

Canada – 6 GHz Consultation

Consultation	Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band
Deadline	19 January 2021
Geographical Scope	Canada
Administration	 Innovation, Science and Economic Development Canada Innovation, Sciences et Développement économique Canada
Frequency Ranges	5925-7125 MHz
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Date / Version	14 January 2021, revision 0

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Apple Response to Canada – Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band

Executive Summary

Apple Inc. (Apple) welcomes the opportunity to respond to this 6 GHz consultation.

We believe the whole 6 GHz (5925-7125 MHz) frequency range is important for the development of digital services and applications provided by Wireless Access Systems / Radio Local Area Networks (WAS/RLAN) including Wi-Fi.

Apple supports the following three core spectrum strategy goals:

- 1) encourage a range of innovative business and engineering approaches so market forces can determine the best use of each frequency band,
- 2) avoid restrictive regulations or Government predictions about future uses of the bands that could dictate outcomes and/or limit innovation, and
- 3) continually bring new bands into use while working to achieve greater efficiency and intensity of use of existing government, commercial, and shared bands.

Apple also recommends two specific ways to advance these goals:

- 1) pursue a balanced spectrum policy that brings more licensed and licence-exempt spectrum into use to serve businesses and consumers, and
- 2) support band plans and technical rules in current and future spectrum proceedings that encourage investment and innovation rather than requiring particular channelisation approaches and/or channel bandwidths geared to any one standard, or otherwise favouring a subset of today's technologies over innovations to come.

Apple recommends adopting a balanced spectrum policy that brings more licensed and licence-exempt spectrum into use to benefit businesses and consumers. Businesses and Consumers depend on both licensed and licence-exempt spectrum bands and will need access to more to meet demand for new applications and services. We note that previously many Administrations have had a preference for the identification of licensed bands over licence-exempt bands but there is now an opportunity to correct this imbalance through provision of access to licence-exempt mid-band spectrum in the whole 5925-7125 MHz frequency range.

Apple supports band plans and technical rules that encourage investment and innovation rather than favouring any one technology, standard, and/or licensing regime. In addition to the need for a balanced spectrum approach that enables access to more licensed and licence-exempt spectrum, the regulations that govern these frequency bands should encourage innovation rather than serving as a barrier to entry. In particular, regulations should avoid mandating the use of any technology or standard.

In conclusion, Apple supports increasing spectrum access, promoting efficient and effective spectrum use, and supporting innovation. These goals can be advanced through a balanced approach that makes new licensed and licence-exempt spectrum available for use, creates larger licence-exempt spectrum blocks allowing emerging technical advances, and governs these new bands through flexible, non-prescriptive technical rules.

Apple Response to 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

Apple does not provide product roadmap information. Wi-Fi 6E equipment is certified by the Wi-Fi Alliance ([Wi-Fi 6E Certified Products](#)) and test procedures are available from the FCC to access the US market. NR-U specifications are still under development in 3GPP. We also highlight that ETSI has a stable draft harmonized standard for low power indoor and very low power indoor and outdoor devices this will enable WAS/RLAN devices to access the European market. .

Q2

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

Apple supports enabling **global licence-exempt access to 5925-7125 MHz frequency range for Wireless Access Systems / Radio Local Area Networks (WAS/RLANs) including Wi-Fi** to facilitate new services and applications including those requiring larger bandwidths (e.g., 160 MHz and in the future 320 MHz channels). We strongly encourage opening the entire 5925-7125 MHz for licence-exempt usage to benefit immediately from product availability and global economies of scale.

Apple believes that immediate access to 5925-7125 MHz will enable WAS/RLAN technologies, including Wi-Fi, to continue delivering positive experiences for the most bandwidth-intensive applications, leveraging wider channels, lower latency and additional capacity to deliver greater network performance and supporting more users at once, even in very dense and congested environments.

Access to licence-exempt mid-band spectrum has not kept pace with the extraordinary growth and adoption of WAS/RLAN technologies. This issue is not new and has been under consideration for number of years including two World Radiocommunication Conference four-year study periods, but with no new mid-band spectrum identified or made available for WAS/RLAN.

Cisco's Visual Networking Index (VNI) considers the impact that users, devices and other trends will have on global IP networks over a five-year period, and it conclude that by 2022, more IP traffic will cross global networks than in all prior "internet years" combined up to the end of 2016. In other words, more traffic will be created in 2022 than in the 32 years since the internet started. Wi-Fi currently delivers more than half of all internet traffic and by 2022, 71% of total IP traffic will be wireless (Wi-Fi and Mobile); a 25% CAGR (Compound Annual Growth Rate) between 2017-2022.

WAS/RLAN including Wi-Fi is an important wireless technology for business and consumer internet connectivity overall and has become essential even for the mobile segment of internet connectivity, where worldwide Wi-Fi carries more traffic than licenced wireless technologies. This is because one of the solutions to address the growing demands for bandwidth on cellular networks has long been leveraging Wi-Fi networks, which enables mobile network operators to scale capacity to meet their subscribers' needs. From 2G to 3G, from 3G to 4G and now moving towards 5G, Wi-Fi offload continues to increase in importance and according to Cisco VNI it is anticipated that approximately 70% of 5G offloaded traffic will be on Wi-Fi.

Ensuring sufficient license-exempt mid-band spectrum is available is critical for supporting existing and ever-growing demand for applications and services delivered over Wi-Fi as well as playing a critical element enabling 5G applications and services where they are off-loaded to Wi-Fi. As mobile and Wi-Fi technologies evolve and continue to be integrated to meet wireless and mobile communications needs, demand for license-exempt spectrum will continue to grow. It is estimated that by 2025 there will be a worldwide Wi-Fi spectrum shortfall of up to 1.6 GHz in the mid-frequency range that will limit the

performance and availability of broadband (Quotient Associates, Wi-Fi Spectrum Needs Study, for Wi-Fi Alliance, February 2017). The need for wide-channel Wi-Fi is even more acute, as existing licence-exempt bands generally do not permit or allow the use of multiple wider channel bandwidths.

Access to 5925-7125 MHz is critical to meet the needs for licence-exempt WAS/RLAN technologies, such as Wi-Fi which require access to wider channels. The proximity to the existing 5 GHz licence-exempt bands means that 6 GHz chipsets and RF front-end modules will be readily available.

The 6425-7125 MHz frequency range contains similar incumbents to the 5925-6425 MHz range; plus the compatibility and sharing studies between primary services performed between Wi-Fi and incumbents (Fixed Service and Fixed Satellite Service) are equally valid in both 5925-6425 MHz and 6425-7125 MHz.

A broad range of Wi-Fi products are becoming available for the 5925-7125 MHz frequency range in line with market demand with chipset suppliers committed to supporting the whole frequency range. In anticipation of additional mid-band spectrum becoming available in parts of the world, the Wi-Fi Alliance announced a certification program for Wi-Fi devices operating in 5925-7125 MHz (see [WFA Brings Wi-Fi 6 into 6 GHz](#)).

Apple does **not** consider it feasible or indeed desirable to enable the operation of IMT (International Mobile Telecommunications) systems in all or part of the 5925-7125 MHz frequency band since we prefer a licence-exempt approach enabling WAS/RLAN.

Apple supports licence-exempt access to the entire 5925-7125 MHz frequency range for WAS/RLAN including Wi-Fi and other similar applications without any technology specific identifications. The 5925-7125 MHz frequency range is already allocated on a primary basis to the mobile service and we believe it is unnecessary to have mobile application specific designations or identifications.

We note that historically spectrum identified for IMT is subsequently licensed on an exclusive basis. IMT is technology specific promoting just the radio interface contained in the IMT-2020 recommendations and 3GPP New Radio specifications, which are not the only technologies available.

Apple believes it is vital to have balance between having access to licensed mid-band spectrum within 3300-4200 MHz and licence-exempt mid-band spectrum in 5925-7125 MHz. We note that there are already IMT identifications in the 2.3 GHz and 2.6 GHz bands that can be used for IMT. Plus, access to bands within 3.3-4.2 GHz is already used for commercial 5G services and will continue to serve as the basis of 5G rollouts over the coming decade. Increasing the amount of globally harmonised spectrum in this range for IMT services comes with major benefits for global manufacturing economies of scale and consumers by enabling the same quality of service when they travel around the world.

In November 2019, the GSMA have stated spectrum in the 3.5 GHz range (from 3.3-4.2 GHz) “would help speed up the introduction of 5G; improve network performance; help drive innovation; and bring down costs. It would also help boost economic benefits of up to \$80 billion over a 15-year period”. What is also interesting is that the GSMA explain why this range is such a good candidate for the mid-band spectrum 5G needs to meet performance expectations; “... it is at the balancing point between coverage and capacity”. They go further the indicate that “more capacity will be required as demand increases” and having access to 3800-4200 MHz would go some way to address that capacity requirement. GSMA also state:

“5G networks are also reaching into mmWave for much higher capacity and use lower frequencies to provide greater coverage, but the equilibrium provided by 3.3- 4.2 GHz has seen these frequencies become the global birthplace of 5G.”

Technological advancements, including beamforming, suggest the 3.5 GHz band can provide the same coverage, and use the same cell sites, as the current 2.6 GHz and 1800 MHz mobile bands. The 600 MHz and 700 MHz, on the other hand, support wide area 5G services including the Internet of Things.

Apple believes an IMT identification in part or all of the 5925-7125 MHz frequency range would deny the benefits of the next generation of Wi-Fi technologies. These frequencies will be the world-wide home for the future of Wi-Fi and chipmakers and device makers will build technology to meet this worldwide market. We are supportive of ensuring access to 5925-7125 MHz under a technology neutral licence-exempt regulatory regime without any technology specific identifications.

Apple anticipates that Regulators will implement a licence-exempt approach for the 5925-7125 MHz frequency range in a similar manner to the existing 5 GHz WAS/RLAN frequency ranges. A harmonised global approach for 5925-7125 MHz would greatly influence rapid deployment of licence-exempt equipment capitalising on product availability in other regions. Several major markets have already released all or portions of the 5925-7125 MHz band for licensed-exempt use including the United States, Europe, South Korea, Japan, Saudi Arabia, Chile, Peru, and others.

We are concerned that access to 6425-7125 MHz will be impacted due to the WRC-2023 Agenda Item 1.2 on possible IMT Identification as this has the potential to introduce additional restrictions, and unnecessary delays. That said, Apple accepts the World Radiocommunications Conference 2019 decision to study the “possibility” of identifying IMT in the 6425-7025 MHz band for Region 1 only and 7025-7125 MHz globally with other incumbent services, but we do not believe that these studies should delay opening this whole frequency range for licensed-exempt uses in Region 2 Administrations that wish to do so and take advantage of technology as soon as it becomes available.

An IMT identification, which is generally associated with higher power outdoor deployments, at the WRC-23 under Agenda Item 1.2 for 6425-7025 MHz in Region 1 and 7025-7125 MHz globally will not achieve global, or even regional harmonization, and will be highly disruptive. IMT sharing with incumbent services (e.g., Fixed Satellite Service and Fixed Service) is likely to be difficult – and may require relocation of existing operations which is likely not required with a licence-exempt solution. Based on the sharing studies conducted to introduce WAS/RLAN into the 5925-7125 MHz or portions of this range with the same incumbents, it is unlikely the ubiquitous, widespread high power IMT networks would be able to effectively share with incumbents without extensive restrictions.

Apple would like to highlight that a broad range of WAS/RLAN products are becoming available for the 5925-7125 MHz frequency range in line with market demand with chipset suppliers committed to supporting the whole 5925-7125 MHz frequency range. Wi-Fi Alliance certification and deployment of Wi-Fi 6E technology has started and will play a highly significant role in enabling transformative wireless services in many sectors from 2020 onwards.

A key aspect for WAS/RLAN industry is to achieve global and regional harmonisation to enable economy-of-scale advantages which provides confidence to developers, vendors and businesses to invest at an early stage in the development of new WAS/RLAN deployments and the creation of the new ecosystem. This helps develop a competitive market with a wide range of products and services with the benefit to all, including consumers and a nation’s productivity and competitiveness. From a regulatory perspective, such harmonization also helps agencies in charge of market surveillance by creating a common platform for product compliance that is understood uniformly by all market players.

Finally, it is important to emphasize that Region 2 and Region 3 are **not** studying 6425-7025 MHz for possible IMT identification as these studies are limited to only Region 1 and therefore may not take into account the unique needs of Region 2 and 3 incumbents.

Q3

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

Apple is supportive of the content in proposed footnote Cxx as detailed below –

ADD Cxx: Licence-exempt RLAN applications in the 5925-7125 MHz band must operate in accordance with the established spectrum policy and technical framework; and must not cause harmful interference to, or claim protection from, licensed systems operating in the band.

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

Apple believes the technical / regulatory conditions as contained in the table below for “Standard Power Outdoor” are appropriate to enable access to the whole 6 GHz (5925-7125 MHz) frequency range for WAS/RLAN.

Standard Power Outdoor

Use Case	Equipment	Operation Band	Maximum Power	Power Spectral Density Limited to EIRP	Restrictions
Standard Power Outdoor	Access Points	5 925 –7125 MHz	36 dBm EIRP	23 dBm / MHz	Access points can only operate under an automated frequency coordination (AFC) system to avoid interference with the services allocated on a primary basis. Use for drones is prohibited.
	User Devices		30 dBm EIRP	17 dBm / MHz	

Q5

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

Please see Apple response to Q4.

Q6

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

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

Apple defers to AFC and standard-power manufacturers for the response to this question.

Q7

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

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

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

Apple considers it feasible to open 5925-7125 MHz for licence-exempt Wireless Access Systems / Radio Local Area Networks (WAS/RLANs) including Wi-Fi for multiple device classes specifically lower power indoor and very low power devices that can operate either indoor or outdoor. There is also the ability to utilize Automated Frequency Coordination (AFC) capabilities for higher power outdoor devices that can facilitate more enterprise capabilities and private area network.

Apple is primarily focused on opening the 5925-7125 MHz for low power indoor and very low power device classes.

Apple believes the majority of envisioned use cases for WAS/RLAN devices are indoors, including in various transportation services. These use cases include home automation, new e-health applications, streaming video services, peer-to-peer device communications and the usual access point home networking applications that have been critical to facilitating education and economies worldwide during the COVID-19 pandemic.

This device class delivers the connectivity to the population when at home, work, and in transit. As technologies develop in the home environment, more client to client and bridge-like systems are coming into consideration to better facilitate home automation. Apple also supports low power indoor devices in cars, trains, and inside planes to promote more connectivity solutions for transportation modes. These use cases would also fall within this indoor use low power category.

Very low power devices enable flexibility for indoor and outdoor uses and create a very localized personal area network required for the expanded use of wearables and streaming audio and video services for portable devices. This class requires lower latency requirements, while also taking into account device power consumption and other considerations relevant specifically for portable mobile devices.

Apple believes the technical / regulatory conditions as contained in the table below for “Low Power Indoor” is appropriate to enable access to the whole 6 GHz (5925-7125 MHz) frequency range for WAS/RLAN.

Low Power Indoor

Use Case	Equipment	Operation Band	Maximum Power	Power Spectral Density Limited to EIRP	Considerations
Low Power Indoor	Access Points	5925-7125 MHz	30 dBm EIRP	10 dBm / MHz	Use not allowed outdoors Use for drones is prohibited
	User Devices		24 dBm EIRP	10 dBm / MHz	

Q8

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

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

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

Please see our response to Q7, plus Apple believes the technical / regulatory conditions as contained in the table below for “Very Low Power Indoor and Outdoor” are appropriate to enable access to the whole 6 GHz (5925-7125 MHz) frequency range for WAS/RLAN.

Very Low Power Indoor and Outdoor

Use Case	Equipment	Operation Band	Maximum Power	Power Spectral Density Limited to EIRP	Considerations
Very Low Power Indoor and Outdoor	Devices	5925-7125 MHz	14 dBm EIRP	10 dBm / MHz	Use for drones is prohibited

Q9

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

Apple has not commented on potential business models for AFC administrators to operate their AFC systems in Canada.

We do however have a general comment on AFC. As determined in the FCC 6 GHz rulemaking proceeding, operation of license-exempt devices at power levels up to 36 dBm under control of an Automated Frequency Coordination system will protect the operations of incumbent users with fixed receive sites. All that is needed to protect incumbent users with an AFC using the FCC Rules is accurate technical parameters of each licensee's operations to calculate protection zones around the receivers.

Apple suggests modelling regulations on the FCC AFC Rules and allowing mobile operation.

The technical record leading to the development of these rules was exceptionally deep and robust, resulting in a solid regulatory framework that is fully protective and easily administered. Further, Canada would benefit from economies of scale by allowing device manufacturers and AFC system providers to offer their products to a larger market with the same regulatory conditions.

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.

Apple has not responded to this question.

Q11

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

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

Apple has not responded to this question.

Q12

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

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

See Apple response to Q9.

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
- c) frequency of AFC update of licensee information
- d) security and privacy requirements

Apple has not responded to this question.

Q14

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

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

Apple has not responded to this question.

Q15

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

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

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

Apple has not responded to this question.

Q16

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

Apple has not responded to this question.

Q17

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

Apple has not responded to this question.

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.

Apple has not responded to this question.