000s, despite years of significant growth in demand.[39]

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[37] Throughout this filing, Joint Filers refer to Wi-Fi systems as a leading example of a technology that would be deployed in the 5925-7125 MHz band. We do not mean to suggest, however, that regulations should be technology specific. To the contrary, Joint Filers champion technology-neutral regulation and agree that 5G New Radio-Licence exempt (NR-U) being standardized by 3GPP is another RLAN technology that will operate in the band.

[38] Richard Nedwich, CommScope, *Can School Bus Wi-Fi Help Address Digital Equity?*, Apr. 24, 2020, https://www.commscope.com/blog/2020/can-school-bus-wi-fi-help-address-digital-equity/.

[39] WRC 2003 included the last significant action on licence-exempt spectrum, and its decisions on 5 GHz were ultimately implemented three to six years after that conference. In contrast, the IMT community has received regular infusions of new spectrum as its technologies have

- Considering the categories of Wi-Fi from a fixed connection and Wi-Fi offloading from a mobile-equipped device, Canada's Internet traffic has grown from nearly 1.7 exabytes per month in 2014 to a projected 2.9 exabytes per month in 2022 – an increase of 70%.
- Considering only the category of mobile offload, in 2022, Wi-Fi will account for 76% of the traffic to and from mobile-equipped devices in Canada, up from 67% in 2017.

The reason for that demand growth has much to do with how consumers are using licence-exempt RLANs. Specifically, demand growth is tightly linked to the accelerating rate with which global consumer electronics products utilize licence-exempt spectrum. Examples of connected devices that did not exist just a few years ago include connected televisions, smart speakers, appliances, security systems, cloud-based gaming systems, and home printers. Similarly, in the enterprise sector, connected video screens, white boards and entire networks of wireless printers and other devices are now common.

Licence-exempt RLAN technologies (e.g., Wi-Fi, 5G NR-U) must continue to meet the critical needs of licence-exempt use cases. In addition, RLANs are a critical component for enabling 5G services. Regulators must ensure that there is sufficient licence-exempt spectrum to complement 5G licenced networks. The concept of "balance" must encompass the whole of spectrum allocations and designations, and not single out one band.

More licence-exempt spectrum is needed. The Wi-Fi Alliance concluded in its *Spectrum Needs Study (2017)* that new designations for licence-free spectrum must be both contiguous and substantial in size to address growing demand.[40] The Wi-Fi Alliance recommended that regulators consider between 1 GHz (under conservative projections) and 1.7 GHz of new spectrum to meet consumer needs in 2025. Regulators such as the U.S. FCC agree – the spectrum designations for permissionless use that date from the early 2000s are no longer enough to support consumer demand for licence-exempt applications, now or in the future.

Since the *Spectrum Needs Study* was released, the underlying trends that point toward the need for more licence-exempt spectrum have continued to develop as projected: more connections, more connected devices, improvements in broadband networks (wired and wireless) to which Wi-Fi connects, the arrival of the Internet of Things (IoT), and a growth in applications – particularly those such as streaming video that consume large amounts of data.

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evolved. In fact, for WRC 2023, the ITU has identified 17.25 GHz of spectrum for IMT, with 1.9 GHz of this amount available before WRC 2019. Per the ITU, 14.75 GHz (85%) has been harmonized for global use. ITU News, *WRC-19 identifies additional frequency bands for 5G*, Nov. 22, 2019, https://news.itu.int/wrc-19-agrees-to-identify-new-frequency-bands-for-5g.

[40] Wi-Fi Alliance, *Additional unlicensed spectrum needed to deliver future Wi-Fi® connectivity*, Feb. 27, 2017, https://www.wi-fi.org/news-events/newsroom/additional-unlicensed-spectrum-needed-to-deliver-future-wi-fi-connectivity.

The number of devices in use is multiplying and, at the same time, devices are becoming more capable and powerful. In Canada, the number of Wi-Fi devices at the edge of a fixed broadband connection continues to grow, from 198.6 million in 2018 to 327.2 million 2023.[41] About 70% of these devices will be in the consumer category. Tablets and laptops continue to supplement the smartphone, particularly for remote education and telework. With each new model release, manufacturers continuously improve devices by including, among other things, more powerful processors, better screen technology that consumes more data, improved cameras and increased data storage. This data is often synced between such devices over licence-exempt spectrum. Beyond the categories of smartphones, tablets and laptops, the number of connected devices in the home continues to grow. Televisions that stream video from Internet platforms have become the norm, as have connected appliances of all types, including security systems and printers.

Just as devices are becoming more powerful and process more data, broadband network technologies are getting faster to accommodate device use. As broadband technology improves its throughput (whether through the evolution of wired broadband or wireless from 4G to 5G), so too must licence-exempt technologies such as Wi-Fi that operate at the edge of the broadband network. In the consumer segment, fixed and mobile broadband speeds are rising to meet consumer demand. In Canada, Cisco projects that by 2023, the average fixed broadband connection will be capable of delivering 136.4 Mbps compared to 48.2 Mbps in 2018.[42] That is an impressive increase. During this same period, mobile operators will continue to advance the capability of their 4G networks and will begin the transition to much faster 5G, enabling 100+ Mbps average data rates. Without action, Wi-Fi will become the weak link. Cisco projects that by 2023, Wi-Fi speeds in Canada will reach just 109 Mbps from mobile devices[43] - roughly the same as licensed mobile networks, but substantially slower than the average fixed broadband connection.

As a fundamental tenet of broadband policy, it is critical that regulators enable all parts of the broadband ecosystem to advance in capabilities, and it is even more critical in the case of licence-exempt technologies given their important roles in supporting broadband requirements.

B. Changing use cases require more powerful licence-exempt technology – Wi-Fi 6E

Three main categories of use cases are driving consideration of improved access to spectrum for licence-exempt use. The first is high bandwidth use cases that today are dominated by video and tomorrow will be challenged by proliferation of Augmented Reality (AR) and

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[41] Cisco, Cisco Internet Report, "Highlights" tool, at https://www.cisco.com/c/en/us/solutions/executive-perspectives/annual-internet-report/air-highlights.html#.

[42] *Id.*

[43] *Id.*

Virtual Reality (VR) in the consumer and business categories. The second is high-density deployments requiring multiple channels. The third is the uptake in the IoT. Each category places a significant emphasis on innovations that demand improved access to spectrum, supporting the need for significant new licence-exempt spectrum sources including the entire 6 GHz band.

Video continues to be the category of traffic that in some ways dominates the Internet.[44] Applications are deploying increasing amounts of higher definition video. The advent of streaming services is accelerating the amount of bandwidth consumed. Soon an even more robust evolution of AR and VR video applications will be used across the consumer and business categories on everything from gaming or teaching cooking techniques to medical or corporate training and productivity aids, and beyond. These AR and VR technologies will impact every sector from tourism and hospitality to retail to manufacturing.

Second, high-density deployments drive the need for more spectrum. In venues such as stadiums, convention centers, hotels and airports, technologies like Wi-Fi can deliver much more robust throughput with access to multiple channels. For example, dense enterprise deployments will require more than the five to seven channels used in enterprise networking today. Multiple wide channels in dense residential settings also will improve the user experience and address innovative new use cases, particularly where multiple people in a household are connecting at the same time. Such high-density deployments are especially necessary in dense urban environments, especially for Canadian cities like Vancouver, Toronto, and Montreal.

Third, the IoT is resulting in economic sectors that are deeply digitizing to pull data from their business operations to enable improved outcomes.[45] As businesses increase connectivity – adding connected devices, and sensors that use more wireless technology – more data is becoming available that enables new insights into business operations. As an example from the leading edge of this trend, Cisco has a hospital customer in Houston, Texas that sees 35,000 connected devices on its network per day, including everything from smartphones carried by staff and guests, to patient diagnostic equipment, video displays, and nursing stations, to connectivity for back-office billing. This connectivity enables patient data to be shared electronically, resulting in more efficient operations and better patient outcomes. Canadian

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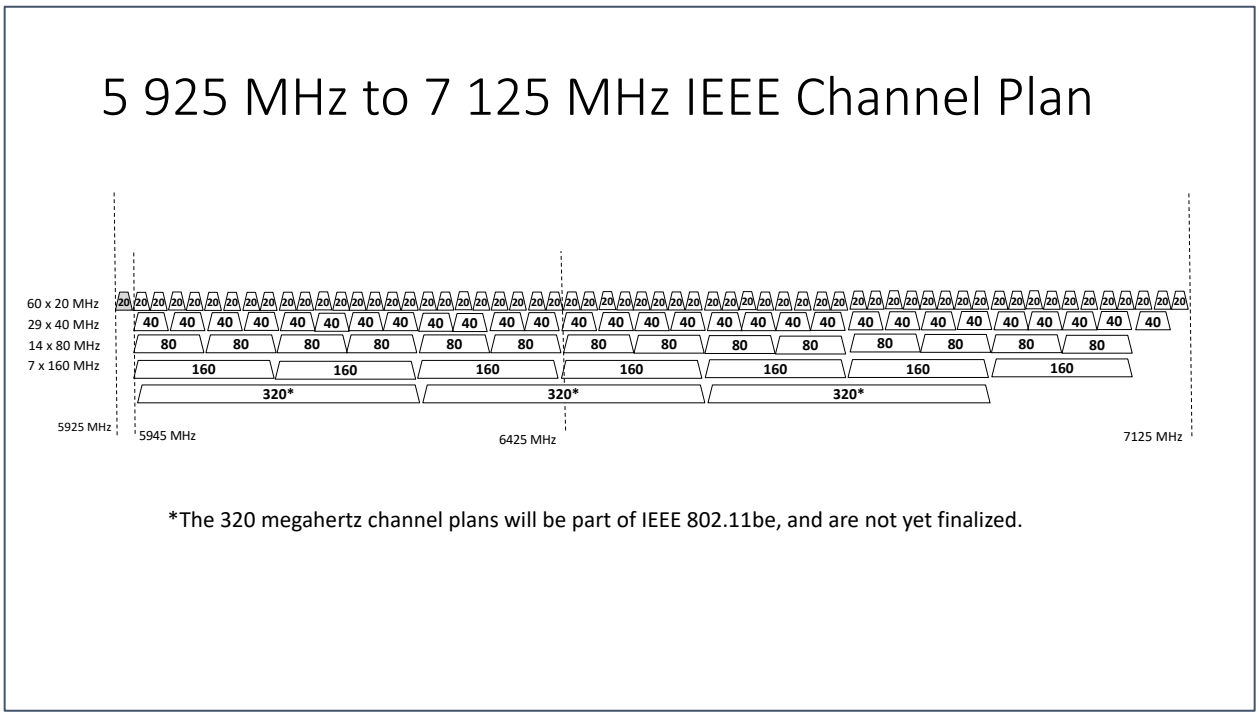
[44] Cisco, *Cisco Annual Internet Report (2018–2023) White Paper*, https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.html (last updated Mar. 9, 2020) (explaining that the "[v]ideo effect of the devices on traffic is more pronounced because of the introduction of Ultra-High-Definition (UHD), or 4K, video streaming. This technology has such an effect because the bit rate for 4K video at about 15 to 18 Mbps is more than double the HD video bit rate and nine times more than Standard-Definition (SD) video bit rate. We estimate that by 2023, two-thirds (66 percent) of the installed flat-panel TV sets will be UHD, up from 33 percent in 2018.").

[45] *See generally* Richard Edgar, *Wi-Fi 6 is set to change the future of IoT—Here's why*, July 24, 2020, https://www.wi-fi.org/beacon/richard-edgar/wi-fi-6-is-set-to-change-the-future-of-iot-here-s-why.

health care facilities now and in the future will face similar needs. This high density of devices demonstrates the urgent need for more licence-exempt spectrum.

Industry has anticipated growing demand and new use case trends and has worked consistently and continuously to address these needs with new generations of technology that operate on licence-exempt spectrum. The latest technology, known as Wi-Fi 6 – or when capable of use in the 6 GHz band, Wi-Fi 6E – addresses the challenges of growth in demand and devices in a variety of ways.[46] For example, Wi-Fi 6 supports not just communication with associated devices on a 1:1 basis (one data stream at a time), but also simultaneous communication with multiple devices. A key feature of Wi-Fi 6 of interest to spectrum policy is its utilization of broad channels (80 and 160 MHz-wide) that can enable data transmissions to occur much more quickly relative to smaller channel sizes. Importantly, Wi-Fi 7 is expected to enable channel sizes up to 320 MHz. Below is a depiction of the IEEE channel plan for the 6 GHz band, showing that the band is capable of supporting up to 14 80-MHz wide channels and up to seven 160-MHz-wide channels. This is the configuration of spectrum needed to address rising density and demand for video, as well as an increasing number of connected devices.



Moreover, the 6 GHz band is adjacent to existing licence-exempt spectrum at 5 GHz, which provides additional benefits. Wi-Fi 6E has been designed to use spectrum in the 2.4 GHz,

[46] *See* Wi-Fi Alliance, *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 (last visited Jan. 17, 2021) (discussing the basic capabilities of Wi-Fi 6, including 6E). *See also* Wireless Broadband Alliance, Understand More About Wi-Fi 6, https://wballiance.com/wi-fi-6/(last visited Jan. 17, 2021).

5 GHz, and 6 GHz bands, providing a more agile use of radio spectrum depending upon the users' needs. For enterprises and consumers, the adjacency is important for another reason – because the propagation characteristics are similar between 5 GHz and 6 GHz, network coverage is similar, and multiple APs deployed in a network configuration can more easily be swapped out for the new generation of Wi-Fi without rewiring the network.

While Wi-Fi 6E radios will still be capable of operating in the 5 GHz and 2.4 GHz bands, prior generation Wi-Fi devices will not operate at 6 GHz. Wi-Fi 6E is a "greenfield" technology in the 6 GHz band. At 6 GHz, it will not have to contend with generations of legacy devices, many of them operating with legacy inefficiencies. The UK's Ofcom noted when it opened 6 GHz for license-exempt spectrum, that:

> [i]n our consultation we said that opening up new spectrum, free from legacy devices, could enable a more efficient group of devices using new Wi-Fi standards from the outset, therefore offering a more future-proof solution to Wi-Fi demand. This would also make it easier to use existing bands to support increased use of Wi-Fi.[47]

Ofcom referred to this opportunity for new technology in a new band as "future-proofing" Wi-Fi. We agree. Not only will the new 6 GHz spectrum support the latest technology – Wi-Fi 6E – it will also support the forthcoming, in-process standard for Wi-Fi 7. Wi-Fi 7 will have channelization of up to 320 MHz to support many next-generation applications. Channel widths of 320 MHz compel the need for a wide swath of spectrum so that multiple channels can be supported. This further supports the conclusion of the Wi-Fi Alliance's *Spectrum Needs Study (2017)* that approximately 1,200 MHz of spectrum needed to be newly identified for licence-exempt use.

ISED should note that release of the entire band encourages and supports deployment of much more spectrally efficient technology (Wi-Fi 6E) in comparison to prior generations, and will be a strong platform for technology and business process innovation. Some of the most important innovations in this generation of technology include:

- Orthogonal Frequency Division Multiple Access (OFDMA) effectively shares channels to increase network efficiency and lower latency for traffic in high-demand environments.
- Multi-user MIMO allows more downlink data to be transferred at one time, enabling APs to concurrently handle more devices.
- 160 MHz channel utilization capability increases bandwidth to deliver greater performance with low latency.
- Target Wake Time (TWT) significantly improves network efficiency and device battery life, including for IoT devices.
- 1024QAM modulation increases throughput for emerging, bandwidth-intensive uses by encoding more data in the same amount of spectrum.

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[47] Ofcom, *Statement: Improving Spectrum Access for Wi-Fi*, July 24, 2020 at 3.3, https://www.ofcom.org.uk/consultations-and-statements/category-2/improving-spectrum-access-for-wi-fi.

- Transmit beamforming enables higher data rates at a given range to increase network capacity.
- The IEEE 802.11ax standard that forms the basis for Wi-Fi 6 and Wi-Fi 6E includes support and channelization from 5.925 GHz to 7.125 GHz.
- The IEEE 802.11ax standard supports eight-stream MU-MIMO for both uplink and downlink, compared to the four-stream, downlink only MU-MIMO of 802.11ac.
- Wi-Fi 6 and 6E fixes a problem with existing 2.4 / 5 GHz Wi-Fi of sometimes excessive management overhead.
- New technology supports "Out of Band" discovery of networks, further reducing management overhead.
- Strict scanning rules prevent unnecessary use of spectrum (e.g., only scans on a subset of 6 GHz channels).

Regulations adopted for the 6 GHz band should be technology neutral to allow other free use technologies to be deployed. For example, the 3GPP community is developing a technology known as "New Radio-Licence exempt."[48] 3GPP-based 5G NR-Unlicensed ("5G NR-U") technology will be deployed in licence-exempt bands, such as the 6 GHz band, to supplement licenced 5G deployments.[49] Like Wi-Fi 6 and the upcoming Wi-Fi 7, 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 licenced spectrum. Whether standalone NR-U, or supplemental to licenced 5G, 5G NR-U is envisioned to support greatly improved Industrial IoT applications with ultra-reliable, low latency needs.

From a spectrum policy perspective, multiple technology organizations see the benefit of licence-exempt spectrum and are seeking to deploy in the 6 GHz range with wholly new, state-of-the-art equipment.

C. Designation of the full band for licence-exempt use improves the coexistence case

When placing technologies that rely on licence-exempt spectrum in the band, opening the full band helps spread the radio energy associated with these technologies throughout the band. This can facilitate coexistence with licenced interests. As a statistical matter, the fewer the licence-exempt transmitters operating co-channel with a licenced fixed receiver, the lower the likelihood of harmful interference – which is already remote.

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[48] *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).

[49] 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, https://www.qualcomm.com/news/onq/2020/06/11/how-does-support-unlicensed-spectrum-nr-u-transform-what-5g-can-do-you.

Moreover, incumbents' fixed use cases are the same throughout the band, so regulatory requirements that enhance coexistence between these licenced networks and licence-exempt ones (such as LPI and VLP device classes) can work throughout the band to enable more intensive use of spectrum.

Greater amounts of spectrum also support wide channels for licence-exempt operations, including in areas where there are many incumbent fixed service links. In fact, the areas of the country where licence-exempt spectrum is needed most happen to be areas with heavy incumbent operations. Thus, opening all 1200 MHz of the 6 GHz band for licence-exempt use ensures that these densely populated areas will have access to ample licence-exempt spectrum resources.

D. Economic and societal benefits of opening the entire 6 GHz band to licence-exempt use.

The Wi-Fi Alliance projects the total global economic value of Wi-Fi in 2023 will be nearly US$3.5 trillion.[50] That measure of economic value reflects three facts:

- more than half of all Internet traffic globally begins or ends on Wi-Fi;
- more than 70% of global data traffic on smartphones is offloaded to Wi-Fi;[51] and
- the number of devices per capita, and the throughput capacity of those devices, continues to grow.

According to the Wi-Fi Alliance, "[t]he report found that Wi-Fi is an 'enabling resource' that extends connectivity to underserved areas, allows other innovative products and services to develop and thrive (including portable devices that require Internet access but lack a cellular connection), expands access to communications services and increases the value of those offerings (such as by spreading a wireline connection throughout the home and through off-loading to reduce the strain on cellular networks), and enhances the effectiveness of existing product and service offerings (such as 'smart home' devices)."[52] Moreover, a recent study by Dr.

[50] The Wi-Fi Alliance, *What Is the Value of Wi-Fi?*, available at https://www.wi-fi.org/value-of-wi-fi.

[51] Beyond offloading, there is a growing body of literature on the issue of 5G and Wi-Fi Convergence, where the two networks technologies can essentially be operated seamlessly from a consumer's perspective. *See, e.g.,* WBA and NGMN Alliance, RAN Convergence Paper, Jan. 2019, https://wballiance.com/wp-content/uploads/2019/01/RAN-Convergence-Paper-2019.pdf.

[52] *See* Comments of the Wi-Fi Alliance, filed in FCC Docket 18-295, Licence exempt Use of the 6 GHz Band, filed Feb. 15, 2019.

Raul Katz found that the FCC's proposal to open the 6 GHz band to licence-exempt use would generate $153.75 billion in economic value evaluating the period 2021-2030.[53]

These are significant results, and reflect that the use of Wi-Fi has spread well beyond use cases of consumer entertainment and convenience, into almost every corner of economic activity. According to FCC Chairman Ajit Pai:

> To realize that potential [economic value], we need faster, stronger Wi-Fi networks. The good news is that the next generation of Wi-Fi, commonly called Wi-Fi 6, has already started rolling out. Wi-Fi 6 will be over two-and-a-half times faster than the current standard, and it will offer better performance for connected devices. But in order to fully take advantage of the benefits of Wi-Fi 6, we need to make more mid-band spectrum available for licence exempt use. It's been a long, long time since we did that—and consumers deserve it.[54]

Nowhere is this more important than in addressing the persistent issue of the Digital Divide, where connectivity is not available in rural areas and not affordable for segments of society. A case in point is addressing the digital divide between urban areas, which tend to have good connectivity, and rural areas that tend to lack good connectivity. According to Cisco, public Wi-Fi hotspots in Canada are projected to grow five-fold, from 2.7 million in 2018 to 14.0 million by 2023.[55] In rural areas, community Wi-Fi hotspots often use satellite broadband connectivity to access the Internet. Moreover, licence-exempt spectrum can also be used by entrepreneurs to extend the reach of fixed broadband facilities to reach rural households, provided good regulatory frameworks are in place. By enabling a less expensive way to deliver broadband, more households can become connected, helping to address the economic limitations that carriers face in trying to address the least dense geographic areas.

A recent example of this use case in action is Digital Canopy,[56] Cisco's September 2020 $1 million technology investment to deliver free Wi-Fi hotspots for approximately 13,000

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[53] *See* Wi-Fi Forward, *New Study by Dr. Raul Katz Finds FCC's Wi-Fi Proposals Will Add $183.44 Billion to U.S. Economy by 2025*, Apr. 13, 2020, at http://wififorward.org/2020/04/13/new-study-by-dr-raul-katz-finds-fccs-wi-fi-proposals-will-add-183-44-billion-to-u-s-economy-by-2025/#:~:text=%E2%80%93%20The%20FCC's%20proposal%20to%20open%20the%206%20GHz%20band%20to,findings%3A%20Katz%20Study's%20key%20conclusions.

[54] *FCC Report & Order,* Statement of Chairman Ajit Pai, https://docs.fcc.gov/public/attachments/FCC-20-51A2.pdf.

[55] *See* Cisco, *Cisco Annual Internet Report - Cisco Annual Internet Report Highlights Tool,* at https://www.cisco.com/c/en/us/solutions/executive-perspectives/annual-internet-report/air-highlights.html.

[56] Cisco, *Cisco and the City of Toronto launch 'Digital Canopy' to expand internet access for underserved communities*, Sept. 9, 2020, https://newsroom.cisco.com/press-release-content?type=webcontent&articleId=2095927.

underserved citizens in some of Toronto's most vulnerable communities. Cisco, together with the City of Toronto, brought together network providers, Internet service providers and managed service providers to provide residents living in low-income residential tower communities free Wi-Fi access – allowing those residents to access much-needed online resources to access distance learning, remote work, crucial medical and social supports, and staying connected to family and friends.

E. Opening the 6 GHz band in part is not a strong option for Canadian consumers

Joint Filers are aware of arguments that ISED should only open 5925-6425 MHz for now, and delay further action until WRC-23 makes a decision with respect to the top part of the 6 GHz band for ITU Region 1. The proponents of this plan apparently believe that if ITU-R ultimately opts for an IMT designation at the next World Radiocommunication Conference in 2023 for Region 1, countries in other Regions should take that result into account. In the Joint Filers' view, proposals that either delay the decision or call for action on an interim decision to split the 6 GHz band between licence-exempt and IMT spectrum, entail serious difficulties. Because licensed IMT technologies are much higher power than technologies using licence-exempt spectrum, IMT's coexistence with existing licenced microwave uses is a difficult (and potentially insurmountable) goal. Furthermore, such arguments are inapplicable as only the upper 100 MHz of the 6 GHz band is designated for an IMT study in ITU Region 2, which includes Canada. Indeed, in the U.S., advocates for "splitting the band" eventually acknowledged that any portion of the band designated for IMT would have to be auctioned and cleared of incumbents to make it useful for IMT.

The U.S. FCC did not find this option compelling:

> Making the entire band available for these license exempt operations enables use of wide swaths of spectrum, including several 160-megahertz channels as well as 320-megahertz channels, which promotes more efficient and productive use of the spectrum, and would also help create a larger ecosystem in the 5 GHz and 6 GHz bands for U-NII devices. Repurposing large portions of the 6 GHz band for new licensed services would diminish the benefits of such use to the American public. Accordingly, we agree with the license exempt proponents that we should reject these requests. Similarly, repurposing substantial portions of the band, as CTIA and Ericsson request, would substantially affect existing licensed services in the band. This would be contrary to the Commission's stated goal in this proceeding to ensure that existing incumbents can continue to thrive in the 6 GHz band. Representatives of the incumbent fixed microwave services also raise concerns about the reasonableness and practicality of relocation, and question whether other appropriate spectrum can be found. The fixed satellite service commenters also strongly reject the contention of CTIA and Ericsson that satellite services would not need to be relocated because new licensed services would not cause harmful

interference to the satellite services. Further, there is no certain or clear path for achieving what CTIA and Ericsson propose, and it would take years.[57]

In fact, no regulator globally has opted for IMT services in the 6 GHz band. Europe, which limited its initial consideration of licence-exempt spectrum to 5925-6425 MHz, has made no decision on 6425-7125 MHz. This includes the U.K.'s Ofcom, which opened the lower portion of 6 GHz in July 2020. Consideration of the fate of 6425-7125 MHz in Europe remains an open question - tied to a WRC-23 Agenda item where Region 1 has been asked to consider whether the band should be designated for IMT. Regulators there are confronting the same issues with regard to incumbent uses in the band identified by the FCC. Furthermore, some European countries, such as France, have recently migrated fixed microwave services from other bands into the upper range of the 6 GHz band. This makes the path forward to clearing the band of fixed uses more difficult. We also note that high power IMT outdoor operations would create sharing challenges with FSS uplink operations, thus requiring those services be relocated, or forcing the reduction of IMT power to a level that would not provide adequate coverage/performance and therefore would not justify investment.

Moreover, delaying the decision for two or more years about whether to open the 6 GHz band above 6425 MHz to licence-exempt uses does not resolve any of these issues. As the U.S. FCC stated, "there is no certain or clear path" when there are incumbents operating in the band that cannot easily coexist with IMT. Delay also fails to provide the full benefits of the most advanced licence-exempt technologies to Canadian consumers and businesses, beginning in 2021.

In addition to the difficult regulatory questions that would arise if a portion of the band were designated for IMT, the IMT community today is focused on other bands in which there has been substantially more progress in terms of delivering services. Opportunities in the 3 GHz range, at 600 MHz, and in other bands have been identified as more important by mobile network operators and are highly advanced in terms of global harmonization. Globally, 6 GHz remains unsupported by standards or equipment that would allow for use by these operators. The U.S. FCC rightly found that technologies that can take advantage of licence-exempt spectrum can be put into productive use immediately. Canada should follow this example.

Certain IMT vendors are reportedly arguing, based solely on lab analysis, that licensed 5G technologies are somehow "superior" to sometimes competing technologies, such as Wi-Fi 6. It is important to note that IMT-designated 5G technology would need to operate in the band as primary while Wi-Fi will share the band with incumbents without the need for relocation. Also, lab-based "comparisons" of this sort say little about how real-world deployments or the structure of the resulting market will benefit consumers. A strong mix of licence-exempt and licenced spectrum technologies has proven to be a tremendous success to date in markets across the world, and licence-exempt access to the 6 GHz band is an important element of maintaining that balance in Canada.

[57] *FCC Report & Order* ¶ 205.

Question 3

Question 3: ISED is seeking comments on the proposed footnote Cxx and the changes to the CTFA as shown in table 2.

Joint Filers enthusiastically support changing the CTFA by adding a footnote to each segment of the 5925-7125 MHz band to permit licence-exempt use as proposed. The proposed language correctly conveys the core concept of licence-exempt transmitters – that they must not cause harmful interference to, or claim protect against interference from, licenced systems.

Question 4

Question 4: 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

Standard power operations are exceedingly desirable from an industry perspective, because the power levels will best ensure that a consumer has a consistent experience relative to 5 GHz RLAN networks. As noted in response to Question 7, the LPI power levels will create challenges for whole home coverage, and may require some enterprises to rewire their APs if they switch from 5 GHz to 6 GHz as the geometry served by the radio may shrink. Standard power provides a way for industry to deliver the experience that consumers expect. In addition, enterprises increasingly want to have access to wireless technologies outdoors – at loading docks, outdoor public areas and garden centers to name a few use cases. For these reasons, manufacturers are highly motivated to create this class of devices.

In Joint Filers' view, the chief reason for supporting a Standard Power device class is the context in which the devices will operate – subject to an AFC database system that protects current and future fixed links, as well as installations like radio astronomy or MSS downlink sites.[58] Joint Filers agree that Standard Power devices be subject to an AFC system. As

[58] *See FCC Report and Order* ¶¶ 20-47 (describing Standard Power operations, which should serve as a template for ISED in designing a similar system). The FCC did not adopt an AFC to protect satellite operations in the band, or to protect satellites from aggregate interference, because it was found to be a non-issue. *Id.* ¶¶ 91-92.

discussed in more detail below, the requirements for devices utilizing an AFC system are broader than typical radio emissions rules.

- An AFC requires the devices to know where they are, which could be accomplished with a GPS-type technology or, if indoors, by an external source or possibly, a professional installer.[59]
- Once the Standard Power device knows where it is, it can retrieve available frequencies from an AFC based on the device's coordinates – as well as other pertinent technical details about its operation.[60] The AFC will calculate a list of permissible frequencies along with maximum permitted Tx power, according to its knowledge of nearby fixed link operations. Devices may only operate pursuant to those permissible frequencies.
- In this way, the AFC creates an "exclusion zone" where APs and associated clients cannot operate, based on frequencies in use by the fixed links, preventing the RLAN and its clients from causing harmful interference.
- Standard Power devices should also be required to perform a check in with the AFC system on a routine basis in case a new microwave link has been authorized or modified.
- Should an AFC system be unavailable for a recheck, the Standard Power device should cease operations in the 6 GHz band (after a designated grace period) until such time as a list of permissible frequencies is once again available.

These requirements enable AFC devices to be operated at power levels comparable to the highest licence-exempt power levels in the 5 GHz band on an indoor and outdoor basis.

We further agree that Standard Power operations should be limited to the 5925-6425 MHz sub-band, the 6425-6525 MHz sub-band, and the 6525-6875 MHz sub-band, because mobile uses are not present. In addition, ISED has proposed that "[w]hile transportable TV pick-up services currently do not operate in the 6875-6930 MHz frequency range, not permitting the operation of standard-power RLANs in this frequency range will allow flexibility for additional spectrum for broadcasting auxiliary services if needed in the future." The Joint Filers request that ISED not make an affirmative decision to permanently exclude licence-exempt RLAN at this time, and instead simply indicate that it will observe broadcast industry developments for a few years before deciding whether to expand standard power range to 6930 MHz or leave the top end of the standard power range at 6875 MHz. Broadcasting communication, including ENG or TV pick-up functions, may be displaced by all-purpose 5G networks. Around the world, this topic is generating discussion, and is the subject of technology and business trials.[61] The spectrum that

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[59] *See FCC Report and Order* ¶ 41 (discussing the need to adopt a geolocational uncertainty requirement, as geolocation is not precise. For 6 GHz, it utilizes the same principle as in its database for the TV White Spaces band: a determination, given in meters, of a 95% confidence level).

[60] *See FCC Report and Order* ¶ 44 (using Antenna Height Above Ground).

[61] *See* Darko Ratkaj, Europan Broadcasting Unit, *Session 3: SPECTRUM MANAGEMENT AND THE FUTURE OF 5G,* ITU REGIONAL SYMPOSIUM FOR EUROPE AND CIS ON SPECTRUM MANAGEMENT AND BROADCASTING, July 1-2, 2020,

the consultation identifies, 6875-6930 MHz, may not be needed if the technology underlying newsgathering shifts to a "service" from a 5G-equipped service provider. If it could ultimately be utilized by licence-exempt Standard Power devices, the addition of the 55 MHz segment would provide two additional 20 MHz wide channels, or one additional 40-, 80-, 160-, or 320-MHz-wide channel.

Finally, ISED's requirement for an antenna mask should state: "For outdoor devices, the maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm)." The requirement should not apply to indoor devices. Energy from indoor transmissions is significantly diminished by roofing materials, and in many cases, by the presence of additional floor(s) above the transmitter.

Question 5

Question 5: 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.

Joint Filers agree with the proposal to open 6425-6525 MHz to Standard Power devices. Because there are no mobile incumbent operations in the band, there is no reason to treat the band differently than 5925-6425 MHz and 6525-6825 MHz. The incumbents in this band operate the same types of systems as incumbents in the sub-bands below and above. Moreover, adopting Standard Power for 6425-6525 MHz allows licence-exempt devices to make better use of the band, with less spectrum lying fallow. In the chart below, the inability to use 6425-6525 MHz (picture below) results not just in fewer channels, but also eliminates use of spectrum on either side of the sub-band due to the channel plan. The issue becomes most acute with the future arrival of 802.11be (or Wi-Fi 7) using 320 MHz channels.

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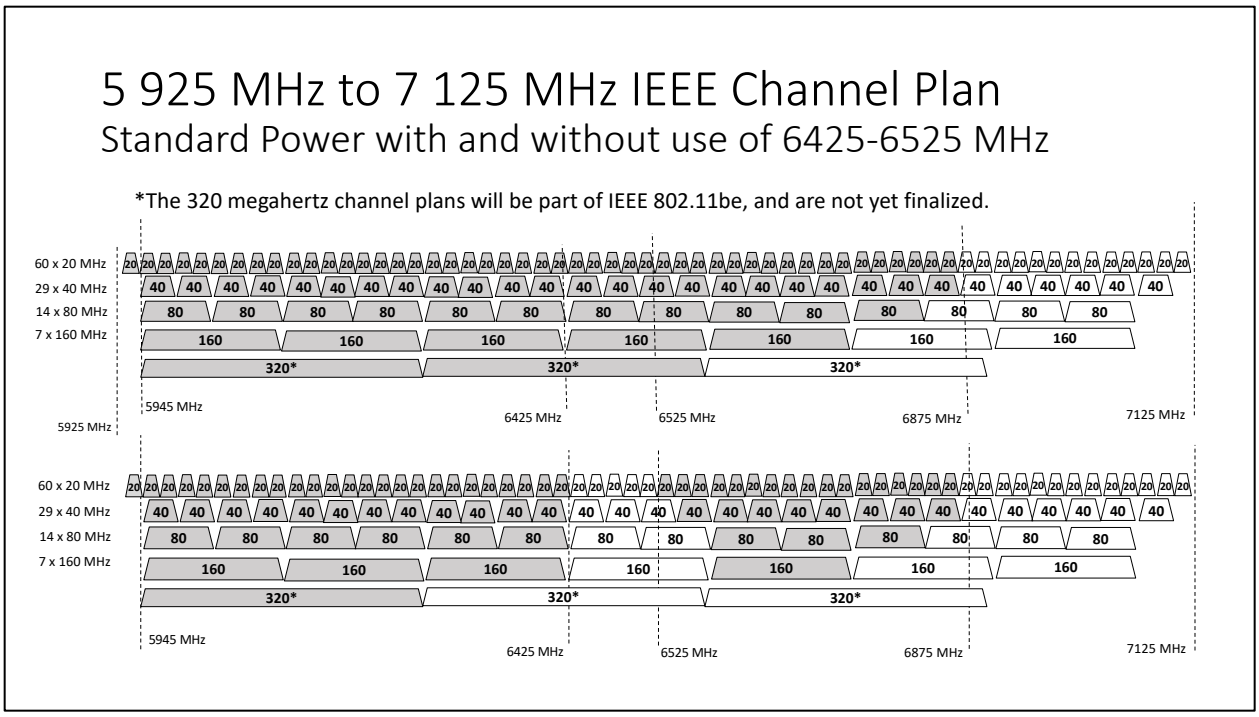
https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2020/Spectrum_EUR_CIS/Darko%20Ratkaj%20%283%29.pdf; Cho Mu-Hyun, *KT to roll out 5G UHD live broadcasting*, ZDNet, Mar. 18, 2019, https://www.zdnet.com/article/kt-to-roll-out-5g-uhd-live-broadcasting/; WashPostPR, *The Washington Post and AT&T use 5G to explore the future of news,* WashPost PR Blog, Nov. 20, 2019, https://www.washingtonpost.com/pr/2019/11/20/washington-post-att-use-g-explore-future-news/.



For incumbent licensees, less licence-exempt spectrum means that whatever traffic the licence-exempt networks carry is now concentrated at 5925-6425 MHz, where the largest grouping of FS links exist. Those two effects – the absence of 6425-6525 MHz and Standard Power devices searching for permissible channels in spectrum where FS links occur more frequently – will have a tendency to cause users to revert to smaller channel widths, failing to take full advantage of the advanced licence-exempt technologies that are the very purpose for opening the band in the first place.

Question 6

Question 6: 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.

Joint Filers agree that there is no point to opening a band for a class of devices if the devices will not be manufactured and marketed for the Canadian market. Fortunately, there is a simple answer to the question – Standard Power devices will be available for the Canadian market as soon as AFCs can be initiated. There is no barrier from technology or manufacturing perspectives to Standard Power devices in the 6425–6525 MHz band in Canada. In fact, most Wi-Fi 6E devices are expected to be multiband devices, which will include 2.4 GHz and/or 5 GHz frequency ranges. It is expected that these devices will be capable of Standard Power operation in the 2.4 GHz and 5 GHz bands, and that the devices will be disabled by the manufacturers from operating at Standard Power in the 6 GHz band until such devices are allowed to operate at Standard Power in any of the frequency ranges (including 6425-6525 MHz).

While it is true that the U.S. has not opened the band for Standard Power use due to the presence of mobile uses there, Mexico is in a similar position as Canada. In Mexico, there are a few mobile licences for train control at 6445-6775 MHz and 6785-7115 MHz. Because the use case is confined to railroad tracks, an AFC can easily protect the identifiable geography of a rail lines. In most of the geography, however, there are only fixed services in the band. While we do not know what Mexico's Instituto Federal de Telecomunicaciones will ultimately decide, the 6 GHz consultation in Mexico asks about Standard Power throughout the band. We have strongly supported the view that Standard Power should be achievable in Mexico throughout the range, and including 6425-6525 MHz.

It is expected that AFC Systems to be designed flexibly and compliance specifications to be developed in a way that cover 6425-6525 MHz with minor customization for Canada.

Question 7

Question 7: 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

Joint Filers support the proposal to open 5925-7125 MHz to licence-exempt LPI devices under the emissions limits proposed, including use of a contention-based protocol (CBP). Below we discuss our views of the power limits and power spectral density approach, the need to recognize Subordinate Devices and qualifying Client-to-Client (C2C) communications, as well as how to ensure that indoor devices remain indoors using requirements that are not present in other licence-exempt bands. We also review the technical studies that have concluded that LPI use under these terms can be accomplished without a risk of harmful interference to incumbents.

Power levels of LPI devices. Current RLAN power rules for 5 GHz use a "constant EIRP" approach where the EIRP limit is the same regardless of channel size. A typical limit for 5 GHz would be 24 dBm (for channels that require Dynamic Frequency Selection (DFS)) or even 30 dBm. Converting these limits to their power spectral density equivalent, for channels of 20 or 40 MHz in width, a 30 dBm transmitter would generate 17 dBm/MHz (20 MHz channel) or 14 dBm/MHz (40 MHz channel).[62] A principal tool that a regulator concerned about interference can use is to dial back on power. That is what the FCC did, dialing down from a proposed 17 dBm/MHz to a constant 5 dBm/MHz regardless of bandwidth. Under this approach, 20 and 40

[62] For a transmitter that can operate up to 24 dBm, the power spectral density would be 11 dBm/MHz (20 MHz wide channel) and 8 dBm/MHz (40 MHz channel).

MHz wide channels operate at substantially less power than 24 dBm (at 5 GHz), and it is not until devices reach 80 MHz wide channels that the power level rises to the equivalent of a 5 GHz DFS device.

Comparative Power Rules	**20 MHz channel**	**40 MHz channel**	**80 MHz channel**	**160 MHz channel**	**320 MHz channel[63]**
24 dBm (250 mW) constant EIRP and PSD values scale	11 dBm/MHz	8 dBm/MHz	5 dBm/MHz	2 dBm/MHz	-1 dBm/MHz
5 dBm/MHz Power Spectral Density is constant and EIRP scales	18 dBm	21 dBm	24 dBm	27 dBm	30 dBm

Power Spectral Density Approach. Not only did the FCC dial down power relative to its initial proposal and to operations in the adjacent 5 GHz band,[64] the FCC also utilized a power spectral density rule instead of a constant EIRP approach. This is important for a couple of reasons. As can be seen from the chart above, the approach encourages manufacturers to implement wider channels as soon as possible. With Wi-Fi 6E technology, wider channels mean that for a given transmission of a given number of bits, utilizing a wider channel transmits those bits more quickly than if a narrow channel is used. Stated broadly, wider channels get on and off the medium more quickly, and therefore are more efficient. As a result, the power spectral density approach works with the wide channel features inherent in the new technology. Second, the power spectral density approach overall can provide predictability about energy the licence-exempt devices will release into the band, regardless of bandwidth. According to the FCC:

> Based on our experience with licence exempt operations and interference analyses as well as our engineering judgment, we find that 5 dBm/MHz PSD will both adequately protect all incumbents in the band from harmful interference as well as offer enough power to unlicensed devices, commensurate with the levels in the other U-NII bands, to sustain meaningful applications especially when using wider bandwidths. At this power limit and with the other constraints imposed on these operations, we find the risk of harmful interference to incumbent operations to be insignificant.[65]

Joint Filers also note that client devices also are subject to a PSD approach, and must be 6 dB below APs, or -1 dBm/MHz. In addition, as discussed below, Joint Filers request ISED

[63] A 320 MHz channel is currently not part of the IEEE 802.11ax standard. A new standard – 802.11be – is in development that would permit a 320 MHz channel.

[64] The FCC initially proposed 17 dBm/MHz for indoor devices, more than three times the power level ultimately selected.

[65] *FCC Report & Order* ¶ 110.

authorize C2C operations when such devices are operating within the coverage area of an LPI AP.

ISED should note that at 5 dBm/MHz power spectral density, the U.S. FCC was pushing the lower end of the boundary of useful power. This is a minimum power level that can be utilized for LPI. At 5 dBm/MHz, it is not clear that the power level can achieve "whole home coverage." Consumers might need to utilize booster/repeater devices to ensure that a larger home is adequately covered. For enterprises, the goal is to be able to take an existing wired network (usually in the ceiling) and replace a Wi-Fi 5 router with a Wi-Fi 6E router. Because the power level at 6 GHz will be less than that at 5 GHz, and due to propagation differences between 5 GHz and 6 GHz, that will be challenging in some enterprise deployments. We note that the FCC acknowledged its conservative choice in its Further Notice of Proposed Rulemaking where it sought comment on a higher power limit and stated that an 8 dBm/MHz PSD limit "would be useful for many indoor devices that require high data rate transmissions."[66]

We agree with the FCC that the 5 dBm/MHz power spectral density rule is conservative, and support the FCC's proposal to raise the power to 8 dBm/MHz. We strongly caution against ISED adopting a power level lower than 5 dBm/MHz.[67]

Effect of an indoor-only requirement and compliance with it. In addition to regulating power, indoor devices are insulated from outdoor FS receivers by being indoors, behind (sometimes multiple) walls and ceilings. Building entry/exit loss has long been recognized in ITU studies. Nonetheless, in other jurisdictions, Joint Filers have encountered incumbent interests that attempt to insist that building exit loss should be ignored in favor of free space propagation. These arguments have generally not been accepted. For example, the FCC referred to ITU studies and elected to apply a ratio of traditionally-constructed buildings to thermally-efficient buildings of 70:30.[68] Building exit loss not only insulates FS receivers from RLAN energy, but generally protects satellite uplink.

Of course, crediting RLAN transmitters with a significant reduction in dB due to building exit loss is only relevant if the devices remain indoors. To that end, industry suggested, and regulators have adopted, four requirements on LPI devices to ensure that they remain indoors. First, APs should be certified with an integrated antenna. While this reduces the flexibility that industry has in the 5 GHz band to introduce new antenna designs, an integrated antenna ensures that the pattern of emission will not change post-certification, and avoids the later introduction of directional antennas that may be more problematic. Second, APs cannot utilize weatherized

[66] *Id.* ¶ 244.

[67] Korea recently opened the 6 GHz band for LPI devices at 2 dBm/MHz, for reasons that appear to be related to mobile broadcasting use. At that power level, there is little practical ability of LPI equipment to perform the functions that consumers have come to expect. Robust deployment in Korea of LPI equipment is thus not expected until the Ministry revisits its choice of power limits.

[68] *Id.* n.297.

enclosures to enable them to withstand outdoor environmental conditions. Third, devices cannot operate on battery power, making it unattractive to carry the device outdoors. Finally, devices must include labeling and warnings for indoor use only. Joint Filers believe these conditions will ensure that LPI devices remain indoors. We also note that the ability of those who want to use outdoor equipment can be immediately satisfied in the 5 GHz band, and – subject to ISED's decision in this proceeding – by future Standard Power device class subject to AFC control.[69]

Subordinate devices. In addition to APs and client devices, ISED should authorize "subordinate devices" as part of the LPI and Standard Power device categories. Subordinate devices can operate at levels equivalent to their corresponding APs, but must be under the control of an indoor AP or Standard Power AP, with power supplied from a wired connection, an integrated antenna, no battery power, no weatherized enclosure, and no direct connection to the Internet. An example of a subordinate device could be a smart TV that forms a connection with a wireless peripheral device.

Client to Client (C2C) operations. Joint Filers also respectfully request that ISED explicitly authorize client devices to communicate directly with other client devices when such devices are operating within the coverage area of a low power indoor access point. The U.S. FCC recently issued a Public Notice seeking comments on permitting this type of communication in the 6 GHz band.[70] C2C communications will be critical for enabling digitally immersive services such as VR, holographic imaging, multicasting for education, worker training, and gaming, and file sharing. Such operations will take place indoors, and require more power than that requested for VLP operations that can operate both indoors and outdoors, as further explained.

ISED can authorize C2C communications by requiring that such communications only occur if the client devices can continuously decode (at least every four seconds) the enabling signal of an LPI AP. If a client device has not decoded the enabling signal in the last four seconds, it would not be authorized to transmit to another client device. This would ensure that such devices are only operating indoors and would create no additional risk of harmful interference.

Contention-based protocols mitigate against nearby mobile uses. The consultation document also proposes, without a corresponding technical specification, use of a CBP for LPI devices. CBP was introduced as a requirement in response to mobile uses of the 6 GHz band in the U.S., where portions of the band are used for activities such as ENG. Where ENG might be in proximity to an indoor AP, a CBP requirement can help ensure that the licence-exempt device politely defers to the always-on ENG transmitter, reducing the opportunity for harmful interference. Importantly, the FCC did not place any technical requirements around CBP. This is because CBP exists for a different purpose, namely, in order to enable licence-exempt devices to

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[70] FCC, *The Office of Engineering & Technology Seeks Additional Information Regarding Client-To-Client Device Communications in the 6 GHz Band*, ET Docket No. 18-295 (rel. Jan. 11, 2021), https://www.fcc.gov/document/oet-seeks-info-6-ghz-u-nii-client-client-device-communications.

utilize spectrum efficiently on an unscheduled basis by deferring until they can hear no transmission. "As is" CBP can have a beneficial effect in indoor deployments if a newsgathering operation is near to an AP. Together with low power and a PSD approach, CBP further assists the cause of coexistence. It would, however, be a misreading to consider it in standalone form as a guarantor against interference. It would also be incorrect to think of CBP as a mitigation technique to protect FS receivers.

Technical studies support the introduction of LPI devices. Examination of whether these conditions adequately protect incumbents from LPI operation has been conducted in multiple jurisdictions; the record is exhaustive. With respect to fixed satellite operations, the FCC record revealed that satellite incumbents themselves had no issue with indoor operations. Sirius XM, Intelsat and SES "…agree[d] that indoor use will have negligible effect on aggregate interference at the satellite…. The low power levels of these devices as well as building attenuation will prevent harmful interference."[71] This result is highly consistent with a Monte Carlo analysis submitted by Joint Filers to the FCC showing that the maximum interference to noise ratio (I/N) into FSS receivers was -21.9 dB, well below the applicable interference protection criteria (IPC) and significantly less than the interference FSS presently receives from existing FS microwave transmissions.[72]

Fixed link services received far more attention in the FCC record, where multiple studies of multiple types, were examined in the *Report & Order.* The FCC's consideration of the record begins at paragraph 112, and should be carefully reviewed by ISED. Two types of studies are extensively highlighted in the discussion – Monte Carlo and Minimum Coupling Loss (MCL) analysis.

Monte Carlo analysis is extremely useful when regulators are considering introducing what will be a widely-available class of transmitters into a band with existing users. Monte Carlo analysis enables regulators to see the likelihood of harmful interference in a statistical or probabilistic way. For fixed links, it is critical that those designing the Monte Carlo analysis have full access to the licencing records, including antenna receiver data. When the Monte Carlo randomly "places" RLAN transmitters into a geography, it is possible to determine whether the RLAN energy in the air will diminish the reliability of existing links. Of course, the analysis is statistical – it cannot predict that a specific link will suffer harm. Rather, it shows the likelihood of harm given the probabilities of co-channel operation and intermittent RLAN transmissions. In addition to a nationwide Monte Carlo analysis prepared by RKF Engineering at Joint Filers' request, the FCC also had before it a Monte Carlo analysis filed by CableLabs. The FCC relied upon the CableLabs study to make its judgment that the Monte Carlo analysis demonstrated that

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[71] *Id.* ¶¶ 170-171.

[72] *See* RKF Engineering Solutions, *Frequency Sharing for Radio Local Area Networks in the 6 GHz Band*, Jan. 2018, https://s3.amazonaws.com/rkfengineering-web/6USC+Report+Release+-+24Jan2018.pdf.

the I/N ratio was below a conservative benchmark of -6dB, the same threshold that fixed link operators use to coordinate links among themselves.[73]

Next, the FCC considered MCL studies, utilizing one filed by AT&T. These studies purport to show that an individual, specific link could experience harmful interference from a particular RLAN placement. Contrary to a Monte Carlo approach that provides deep insight, a MCL analysis can often be an exercise in whether there is some possible geometry, and some possible set of conditions, which if aligned just perfectly, can produce a harmful interference event. Care must be taken to ensure the scenarios presented are realistic. Joint Filers encourage ISED to review paragraphs 124-131 of the *FCC Report & Order*. After correcting the parameters that AT&T presented in its MCL, the FCC found that:

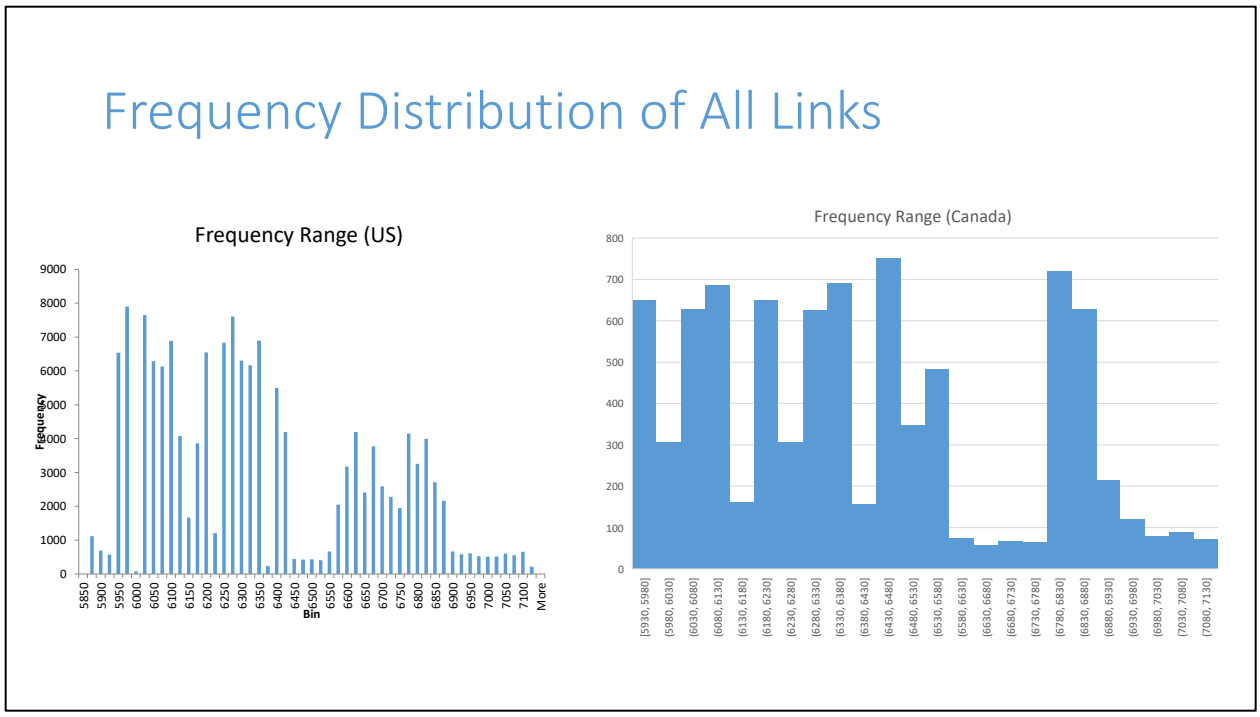
> In only one case does a static link budget analysis suggest a nontrivial possibility of harmful interference (Case 5), and we do not believe this one case poses a significant potential for actual harmful interference. That is in part because a -6 dB I/N interference protection criterion is a conservative approach to ensuring that the potential for harmful interference is minimized (footnote omitted) and in part because many statistical factors unaccounted for in this link budget analysis further make the potential for harmful interference much less likely.[74]

Given that the U.S. has well over 100,000 fixed point-to-point links, it is reasonable for ISED to conclude that technical studies conducted for the U.S. apply equally to fixed point-to-point links in Canada. Not only are the fixed link use cases the same or similar (e.g., public safety), but both countries have varied geography as well as large concentrations of people living in urban areas, where more RLANs will operate relative to rural areas. The below charts compare Canada's FS links to that of the US.[75] The first chart looks at the frequency distribution of links. While the Canadian scale is different due to fewer links, the pattern of which frequencies are used is strikingly similar, with the lower portion of 6 GHz more heavily used than the upper portion.

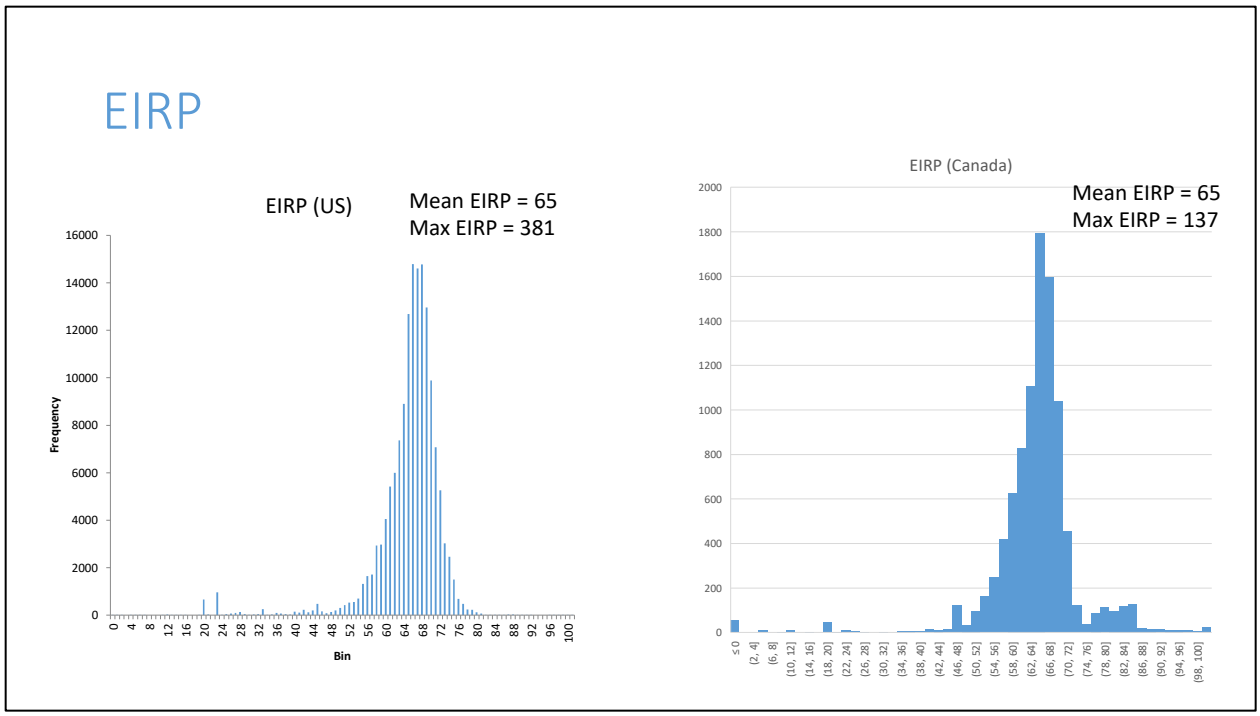
[73] *FCC Report & Order* ¶¶ 117-118. The FCC discarded various arguments about why the CableLabs study should not be considered, finding these arguments unpersuasive. *Id.* ¶¶ 119-122.

[74] *Id.* ¶ 131. The FCC noted that additional reasons for its skepticism about the Case 5 result were that the study did not take into account the probability of co-channel operation or a realistic duty cycle for the RLAN Access Point.

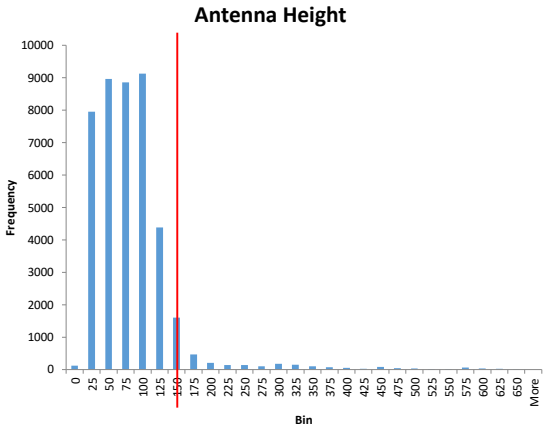
[75] FS data for the U.S. is mainly from 2016. FS data for Canada is from November 2020. There are 2733 unique receiver sites and 645 total receiver frequencies, less than 10 percent of the volume seen in the U.S.

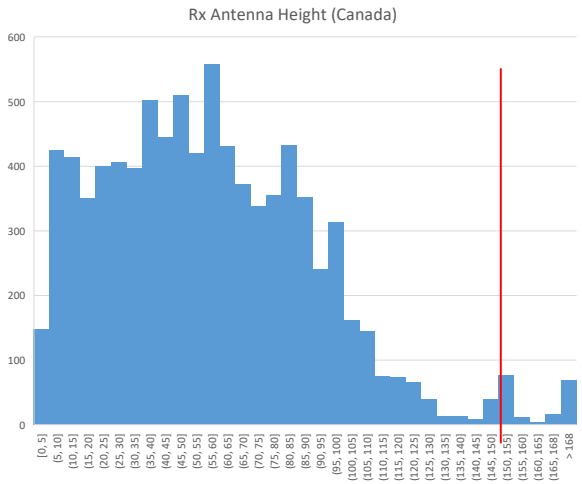


Below are country comparisons of EIRP, antenna height, TX or RX power, channel bandwidth, and link length. All are quite similar. This should not come as a surprise because the use cases are nearly, if not entirely, the same, and the vendor community serving these incumbent customers is identical.



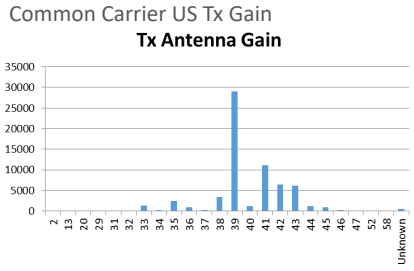
Antenna Height

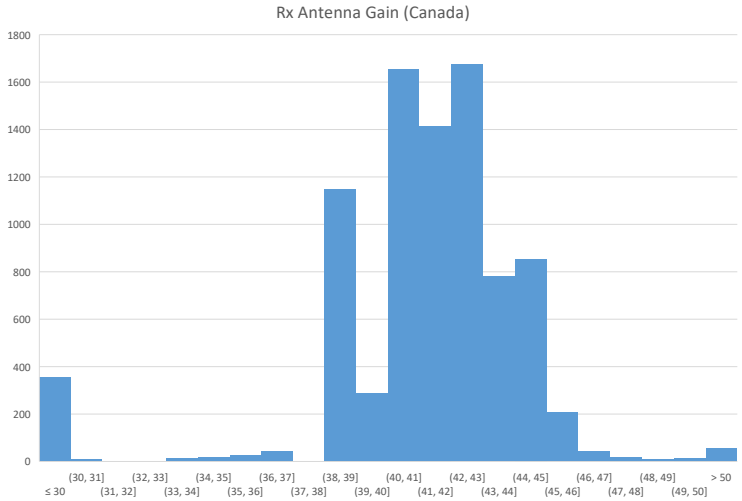




Rx Antenna Gain

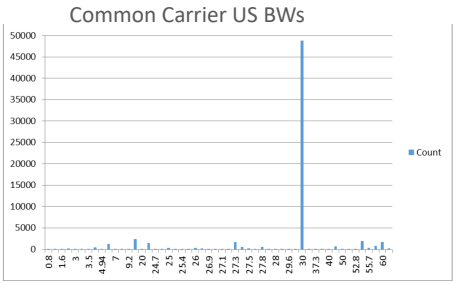
- Similar distribution to US links
- Majority of the antenna gain is between 35 dB to 50 dB

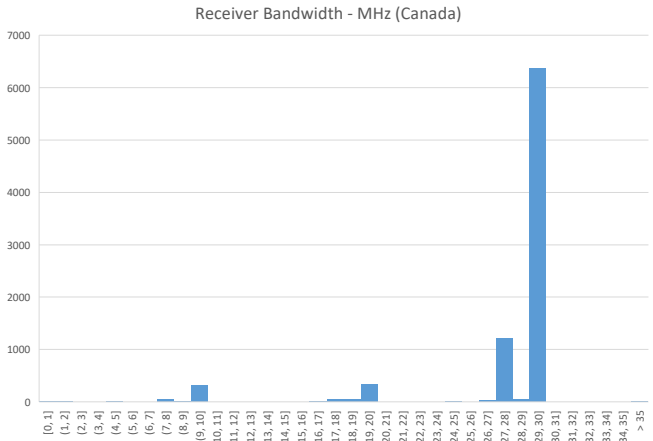




Channel Bandwidth

- Similar distribution to US
- 30 MHz is the dominant bandwidth of operation

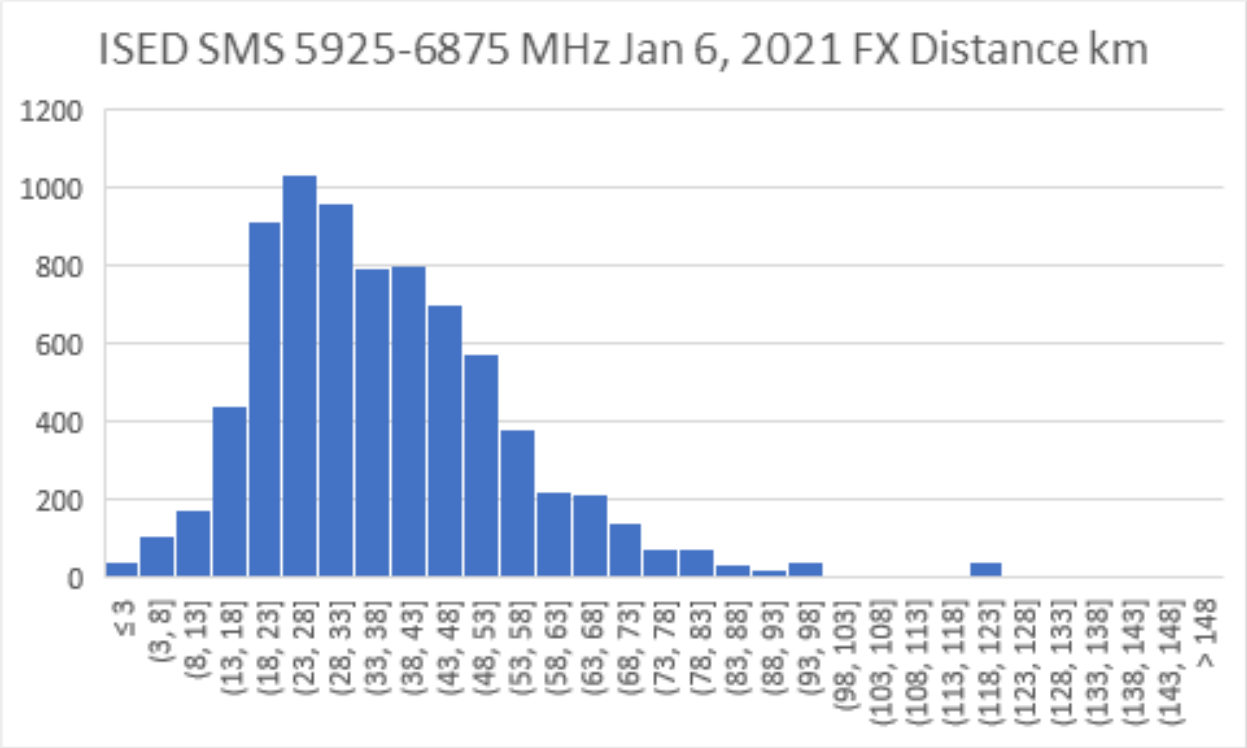


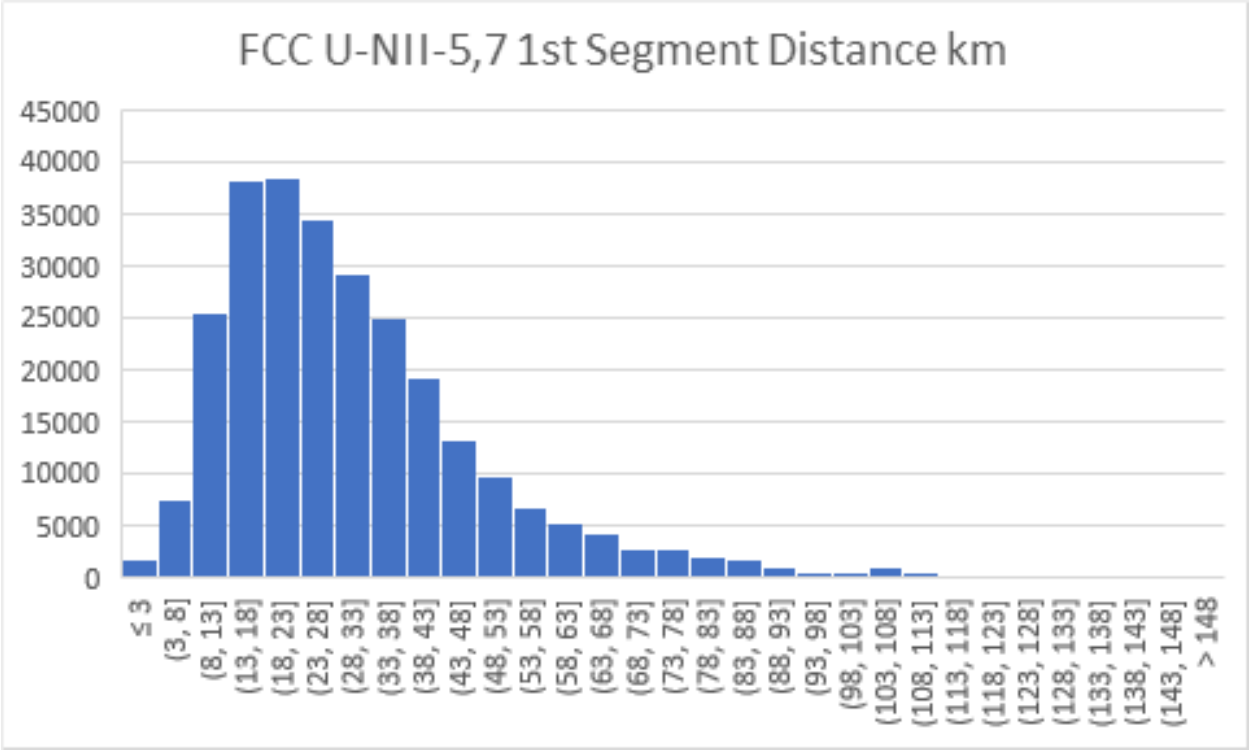


Note – Common Carrier is the largest class of FS licensees in the US 6 GHz band.

In addition, Joint Filers have also investigated link length, using actual data from the FCC database and estimating Canadian data based on other link characteristics. Link lengths are also strikingly similar as between the two countries.

Link Length Comparison Canada (estimated) and US





Joint Filers urge ISED to take the studies relied upon (and corrected) by the FCC into account in reaching a decision for Canada.

Question 8

Question 8: ISED is seeking comments on the proposed rules to allow very low-power RLAN devices:

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

As proposed, VLP devices would operate at a fraction of the power of LPI devices. As such, when operating indoors, they raise no new or different interference issues. Moreover, these devices are likely to operate indoors a substantial amount of the time. However, because they are highly portable devices, Joint Filers believe that the use case includes outdoor use.

The U.S. FCC is considering adopting a VLP device class that would encompass devices used indoors and outdoors limited to no more than 14 dBm, which could be used on-body or off-body in close proximity to each other. VLP is expected to be an essential component of the evolving Wi-Fi ecosystem. Low-latency, high capacity, and power-efficient VLP devices are poised to bring exciting applications and yet-to-be-imagined advancements to the market, in fields ranging from healthcare to AR, VR, and mixed reality to automotive, fitness, and many others. One example could be AR/VR glasses that communicate with Wi-Fi on a smartphone or laptop, but the potential use cases are numerous. Industry believes portable/mobile uses cases are likely to become as important as the fixed deployments of technologies running on licence-exempt spectrum.

Europe is poised to deliver regulations supporting this class of devices as well, with the recommendations from the CEPT evaluation of the 6 GHz band currently including a VLP category at 14 dBm and up to 1 dBm/MHz for wideband transmissions and 10 dBm/MHz for narrowband transmissions with a frequency hopping mechanism.[76] This recommendation was accepted by the ECC in November 2020, and is expected to become European law in early 2021. Europe's consideration of VLP devices is contained in ECC Report 316, which contains multiple studies developed by European administrations and industry, focused on VLP among other issues.[77] Based on ECC Report 316, the ECC decided that 14 dBm would permit coexistence

[76] CEPT ECC, *ECC Decision 20(01): On the harmonised use of the frequency band 5945-6425 MHz for Wireless Access Systems including Radio Local Area Networks (WAS/RLAN)*, Annex 1, A1.2, Nov. 20, 2020, https://docdb.cept.org/document/16737 (listing technical conditions for VLP in Europe) (*ECC Decision 20(01)*).

[77] CEPT ECC, *ECC Report 316*: *Sharing studies assessing short-term interference from Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) into Fixed Service in the frequency*

with fixed links,[78] and is therefore recommending adoption of this device class to the E.C. The UK's Ofcom has also opened the 6 GHz band for VLP ahead of the publication date of the CEPT decision.[79]

Similarly, Korea approved a VLP category at 14 dBm in the bottom portion of 6 GHz band in its October 2020 decision enabling up to 1 dBm/MHz for any device, and is considering ways to enable VLP operations throughout the entire band. Brazil has announced it is also considering this device class.

The regulatory structure in Europe and Korea is the most advantageous for VLP devices because it will enable the widest array of use cases. For example, the most popular bandwidth expected for VLP operations is 80 MHz and -5 dBm/MHz. While this is 3 dB higher PSD than ISED proposes, the interference risk from this PSD is offset by the lower probability of frequency overlap with an incumbent operation. Joint Filers also recommend that ISED adopt the higher PSD value of -5 dBm/MHz, which would enable better operation of VLP devices.

Question 9

Question 9: ISED is seeking comments on potential business models for AFC administrators to operate their AFC systems in Canada.

The AFC should be a simple and easy-to-implement database, which can rely on a centralized system architecture (i.e., in which all data and computations are performed in a central location), a decentralized architecture (i.e., where the standard-power AP maintains a local database and performs necessary computations), or some combination thereof. Enabling both centralized and decentralized architectures would ensure a vibrant AFC ecosystem and enable continued innovation. It also would allow for a higher level of competition while lowering service costs for consumers, as AFCs could be tailored to different and/or specific use cases. For instance, a centralized model may be most appropriate for service/provider enterprise deployments, whereas a decentralized model may be more appropriate for consumer and IoT implementations. The location of the data repository and the calculation engine functions could

band 5925-6425 MHz, May 21, 2020, https://www.ecodocdb.dk/download/8951af9e-1932/ECC%20Report%20316.pdf.

[78] *ECC Decision 20(01)*, *supra* n. 75.

[79] Ofcom, *Statement: Improving spectrum access for Wi-Fi, Statement*, 4.51, (July 24, 2020), (https://www.ofcom.org.uk/consultations-and-statements/category-2/improving-spectrum-access-for-wi-fi (confirming that radiated power limits of 25 mW for VLP are "sufficient to manage the risk of interference.").

range from being built into the standard-power AP itself or residing in the cloud, as discussed in the sample implementations below:

- **AFC Implementation with Third Party Database:** One possible centralized architecture of an AFC implementation would use a third-party database provider. In this example, a third party (other than the AFC Device manufacturer) would provide stored licensee data—obtained from the target national Regulatory Authority (NRA) databases and potentially pre-processed to facilitate rapid calculations—and include frequency availability and associated max Tx power calculation. Channel selection would be performed by the AFC device from the available frequencies provided by the third-party AFC system. In this arrangement, the third party could provide these AFC services under a contract with an AP vendor or service provider for that vendor or provider's devices. The third-party provider could service AFC devices produced or deployed by multiple parties, and the interface between the AFC device and AFC system could be based on industry adopted open standard(s). In addition to traditional Wi-Fi Alliance MAC/PHY interoperability certification of APs and Clients for 6 GHz operation, the AFC System and AFC Devices would be directly certified by NRAs as meeting the regulatory requirements of each domain. This certification program would be customized to meet the model's modular architecture (i.e., AFC System interfacing with and enabling various AFC Device producers and deployments).

- **Fully Integrated AFC Implementation to Support Standalone Devices**: Another possible architecture, as a decentralized model, would be an embedded implementation, where the AP essentially would provide its own AFC services using incumbent registration data downloaded periodically from a central repository. Under this scenario, the AFC system and the AFC device that it controls would be integrated into the same physical system on a user's premises (and perhaps even into the same device). There may be physical implementations where aspects of the AFC system, such as a mirrored copy of the regulator's database, are cloud-based and other aspects are integrated within the same hardware as the stand-alone AP. In this AFC model, after incumbent link information is retrieved from a central repository into a local data repository, the AFC AP would be a self-contained, indoor or outdoor solution for determining frequencies, along with associated max Tx power, on which the AFC device can operate. There would be no exposed physical interface between AFC System and AFC Device elements of the architecture. Certification testing methodology could be designed to verify compliance with all relevant regulatory requirements through a standardized secure test harness accessible by authorized employees of the system manufacturer in an NRA test lab.

- **AFC Implementation Using Operator's Private Cloud:** A service provider, such as a large ISP operating many RLAN devices, could deploy and certify its own AFC system within its private cloud. A proprietary interface and protocol for communication between the AFC system and AFC-controlled devices could be developed, depending on network management needs. These AFC devices would be deployed at each subscriber location and could be unique to, and managed by, the provider's network. The certification testing methodology would be designed to fully verify compliance with all relevant regulatory requirements while respecting the integrity of the architecture's proprietary interface and protocol for internal communication.

It is notable that the U.S. FCC opted for a centralized AFC architecture, with each standard-power access point remotely accessing an AFC to obtain a list of available frequency ranges and maximum permissible power levels. In particular, the FCC adopted this approach because it was consistent with models already employed in the U.S. for both TV white space databases and the Citizens Band Radio Service. It also was deemed likely to facilitate FCC oversight and to enable faster AFC development and implementation by reducing design complexity. Because Canada does not employ the unique U.S. CBRS spectrum architecture, however, ISED has greater flexibility to enable both centralized and decentralized architectures, and should do so.

Question 10

Question 10: 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.

Like the U.S. FCC, ISED should allow for designation of multiple AFC operators. Doing so would prevent a single party from obtaining control over all AFC systems, would encourage AFC operators to provide additional services beyond baseline regulatory requirements, and would lower costs for consumers. AFC functions (e.g., data repository, registration, and query services) should be permitted to be split among multiple entities. This would allow for greater flexibility in AFC system design and could lead to savings from allowing multiple operators to share the costs of running parts of an AFC system. Allowing flexible approaches to AFC implementation will also enable different business models for AFC such as standalone providers serving enterprise deployments and embedded operation integrated within consumer products and services. To ensure regulatory oversight, ISED could follow the action of the U.S. FCC in holding entities designated as AFC system operators accountable for all aspects of system administration, including any functions performed by third parties.

Question 11

Question 11: ISED is seeking comments on potential exit strategies if the AFC administrator decides to cease operation in Canada.

Like the U.S. FCC, to help ensure a stable operating environment for standard-power access points, ISED could require AFC administrators to serve for a five-year term that can be renewed based on performance during the operating term.

In the event an AFC system operator decides that it no longer wants to provide services, or if ISED chooses not to renew the operator's term, the system operator could be required to transfer its database along with the information necessary to access the database to another designated AFC system. Like the U.S. FCC, ISED could allow the AFC operator to charge a reasonable fee for the transfer of this information. This process would ensure operational

continuity for existing devices, which may otherwise be denied operating frequencies and/or rendered unable to provide services until a connection to a new database would be established.

Like the U.S. FCC, ISED also can require that an AFC system operator provide a minimum of 30 days' notice to ISED when it plans to cease operation.

Question 12

Question 12: 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.

International harmonization in the AFC system model will create economies of scope and scale and produce a robust equipment market, benefitting Canadian businesses and consumers. Harmonization will expedite the introduction of new types of devices, applications, and services to the market to meet the public's evolving needs. Adoption of a differential or fragmented regulatory approach by ISED, however, could encourage other regulators or administrations to formulate their own unique approaches to AFCs. This would lead to manufacturers needing to attempt to comply with a patchwork of national regulations, which would slow the introduction of new products and create supply chain and production inefficiencies.

Question 13

Question 13: 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

In general, standard power devices subject to an AFC should be allowed up to 6875 MHz, with prospective expansion to 6875-6930 MHz depending on migration of broadcast newsgathering operations to all-purpose carrier 5G networks in the future. Standard power levels will best ensure that a consumer has a consistent experience relative to 5 GHz RLAN networks, allowing industry to meet consumers' expectations. Low Power Indoor power levels will create challenges for whole home coverage, and may require some enterprises to re-wire access points if they switch from 5 GHz to 6 GHz due to differences in the geometries served by the radio. In addition, enterprises increasingly want access to wireless technologies outdoors, such as at loading docks, outdoor public areas, or garden centers.

For these reasons, manufacturers are highly motivated to create this class of devices. As the interference analysis for LPI reveals, Standard Power devices create interference challenges – particularly if deployed outdoors. For that reason, Standard Power devices should be subject to an AFC system that requires the devices to know where they are. This could be accomplished with a GPS-type technology or, if indoors, by an external source or possibly by professional installation. The rules established by the U.S. FCC provide a useful template for AFCs. ISED can determine whether to select a model for AFC operations. The U.S. FCC decided it preferred a centralized model over a decentralized model.[80]

Regardless of the model chosen, ISED should designate AFC operators,[81] approving who is allowed to operate as an AFC, and approving the systems for conformance with requirements. Multiple AFC operators should be permitted, and operators should be allowed to charge fees. If multiple operators exist, there is no need for them to synchronize their data.[82] Aggregate interference is not an issue with respect to Fixed Links and does not require the AFC to address aggregate energy through synchronization of AFCs.[83]

- **Information Required from Licensed Users:** Licensing data should be made available in electronic form to an AFC or multiple AFCs to enable multiple and frequent downloads. This requires licensees to update this information to ensure its accuracy and completeness, as well as to provide needed receiver and installation details.

- **Interference Protection Criteria for Computation of Exclusion Zones:** Once the Standard Power device knows where it is, it can consult the AFC with its coordinates – as well as other pertinent technical details about its operation – and the AFC will calculate a list of permissible frequencies, according to its understanding of nearby fixed link operations. In this way, the AFC creates an "exclusion zone", based on frequencies in use by the link, that protect the fixed licensed receiver, preventing the RLAN and its clients from causing harmful interference.

  Protection criteria should be established for fixed link operations. The FCC selected -6 dB I/N.[84] In the FCC's and Joint Filers' view, this criterion is more conservative than necessary to protect against harmful interference, but was supported by US fixed link operators. ISED also should determine whether to protect adjacent channel operations for fixed links. The FCC decided to utilize the out-of-band emission mask it adopted for licence-exempt devices, which is designed to keep energy outside a licence-exempt device's operating channel to low levels and the same -6dB I/N protection criterion for co-channel exclusion zones. By collaborating with the U.S. FCC, ISED can provide

[80] *FCC Report & Order* ¶¶ 26-27.

[81] *Id.* ¶¶ 48-57.

[82] *Id.* ¶¶ 57-58.

[83] *Id.* ¶ 72.

[84] *Id.* ¶ 71.

details on U.S. licensed fixed services near the border, and as necessary can create an exclusion zone near the border for Canadian RLAN operations that might interfere with U.S. mobile authorizations in the portions of the 6 GHz band where the U.S. FCC has authorized mobile uses.

Propagation models that the AFC will use in its calculations should be selected to ensure consistency across multiple AFCs. The FCC selected the free-space model for short distances,[85] where it accurately predicts signal path loss, the WINNER II for medium distances, and the Irregular Terrain Model (ITM) for longer distances to more realistically account for terrain and clutter losses. This approach appears to fairly balance all concerns.

AFCs should be required to perform calculations for RLANs operating frequency availabilities at different power levels. The FCC stated that it would require "that the AFC system be capable of determining frequency availability in steps of no greater than 3 dB below the maximum 36 dBm permissible EIRP, down to a minimum level of 21 dBm."[86]

- **Information required from standard-power APs:** Standard power access points should be required to deliver geolocation data, antenna height, and power level. Devices should be required to be registered to the AFC.[87] A serial number and/or certification identifier is sufficient for this purpose. If an RLAN ceases to communicate with an AFC, AFCs should store device registration for a short period before discarding it.[88] Multi-device networks, such as those found in enterprises, should be permitted to have a single interface to the AFC.[89] Standard Power devices operating outdoors should be required to adopt an antenna mask. For outdoor devices, the maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm). The requirement would not be applicable to indoor devices.

- **Frequency of AFC Update of Licensee Information:** ISED should require standard power devices to perform a check in with the AFC system on a routine basis of no more than one per day in case a new microwave link has been authorized or modified and to ensure that the list of permissible frequencies is up to date. If an AFC system is unavailable for a recheck, the device would cease operations in the 6 GHz band until such time as a list of permissible frequencies is once again available.

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[85] *Id.* ¶¶ 63-67.

[86] *Id.* ¶ 37.

[87] *Id.* ¶¶ 82-83.

[88] *Id.* ¶ 86.

[89] *Id.* ¶ 85.

Like the U.S. FCC, ISED should consider how to handle situations when an AFC system is temporarily unavailable due to circumstances that disrupt a device's ability to contact an AFC system, such as a sustained power loss or Internet outage. In such cases, the access point that cannot contact the AFC system during any given day should be permitted to continue operating until 11:59 p.m. of the following day, at which time it would be required to cease operations until it reestablishes contact with the AFC system and re-verifies its list of available frequencies. As the U.S. FCC found, such a one-day grace period is unlikely to result in harmful interference to fixed service links. An AP being unable to contact the AFC system for a day is likely to be a relatively infrequent occurrence. Furthermore, the probability that it will occur at the same time in the same place where a new microwave link commences operation is low.

- **Security and privacy requirements:** AFC systems and standard-power access points should be required to employ protocols and procedures to ensure that all communications and interactions between the AFC and standard-power access points are accurate and secure and that unauthorized parties cannot access or alter the database or the list of available frequencies and power levels sent to an AP.

  Like the U.S. FCC, however, ISED should decline to mandate specific security models. Instead, AFC system operators should be required to use advanced security standards and demonstrate that their systems contain sufficient communication and information security features during the AFC system certification process.

Question 14

Question 14: 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.

An AFC is suitable for Standard Power RLAN operations, both indoor and outdoor, to prevent instances of harmful interference to fixed links for operations throughout the band from, 5925-6875 MHz, with potential extension from 6875-6930 MHz in the future depending on the progress of broadcaster migration to all-purpose carrier 5G networks for newsgathering operations. An AFC is unnecessary to prevent interference to satellite operations. In addition, an AFC is unnecessary for Very Low Power devices, as the low power levels associated with that device class is itself the protection mechanism. An AFC can create an exclusion zone of frequencies associated with specific fixed link operations to ensure that Standard Power transmitters are not both co-channel and co-located. Key regulatory requirements for the performance of an AFC's calculation can be specified by ISED.

Question 15

Question 15: 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

By ingesting information supplied by operators of fixed microwave stations, fixed point-to-point television auxiliary stations, and radio astronomy stations, AFCs will be able to determine the location of these operations and set appropriate exclusion zones to guard against harmful interference.

- **Fixed microwave stations and fixed point-to-point television auxiliary stations:** The AFC can allow standard-power access points to operate in the 6 GHz band while protecting both fixed microwave and fixed point-to-point television auxiliary stations because information about these stations' exact operating locations and conditions would be readily available and stable.
- **Radio astronomy stations:** Because AFC-managed devices report their location to the AFC prior to receiving a list of available frequency channels, the AFC can determine if the device is within the designated radio astronomy exclusion zone (DRAO) surrounding it , and, if so, the AFC will not permit the use of any channels that overlap the 6650-6675.2 MHz radio astronomy band.

Question 16

Question 16: ISED is seeking comments on the sample agreement related to the designation and operation of an AFC system in Canada.

No response.

Question 17

Question 17 ISED is seeking comments on the proposed approach to incremental implementation of an AFC system in Canada.

The Joint Filers oppose mandatory incremental implementation of an AFC system in Canada. AFCs need the flexibility to offer services to different classes of customers and therefore will likely have different geographic scope. For example, an AFC serving a cable MSO will likely be operating with APs in operator's service area, while an AFC serving enterprise customers could be nationwide. Before allowing an AFC to operate with equipment, the AFC must be tested against a set of testing requirements that ensure the AFC will perform in accordance with the rules. AFCs must be able to demonstrate that the permissible list of frequencies is properly developed, that the interference exclusion zone is correct, that they are receiving correct information on fixed links, as well as correct information from the standard power devices. If they are then demonstrating compliance, there is no need to support partial implementation.

Moreover, partial implementation is harmful to the provider's business case as it provides no certainty on when the provider can address the whole of the market.

Question 18

Question 18: 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.

No response.

IV. Conclusion

Joint Filers enthusiastically support this consultation, with the minor modifications and suggestions noted above. As discussed, opening the 6 GHz band to licence-exempt use on a technology-neutral basis is the best and the fastest mechanism to address Canada's mounting broadband needs. We urge ISED to move promptly to final rules, enabling Canadians to take advantage of the latest licence-exempt technologies.

Respectfully submitted,

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