



Ottawa, January 19<sup>th</sup>, 2021

Innovation, Science and Economic Development Canada  
Senior Director, Spectrum Planning and Engineering  
Engineering, Planning and Standards Branch  
[ic.spectrumengineering-genieduspectre.ic@canada.ca](mailto:ic.spectrumengineering-genieduspectre.ic@canada.ca)

**Ref: Intel’s comments on “Consultation on the Technical and Policy Framework for License-Exempt Use in the 6 GHz Band”**

Intel Corporation welcomes the opportunity to deliver our views to the Canadian ISED on the Consultation on the Technical and Policy Framework for License-Exempt Use in the 6 GHz Band. We commend the ISED efforts to promote vital conversations that will improve and enrich Canadian’s lives using ultra-fast wireless connectivity.

Our comments are delivered using electronic format and follow the guidance specified in section 11 of the consultation, “Submitting comments<sup>1</sup>”. We have divided our comments into two sections. Section 1 covers Intel’s general view and comments and Section 2 answer the specific question numbers from the consultation.

**Section 1. Intel’s General Views and Comments**

Intel commends the ISED’s proposal to designate the 5925-7125 MHz band as license-exempt and for the efforts to accelerate the high-speed, high-quality wireless broadband in Canada and initiation of Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band (“Consultation”). Intel Corporation (“Intel”) welcomes the opportunity to respond to the invitation to submit written response to the Consultation.

Intel is an industry leader in creating world-changing technology that enriches the live of every person on earth. We stand at the brink of several technology inflections—artificial intelligence (AI), 5G network transformation, and the rise of the intelligent edge—that together will shape the future of technology. Silicon and software drive these inflections, and Intel is at the heart of it all. Intel® Wi-Fi 6 and 6E solutions enable the fastest wireless speeds for PCs, more responsive performance, with enhanced security and reliability, especially in dense environments.

Intel’s global broadband objectives are the same as that of most governments and consumers: we want to enable high-speed and high-quality, widespread, affordable broadband in all countries extending computing technology to connect and enrich the lives of every person on earth. We strongly encourage all Administrations to establish technology and service neutral policies, expeditiously assign spectrum, and permit compliance to globally recognized standards.

---

<sup>1</sup> <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11643.html>



Intel supports allocating the full band for unlicensed use and recognizes that the 6 GHz band is now Priority # 1 for Canada, as announced by ISED's spectrum long term outlook, based on the developments taking place internationally.

The connections provided by Wi-Fi technology through low-cost, license exempt devices are worth billions of dollars to the Canadian economy, as is also recognized in the consultation. We believe Canada should get maximum benefit from Wi-Fi 6 similar to the other leading countries around the world.

Indeed, a recent study by Telecom Advisory Services found that license exempt networks like Wi-Fi generate two trillion dollars a year to the world's economy, a number expected to grow to \$3.5 trillion by 2023<sup>2</sup>. The US FCC Report and Order<sup>3</sup> on the 6 GHz band (5.925–7.125 GHz) highlights the economic and social benefits of Wi-Fi 6 (based on IEEE 802.11ax) and Wi-Fi 6E (Extending Wi-Fi CERTIFIED 6 into 6 GHz).

Statements from the FCC<sup>4</sup> and Intel<sup>5</sup> on the "Adoption of New Rules for the 6 GHz Band (Unleashing 1,200 Megahertz of Spectrum for Unlicensed Use)" explain the importance of opening spectrum in the 6 GHz band (5.925–7.125 GHz) and the benefits of Wi-Fi 6E.

In addition to the US, in July 2020, the UK made the lower 6 GHz band (5925-6425 MHz) available for Wi-Fi and other RLAN technologies. Also, other countries like South Korea and Chile have already allocated the entire 1200MHz of spectrum (5.925–7.125 GHz) for license-exempt operation. Electronic Communications Committee (ECC), during its Nov 2020 meeting, approved CEPT Report 75<sup>6</sup> and ECC Decision (20)01<sup>7</sup> to authorize license-exempt use of the 5925-6425 MHz band for VLP and LPI modes. The European Commission decision is expected in March 2021. Once license-exempt usage is taking place under the Low-Power Indoor and Very-Low-Power Indoor and Outdoor rules which protect incumbent users, expansion to the 6425-7125 MHz portion could be considered under similar rules since incumbent considerations are the same as in the 5925-6425 MHz portion. On December 28, 2020, UAE Telecommunications Regulatory Authority (TRA) designated the 6 GHz band (5925-6425 MHz) to permit Wi-Fi for indoor use. Many other countries including Brazil, Japan, Australia, Mexico, Argentina, Peru and Saudi Arabia are currently in the process of making the 6 GHz band available for license-exempt use, or in the case of India, are considering this option.

Intel's responses to the questions in the Consultation are included below, and we are happy to provide any additional information or required clarifications.

---

<sup>2</sup> Economic Value of Wi-Fi available at <http://valueofwifi.com>

<sup>3</sup> FCC 20-51A1, Unlicensed Use of the 6 GHz Band, Report and Order and Further Notice of Proposed Rulemaking, ET Docket No. 18-295; GN Docket No. 17-183, April 24, 2020 <https://s3.amazonaws.com/public-inspection.federalregister.gov/2020-11236.pdf>

<sup>4</sup> <https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses-0>

<sup>5</sup> <https://blogs.intel.com/policy/2020/04/23/intel-supports-fcc-vote-to-improve-wifi/#gs.7oh7dn>

<sup>6</sup> CEPT Report 75, Harmonised technical parameters for WAS/RLANs operating on a coexistence basis with appropriate mitigation techniques and/or operational compatibility/coexistence conditions, operating on the basis of a general authorisation, Nov 20, 2020

<sup>7</sup> ECC Decision (20)01 [4], On the harmonized use of the frequency band 5945-6425 MHz for Wireless Access System including Radio Local Area Networks (WAS/RLAN), Nov 202, 2020



## Section 2. Intel's answers to specific questions

### Q1

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

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

Wi-Fi Alliance Wi-Fi 6 Certification is customized for 6GHz as Wi-Fi 6E and started certification in Jan 2021. On Jan 7, 2021, the Wi-Fi Alliance announced<sup>8</sup> its certification for Wi-Fi 6E is now available to deliver interoperability for devices operating in the 6 GHz spectrum, and numerous certifications are expected during 2021. Similarly, in Europe, with the ETSI standard reaching the stage where it is stable, and assuming the European process is to complete early in 2021, equipment could enter the European market in the middle of 2021. Wi-Fi Alliance projects that 316 million devices will be sold in 2021 globally.

On December 9, 2020, the US FCC published its Knowledge Database (“KDB”) test requirements for the 6 GHz band<sup>9</sup> and the first Low Power Indoor devices are already certified to comply with FCC KDB guidelines as part of this Phase I certification. The FCC is expected to certify Standard Power AFC Enabled devices in Phase II, and issuing the following guidance: “When the FCC allows Phase II devices to file applications, it will be permitted to add a new equipment class or classes under the same FCC ID to already-approved devices as a new original grant.”

Certification and market availability of Standard Power devices depend on availability of AFC Systems and their certification. Some potential AFC system vendors have already announced availability of early implementations<sup>10</sup>.

Wi-Fi alliance is currently working on developing compliance recommendations for AFC Systems as well as complimentary specification such as AFC Device to AFC System interface that can be flexibly adapted for use by the systems in US, Canada or other regions if required. The compliance recommendation requires complete, up to date and stable fixed services database.

### Q2

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

Intel believes it is feasible to enable RLAN and Wi-Fi in the 5925-7125MHz band under license-exempt operation while protecting incumbent services in the band against harmful interference.

<sup>8</sup> <https://www.embedded-computing.com/home-page/wi-fi-alliance-announces-certification-for-wi-fi-6e-now-available>

<sup>9</sup> <https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?id=277034&switch=P>

<sup>10</sup> <https://federatedwireless.com/federated-wireless-extends-spectrum-controller-to-the-6-ghz-band-to-accelerate-wi-fi-6-and-5g-service-delivery/>

The 2017 Wi-Fi Alliance spectrum needs study<sup>11</sup> concluded that up to 1 GHz of new spectrum will be needed in 2025 to satisfy the anticipated busy hour, with between 1.3 and 1.7 GHz required if demand exceeds the busy hour prediction. The study emphasized the importance of contiguous spectrum to be assigned to accommodate wide channels of 160 MHz bandwidth (See Annex A). The IEEE 802.11ax<sup>12</sup> specification, already completed, provisioned all required protocols to support the technical and regulatory requirements for the 6 GHz band. IEEE 802.11ax currently supports 160MHz channels and channel sizes of 320MHz are being provisioned in IEEE 802.11be. As already accommodated by the US FCC 6GHz rules, forward looking spectrum regulation that allocates multiple contiguous 160MHz and 320MHz channels will enable growth of Wi-Fi and the associated economic benefits.

Studies conducted in US, EU and other regions globally<sup>13</sup> and other studies<sup>14</sup> have already concluded that indoor and outdoor Wi-Fi services and devices can coexist with incumbent services by limiting the Tx power of Wi-Fi devices, among other mechanisms.

Supported by spectrum need, economic value and feasibility of co-existence with incumbent services, Intel recommends authorizing the entire 1200 MHz of 6GHz spectrum for unlicensed operation of RLAN including Low Power Indoor (LPI) for indoor operation and Very Low Power (VLP) and Standard Power (SP) for Indoor and Outdoor operation. Channel bandwidths up to 160MHz and 320MHz should be supported.

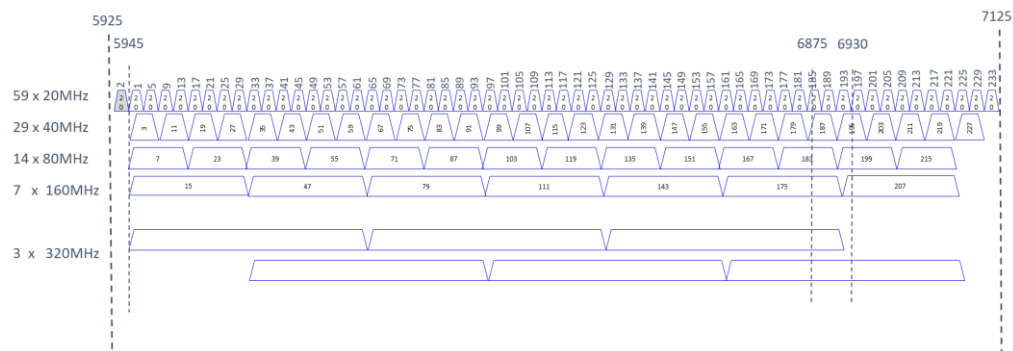


Figure 1. IEEE 802.11ax and 802.11be 6GHz Channelization

<sup>11</sup> Wi-Fi Alliance, Spectrum Needs Study (2017). <https://www.wi-fi.org/news-events/newsroom/additional-licence-exempt-spectrum-needed-to-deliver-future-wi-fi-connectivity>

<sup>12</sup> IEEE P802.11ax™/D8.0, Draft Standard for Information technology— Telecommunications and information exchange between systems Local and metropolitan area networks— Specific requirements, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 1: Enhancements for High Efficiency, Nov 2020

<sup>13</sup> RKF report (commissioned by 6USC, detailed report from 2018): <https://s3.amazonaws.com/rkfengineering-web/6USC+Report+Release+-+24Jan2018.pdf>

<sup>14</sup> 6USC Group:

Fixed link interference: [https://ecfsapi.fcc.gov/file/108230735019254/6GHz%20FS%20coexistence%20study%20ex%20parte%20\(final\).pdf](https://ecfsapi.fcc.gov/file/108230735019254/6GHz%20FS%20coexistence%20study%20ex%20parte%20(final).pdf)

VLP Sharing Study: [https://ecfsapi.fcc.gov/file/10702302769261/VLP%20Ex%20Parte\\_28June2019.pdf](https://ecfsapi.fcc.gov/file/10702302769261/VLP%20Ex%20Parte_28June2019.pdf)

Comments to NPRM: [https://ecfsapi.fcc.gov/file/10216633127609/6%20GHz%20RLAN%20Group%20Comments%20\(Feb%2015%202019\).pdf](https://ecfsapi.fcc.gov/file/10216633127609/6%20GHz%20RLAN%20Group%20Comments%20(Feb%2015%202019).pdf)

Summary position (before R&O): [https://ecfsapi.fcc.gov/file/1031999525288/AFC%20Ex%20Parte%20\(Mar%2019%202020\).pdf](https://ecfsapi.fcc.gov/file/1031999525288/AFC%20Ex%20Parte%20(Mar%2019%202020).pdf)

**Q3**

ISED is seeking comments on the proposed footnote Cxx and the changes to the CTFA as shown in [table 2](#).

Intel supports changing the CTFA by adding footnote Cxx as shown in Table 2.

**Q4**

ISED is seeking comments on the proposed rules for standard-power RLANs:

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

Intel agrees with ISED that various studies submitted to the FCC related to the 6 GHz as well as the conclusions made by the FCC in Report and Order (20-51) with the appropriate technical measures in place, support the view that the proposals for the operation of RLANs in the 6 GHz band would sufficiently protect Canadian licensed incumbents. Intel also supports alignment with the three uses/modes of the 6 GHz band adopted by the FCC so that the equipment ecosystem development efforts for the US also benefits Canadian citizens.

Intel supports proposed Items a. through e. for Standard Power devices with the following modifications:

**Item b:** as transportable TV pick-up services currently do not operate in the 6875-6930 MHz frequency range, we therefore recommend not deciding to exclude that frequency segment permanently at this time. Intel proposes to expand the frequency range to 5925-6930MHz, since it enables two additional 20MHz channels, one additional 40MHz channel, one additional 80MHz channel, one additional 160 MHz channel (6 channels instead of 5) or one additional 320MHz channels (3 channels instead of 2) for Standard Power indoor/outdoor operation under control of AFC. If and when the segment of band is utilized for transportable TV pick-up services, AFC Systems can be updated to exclude the segment.

**Item e:** Recommend requiring the vertical elevation mask for outdoor access points only and not for Standard Power indoor access points.

**Q6**

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



Intel supports inclusion of the 6425-6525 MHz sub-band for Standard Power devices. We believe that AFC Systems can flexibly support the sub-band. Inclusion of this sub-band adds two 80MHz channels, one 160MHz channel or one 320MHz channel for indoor and outdoor standard power use. Also, AFC Systems and Devices compliance specifications under development by Wi-Fi Alliance can flexibly support 6425-6525 MHz sub-band for use in Canada.

#### Q7

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

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

Intel supports proposed Items a. through e. for Low Power Indoor (LPI) devices with the following modifications:

**Item c & d:** Recommend permitting maximum 33 dBm (instead of 30 dBm) EIRP and 8 dBm/MHz (instead of 5 dBm/MHz) to minimize the coverage gap with the Wi-Fi performance in 5GHz; Cablelab's analysis<sup>15</sup> supports the co-existence with fixed services at these higher total and PSD power levels.

Aligned with US FCC Low Power Indoor (LPI) requirements, Intel recommends the following requirements to confine LPI Access Points to indoor operations:

- Access Points should be certified with an integrated antenna.
- Access Points cannot utilize weatherized enclosures to enable them to withstand outdoor environmental conditions.
- Access Points cannot operate on battery power, making it unattractive to carry the device outdoors.
- Finally, Access Points include labeling and warnings for indoor use only.

On January 11, 2021, US FCC Office of Engineering and Technology issued a Public Notice seeking additional information regarding Client-to-Client device communications in the 6GHz band<sup>16</sup>. Client to Client communications between client devices within the coverage area of indoor Access Points enables many innovative applications that are not feasible with the alternative Very Low Power (VLP) mode because of the expectedly restrictive maximum power requirements. Intel strongly recommends ISED authorize Client-to-Client operations when such devices are operating within the coverage area of Low Power Indoor Access Points (i.e. are able to decode an enabling signal from LPI Access Points) since it does not pose harmful interference to incumbent services.

In addition, aligned with US FCC, Intel recommends adding Subordinate devices to operate at levels equivalent to LPI Access Points, but must be under the control of an LPI Access Point (subordinate devices

<sup>15</sup> Ex parte filed by CableLabs, March 30, 2020: <https://www.fcc.gov/ecfs/filing/1033043576413>

<sup>16</sup> <https://docs.fcc.gov/public/attachments/DA-21-7AI.pdf>



do not have a direct connection to the internet). Like LPI Access Points, Subordinate devices are supplied power from a wired connection, have an integrated antenna, are not battery powered, and do not have a weatherized enclosure.

#### **Q8**

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

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

Intel supports proposed Items a. through d. for Very Low Power (VLP) with the following modifications:

**Item d:** Recommend increasing maximum permitted PSD level and harmonize internationally with EU, UK & Korea, as -8 dBm/MHz is unnecessarily restrictive and precludes use cases. Intel proposes allowing 1 dBm/MHz. ISED may consider requiring Transmit Power Control (TCP) to further mitigate potential interference.

#### **Q9**

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

WFA introduced three centralized and decentralized models for AFC Systems implementations. The first centralized model is Third Party Database Provider where a third party provides stored licensee data—obtained from FCC databases and potentially pre-processed to facilitate rapid calculations. The second model, a decentralized model, is Standalone AP(s) with Integrated AFC. Under this physical implementation scenario, the AFC system and the AFC device that it controls are integrated into the same physical system on a user's premises (and perhaps even into the same device). The third model is Enterprise or Service Provider. In this centralized model, a service provider, such as a large ISP operating many RLAN devices, could deploy and certify its own AFC system within its private cloud. The US FCC 6GHz ruling only allows centralized AFC models. WFA is currently focusing on the first and third models in its development of compliance specification. ISED should consider both centralized and decentralized options.

#### **Q10**

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





Intel recommends alignment with US FCC and believes ISED should allow multiple AFC System implementations. The market should decide on the actual number of AFC systems operational in Canada.

**Q11**

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

Like the U.S. FCC, ISED could require AFC administrators to serve for a five-year term that can be renewed based on performance during the operating term; Transfer of AFC Device information may be required if an AFC operator ceases operation.

**Q12**

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

Intel supports ISED adopting an AFC system model that is harmonized to the maximum extent possible with the AFC system model being implemented in the U.S.

**Q13**

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

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

Intel recommends the following implementation for the operation of AFC systems aligned with US FCC.

- a. information required from licensed users: A database should be used as the single reference for required information from licensed users and must include all incumbent information.
- b. interference protection criteria for computation of exclusion zones:
  - o Interference protection criteria:  $I/N < -6$  dBm
  - o Propagation Model: free-space model for short distances, the WINNER II for medium distances, and the Irregular Terrain Model (ITM) for longer distances
- c. information required from standard-power APs
  - o Geographic coordinates (latitude and longitude): 95% confidence, Location uncertainty (lat and lon) for internal or external geo-location
  - o Antenna height above ground level: 95% confidence, Location uncertainty





- [ISED] identification number
- Unique manufacturer's serial number
- d. frequency of AFC update of licensee information: Similar to FCC, AFC system on a routine basis of no less than one per day should update the incumbent licensees' information
- e. security and privacy requirements: Like the U.S. FCC, however, ISED should decline mandating specific security models.
- f. Intel recommends to ISED to add fixed client devices with the same power as APs for point to multi-point operation.

**Q14**

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

No comments.

**Q15**

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

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

Intel supports ISED proposal to require AFC systems to protect the types of licensed stations listed under Q15 from standard-power APs. Like US, exclusion zones for radio astronomy are determined by the radio line-of-sight distance between the radio astronomy antenna and the licence-exempt access point.

**Q16**

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

No comments.

**Q17**

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

Intel disagrees with ISED proposed approach for incremental implementation of an AFC system in Canada. Assuming AFC Systems demonstrate compliance in general and using proper test vectors, there is no reason for incremental implementation. Incremental implementation may make the provider's business case more challenging, thereby negatively impacting adoption.

**Q18**

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

No comments.