



Spectrum Management and Telecommunications

Decision on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band

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1. Intent

1. Through the release of this document, Innovation, Science and Economic Development Canada (ISED), on behalf of the Minister of Innovation, Science and Industry (the Minister), announces the decisions resulting from the consultation process undertaken in Canada Gazette notice SMSE-014-20, [*Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band*](#) (the Consultation).

2. All [comments](#) and [reply comments](#) received on the Consultation are available on ISED's website. Comments and/or reply comments to the Consultation were received from:

- 5G Automotive Association (5GAA)
- Apple Inc. (Apple)
- BCE Inc. (BCE)
- Canadian Association of Wireless Internet Service Providers (CanWISP)
- Canadian Communication Systems Alliance, Inc. (CCSA)
- Canadian Electricity Association (CEA)
- Canadian Satellite and Space Industry Forum (CSSIF)
- Cogeco Communications Inc. (Cogeco)
- CommScope
- Competitive Network Operators of Canada (CNO)
- Department of National Defence Frequency Spectrum Management (DND)
- Dynamic Spectrum Alliance Limited (DSA)
- ENHS (Ericsson Canada Inc., Nokia, Huawei Technologies Canada Co., Ltd., and Samsung Electronics Canada Inc.)
- Federated Wireless, Inc. (Federated Wireless)
- Global VSAT Forum (GVF)
- Hewlett Packard Enterprise (HPE)
- Huawei Technologies Canada Co., Ltd. (Huawei)
- Inmarsat Solutions (Canada) Inc. (Inmarsat)
- innovation@6ghz.ca
- Intel Corporation (Intel)
- Joint Filers (Apple Canada, Inc., Broadcom, Inc., Cisco Systems, Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, Microsoft Corporation, Qualcomm Incorporated, CommScope, Inc.)
- Mobile Interest Group (MIG) (BCE Inc., Rogers Communications Canada Inc., Saskatchewan Telecommunications, TELUS Communications Inc., Ericsson Canada Inc., Huawei Technologies Canada Co., Ltd., Nokia, Samsung Electronics Canada Inc.)
- Province of Ontario
- PSBN Innovation Alliance (PIA)
- Public Interest Advocacy Centre (PIAC)
- Qualcomm Incorporated (Qualcomm)
- Québecor Média inc. (Québecor)
- Radio Advisory Board of Canada (RABC)
- RED Technologies (RED)
- Rogers Communications Canada Inc. (Rogers)

- Saskatchewan Telecommunications (SaskTel)
- SES (Americom, Inc., New Skies Satellites B.V., SES Satellites (Gibraltar) Ltd, and Ciel Satellite L.P.)
- Shaw Communications Inc. (Shaw)
- Sony Electronics Inc. (Sony)
- TekSavvy Solution Inc. (TekSavvy)
- Telesat
- TELUS Communications Inc. (TELUS)
- Wi-Fi Alliance
- Wireless Broadband Alliance (WBA)
- Wireless Innovation Forum (WInnForum)
- Xplornet Communications Inc. and Xplore Mobile Inc. (Xplornet)

3. This document (the Decision), sets out the technical and policy framework for the 5925-7125 MHz frequency band (the 6 GHz band).

2. Legislative mandate

4. The Minister, through the [Department of Industry Act](#), the [Radiocommunication Act](#) and the [Radiocommunication Regulations](#), with due regard to the objectives of the [Telecommunications Act](#), is responsible for spectrum management in Canada. As such, the Minister is responsible for developing national goals and policies for spectrum utilization and for ensuring effective management of the radio frequency spectrum resource.

3. Policy objectives

5. Wireless services play an important part in the lives of Canadians, whether they are accessing multimedia applications, conducting business while on the move or from home, accessing online education, connecting with family and friends, or managing their finances. As wireless services become increasingly integrated into their lives, Canadians expect these services to be high-quality, affordable and available in every region of the country. Especially during critical times, which has been the case during the COVID-19 pandemic, Canadians demand more and have relied more on their wireless services to stay connected.

6. One of ISED's objectives is ensuring all Canadian consumers, as well as business and public institutions, have access to the latest wireless telecommunications services at affordable prices. A robust wireless telecommunications industry not only drives the adoption and use of digital technologies, it also enhances the productivity of the Canadian economy.

7. Over the past few decades, licence-exempt spectrum has witnessed a significant increase in use and innovation due to low barriers to entry, such as easy access to spectrum and the low cost of devices. For instance, Canadians rely on Wi-Fi routers and hotspots using licence-exempt spectrum to enable access to the Internet and other applications on their smartphones, tablets and laptops in support of

remote working and schooling, staying connected with friends and family and for entertainment. Many of these applications, such as video streaming and multi-player gaming, are data-intensive. Wi-Fi also serves a crucial function in support of Canadian commercial wireless service providers, who rely on it to offload traffic from their mobile cellular networks and without which additional commercial mobile spectrum would be required to support current mobile services. Rural broadband service providers leverage licence-exempt spectrum to deliver broadband connectivity to residential and business customers in rural areas. Furthermore, a variety of Internet of Things (IoT) devices, from smart watches to industrial and agricultural sensor networks, also make use of licence-exempt spectrum. The range of IoT applications is rapidly increasing to include outdoor enterprise services such as asset tracking services in container port terminals, railyards and mining and extraction. Additional spectrum for licence-exempt use will support the introduction of next-generation licence-exempt wireless technologies that are deployed both indoors and outdoors, operating over distances ranging from less than a metre to several hundred metres, and delivering increased capacity and reliability for existing use cases, as well as new and emerging use cases.

8. Wi-Fi is the most widely used Radio Local Area Network (RLAN) technology to provide high data rate wireless access over a local area. Wi-Fi enables low-cost Internet connectivity for Canadians on a wide range of licence-exempt consumer devices. Wi-Fi operates in mid-band spectrum, specifically in the 2400-2483.5 MHz (2.4 GHz) band and in several sub-bands of the 5150-5850 MHz (5 GHz) band. The adjacent 6 GHz band is therefore a natural fit for the extension of spectrum for Wi-Fi technologies.

9. ISED recognizes that wireless technology development continues to evolve, and that there are new technologies and techniques being developed, such as dynamic spectrum access (DSA) that will provide new opportunities for improving efficiency for spectrum access. DSA may be realized through the use of mechanisms such as radio-environment sensing and/or the use of a geolocation database to perform automated frequency control. These new approaches to enable efficient spectrum access make it increasingly feasible to share spectrum between multiple services, including opportunistic access to licensed spectrum. In order to maximize the use of the spectrum resource and make spectrum available for a variety of services and applications, ISED is committed to further enabling technologies and approaches that will support the increased sharing of spectrum. ISED views the 6 GHz band as an opportunity to begin considering some of these new spectrum sharing techniques in order to provide access for new services in the band while maintaining access and protection for existing services.

10. In developing this decision paper, ISED was guided by the [Spectrum Policy Framework for Canada](#) (SPFC), which states 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. This objective and the enabling guidelines listed in the SPFC remain relevant for guiding ISED in delivering its spectrum management mandate.

11. In May 2019, the Government of Canada released [Canada's Digital Charter](#). The Digital Charter lists universal access as the first of 10 principles that will lay the foundation for a made-in-Canada digital approach, and guides policies and actions towards establishing an innovative, people-centred and

inclusive digital and data economy built on trust. Universal access is the principle that all Canadians will have an equal opportunity to participate in the digital world and have the necessary tools to do so, including access, connectivity, literacy and skills.

12. Decisions made in this document support ISED's objectives of the [Telecommunications Act](#), the [SPFC](#) and [Canada's Digital Charter](#). ISED's objectives for licence-exempt use of the 6 GHz band in Canada are to:

- foster innovation and investment in new wireless technologies and services
- support greater choice and affordability of wireless services for consumers and businesses
- facilitate deployment and timely availability of wireless broadband Internet across the country

4. Background

13. In [Spectrum Outlook 2018 to 2022](#) (the Spectrum Outlook), ISED concluded that demand for spectrum in licence-exempt bands will continue to grow, largely due to growth in the number of Wi-Fi and IoT devices, and that more spectrum for licence-exempt use is therefore required. It is recognized internationally that access to additional licence-exempt spectrum is needed to meet the exponentially increasing demand for innovative wireless services operating in licence-exempt spectrum. Globally, the 6 GHz band has traditionally been used for fixed services and fixed-satellite services, among other services and applications. Spectrum regulators in many regions of the world have released or are planning to release the 6 GHz band or portions of the band for licence-exempt use, alongside the licensed incumbents currently using this band.

14. In the U.S., the Federal Communications Commission (FCC) published [Report and Order \(FCC-20-51\)](#) (the Report and Order) titled *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz* in April 2020, which allows licence-exempt use in 1200 MHz of spectrum in the 6 GHz band. The FCC permitted two types of licence-exempt devices, commonly referred to as access points (APs), to operate under different technical rules to minimize the potential of interference to incumbent services: (1) low-power (maximum equivalent isotropically radiated power (e.i.r.p.) of 30 dBm) indoor-only APs across all 1200 MHz of spectrum; and (2) standard-power APs (maximum e.i.r.p. of 36 dBm) for indoor and outdoor use in only two sub-bands (5925-6425 MHz and 6525-6875 MHz). The standard-power APs must operate under the control of an automated frequency coordination (AFC) system. The Report and Order's accompanying Further Notice of Proposed Rulemaking also proposed to permit very low-power devices (maximum e.i.r.p. of 14 dBm) to operate both indoors and outdoors across the entire band.

Some of the information in the following paragraph has been provided by external sources. The Government of Canada is not responsible for the accuracy, reliability or currency of the information supplied by external sources. Users wishing to rely upon this information should consult directly with the source of the information. Content provided by external sources is not subject to official languages, privacy and accessibility requirements.

15. In Latin America, [Chile](#) recently permitted low-power, indoor licence-exempt use across the entire 1200 MHz of the 6 GHz band. [Brazil](#) also decided to release 1200 MHz of spectrum for licence-exempt use in the 6 GHz band, introducing low-power indoor use and very low-power use, and has indicated that it will be considering standard-power use at a later stage. [Mexico](#), [Colombia](#), [Argentina](#) and [Costa Rica](#) are in various stages of the consultation process regarding the release of spectrum in the 6 GHz band for licence-exempt use. Elsewhere in the world, [Japan](#), [South Korea](#), [Jordan](#) and [Saudi Arabia](#) are also at various stages of consultation to permit low-power indoor licence-exempt use across the entire 1200 MHz of the 6 GHz band. Finally, initiatives to allow licence-exempt use in portions (5925-6425 MHz) of the 6 GHz band are underway in other parts of the world, including in the U.K. and the EU as well as Argentina and Peru.

16. In October 2020, ISED issued the Consultation to seek comments on licence-exempt use in the 6 GHz band. In order to leverage the incipient U.S. equipment ecosystem, the Consultation proposed to closely align with the use of the 6 GHz band adopted by the FCC.

5. Development of the 6 GHz licence-exempt ecosystem

17. In the Consultation, ISED sought comments on the timelines for the availability of low-power and standard-power RLAN ecosystems, including the timeline for the availability of automated frequency coordination (AFC) systems. In its assessment, ISED noted that Wi-Fi 6E and 5G New Radio-Unlicensed (NR-U) technologies are currently considered as candidates for use in this band. ISED also noted that many Wi-Fi device manufacturers are already shipping Wi-Fi 6 equipment for operation in the 2.4 GHz and 5 GHz bands. Further, ISED noted that the 3rd Generation Partnership Project (3GPP) standards development body has standardized licence-exempt NR-U technology in its Release 16 (Rel-16) published in July 2020. The availability of standardized and certified AFC solutions is another important element to consider for the overall 6 GHz ecosystem. The Consultation noted that the development of AFC solutions for the 6 GHz band is under way in the U.S., while multi-stakeholder discussions are continuing to refine and standardize AFC system parameters and operation.

Summary of comments

18. BCE, Cogeco, DSA, HPE, Intel, Joint Filers, Québecor, RABC, Rogers, Shaw, TekSavvy, TELUS, WBA, Wi-Fi Alliance and Xplornet believe that low-power Wi-Fi 6E devices will enter the market in 2021. In December 2020, the FCC certified the U.S.'s first low-power Wi-Fi device for 6 GHz. Chipset manufacturers, Broadcom, Intel and Qualcomm, stated that Wi-Fi chipsets for Wi-Fi 6E

products are already available and the list of Wi-Fi 6E certified products will be growing in 2021. Cogeco, the Joint Filers and the RABC pointed out that in addition to the U.S. market, low-power Wi-Fi 6E equipment could also enter the European market in the middle of 2021. Looking forward to future releases of Wi-Fi equipment for the 6 GHz band, Shaw noted in its reply comments that Wi-Fi 7 should arrive by 2024 and would support channels of 320 MHz.

19. Federated Wireless, Intel, Joint Filers and Wi-Fi Alliance mentioned that the availability of standard-power Wi-Fi 6E devices will be dependent on the FCC authorization of an AFC system. These commenters, as well as TELUS, were of the opinion that standard-power Wi-Fi 6E devices will likely be available in 2022. In the reply comments, Rogers gave the view that a realistic timeline for wide deployment of AFC-controlled standard-power devices would likely be 2023, even if some devices become available earlier.

20. In the case of the 5G NR-U ecosystems, Apple, Huawei, RABC and TELUS mentioned that the 5G NR-U specifications are still under development in the 3GPP standards development body. The RABC noted that the introduction of 3GPP band n96, covering 5925-7125 MHz for the U.S. market, was finalized in 3GPP Rel-16 with core requirements, but indicated that there are still open issues related to wideband operation and capabilities. As a result, the RABC was of the view that the 5G NR-U ecosystem would be available in late 2021 or early 2022. Rogers was of the view that standard-power devices could be available by mid-2022, with low-power 5G NR-U devices being available by late 2021, whereas Shaw, TekSavvy and TELUS noted that 5G NR-U products would enter the market in 2022.

21. In terms of AFC system availability, the Joint Filers stated that the AFC testing requirements are subject to the work from the U.S. multi-stakeholder group, which is expected to provide recommendations to the FCC in late 2021, with a commercial implementation to follow, likely in late 2021 or 2022. Wi-Fi Alliance mentioned that multiple entities have already demonstrated functioning AFC prototypes. It further indicated that it is currently working on developing compliance recommendations for AFC systems, as well as complementary specifications such as the interface between standard-power devices and the AFC system, which could be adapted for Canada, if required. According to DSA and Wi-Fi Alliance, the FCC could initiate its authorization process for AFC systems by mid-2021, where approval could be completed by the end of 2021. Sony estimated that if ISED adopts rules similar to those in the U.S., AFC systems could be available in the Canadian market six months after the U.S. launch. TELUS, Rogers and Shaw noted the likelihood of AFC system availability in 2022. In its reply comments, Rogers encouraged ISED to monitor all international jurisdictions for any learnings that could enhance potential deployment of AFC systems in Canada and ensure protection of licensed 6 GHz operations.

Discussion

22. Based on comments received, ISED is of the view that there are rapidly growing 6 GHz licence-exempt ecosystems. ISED believes that Canada could benefit from a global marketplace and economies of scale to drive 6 GHz licence-exempt ecosystem availability in Canada by the end of 2021 (for low-power and very low-power Wi-Fi equipment) or early-to-mid 2022 (for 5G NR-U devices and standard-power Wi-Fi devices).

6. Changes to the spectrum utilization for the 6 GHz band

23. In the [Canadian Table of Frequency Allocations](#) (CTFA), the 6 GHz band is allocated to the fixed service and fixed-satellite services on a co-primary basis. In 2004, ISED published Spectrum Utilization Policy SP 3-30 GHz, [Revisions to Spectrum Utilization Policies in the 3-30 GHz Frequency Range and Further Consultation](#). This policy includes designation of the 5925-7025 MHz band for fixed-satellite and fixed services, with coordination being carried out on a first-come, first-served basis.

24. In the Consultation, ISED sought comments on its proposal to establish a new spectrum policy and technical framework for licence-exempt RLAN operation in the 5925-7125 MHz band. Moreover, ISED sought comments on its proposal to modify the CTFA to include the following footnote:

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.

25. The corresponding changes to the CTFA were proposed as follows:

Table 1: CTFA revisions to 6 GHz band allocation

MHz
5 925 - 6 700 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.149 5.440 5.458 ADD Cxx
6 700 - 7 075 FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441 C40 5.458 5.458A 5.458B ADD Cxx
7 075 - 7 145 FIXED 5.458 ADD Cxx

Summary of comments

26. Apple, CanWISP, CEA, Cogeco, DSA, Federated Wireless, HPE, Intel, Joint Filers, PIA, PIAC, Qualcomm, SaskTel, Shaw, TekSavvy, WBA, Wi-Fi Alliance and Xplornet supported ISED's proposal to allow licence-exempt RLAN use in the 5925-7125 MHz band under technical conditions that support coexistence, including the introduction of footnote Cxx in the CTFA.
27. The Joint Filers, Shaw, WBA and Wi-Fi Alliance commented that licence-exempt technologies such as Wi-Fi play a key role in delivering that connectivity by allowing multiple devices in a household to be connected at the same time. The commenters further noted that opening the full 6 GHz band for licence-exempt use will enable less expensive means to deliver broadband connectivity to more households and allow consumers to have an improved broadband experience. Furthermore, the commenters noted that use cases such as virtual reality, augmented reality, high-density deployments and the uptake of IoT applications are driving the need for significant new licence-exempt spectrum. The Joint Filers, Shaw and WBA stated further that the global pandemic has thrown into focus the critical need for households to have robust broadband connections. In their reply comments, Shaw noted that it is witnessing significant congestion in the 2.4 GHz and 5 GHz bands.
28. CanWISP, Shaw and Xplornet noted that the proposed designation of the entire band as licence-exempt harmonizes the equipment ecosystem in Canada with the larger U.S. market, which will ensure that Canadian consumers have access to the most innovative consumer devices and services available. They also expressed views that making this band available for Wi-Fi would be beneficial for serving rural and remote areas. CanWISP noted that rural fixed wireless operators could use this spectrum to offer consumer home Internet speeds well above 100 Mbps, anticipating the next generation of basic service objectives.
29. While CEA, CSSIF, GVF, Inmarsat and SES did not oppose the introduction of licence-exempt use in the 5925-7125 MHz, they stated that ISED must ensure that its decision does not result in unacceptable interference to satellite services and electrical utility backhaul systems in the band. CSSIF and SES suggested aligning the proposed footnote's wording more closely to the existing footnote C39A that applies to similar licence-exempt devices in the adjacent 5725-5825 MHz band. DND and the Province of Ontario expressed overall concerns with potential harmful interference to their licensed systems from licence-exempt RLANs if they were to operate without stringent interference mitigation mechanisms.
30. The Joint Filers, Shaw and WBA noted that opening the full band for licence-exempt operation will help with spreading the RLAN radio energy throughout the 6 GHz band, which will have the beneficial effect of aiding coexistence with the incumbent services. In their reply comments, Cogeco and DSA supported this view, noting that it would help mitigate interference concerns.

31. As noted in the Consultation, agenda item 1.2 of the 2023 World Radiocommunication Conference (WRC-23) will consider identifying spectrum for International Mobile Telecommunications (IMT) to support commercial mobile broadband services in the 6425-7025 MHz band for Europe, Africa and the Middle East, and in the 7025-7125 MHz band globally. BCE, Ericsson, Huawei, MIG, Nokia, Québecor, Rogers, Samsung and TELUS supported licence-exempt use in the 5925-6425 MHz band. However, these respondents recommended that ISED delay the decision for the 6425-7125 MHz band until after WRC-23. While SaskTel agreed in general to the introduction of licence-exempt RLAN use in the 6 GHz band on the condition that licence-exempt devices do not cause harmful interference to licensed systems, they recommended that ISED defer the decision for licence-exempt use in the 7025-7125 MHz band until after the WRC-23.

32. The commenters who proposed waiting for the outcome of WRC-23 before making 6425-7125 MHz available for RLAN were of the view that the ecosystem for licensed commercial mobile services and licence-exempt use would be better understood in a few years. They also noted that 500 MHz of spectrum would be sufficient to alleviate congestion of Wi-Fi traffic in the 5 GHz band—particularly when additional improvements could be applied to enhance the overall performance of Wi-Fi applications—and that allocating the full 1200 MHz of 6 GHz spectrum to licence-exempt operation would create an imbalance between the spectrum available for licensed commercial mobile and licence-exempt use. Furthermore, they stated that allowing licence-exempt operation throughout the 6 GHz band will make the possibility of later allowing licensed mobile operations in the upper part of the band more difficult as devices proliferate and become ubiquitous. In its reply comments, Rogers argued that there is insufficient evidence to support the need for more than 500 MHz of mid-band licence-exempt spectrum and disagreed with Wi-Fi Alliance’s 2017 Wi-Fi spectrum requirements study after comparing its predictions with 2020 Canadian residential Wi-Fi usage during the pandemic. Further, Rogers proposed that there are mechanisms that allow spectrum sharing between fixed services and licensed mobile services, as well as with other services, citing HPE’s views that the developments in the electronic news gathering (ENG) market make sharing with licensed 4G/5G a realistic outcome.

33. On the proposal to defer the decision for the 6425-7125 MHz band until after WRC-23, Apple, Joint Filers, WBA and some of the satellite stakeholders did not support setting aside part of the band for IMT services. CSSIF commented that any proposal to add an IMT/mobile allocation is outside the scope of the current consultation. In their view, consideration of this proposal would require a separate consultation. DSA, GVF, SES and Telesat concurred with CSSIF’s view. GVF further noted that ISED lacks a record on which to base the introduction of IMT in this range. SES similarly noted that the WRC-23 agenda item is limited to ITU Region 1 and it is premature for countries in Region 2, such as Canada, to consider the identification of IMT in any part of this range during the current ITU study cycle. Apple, CanWISP and Shaw were of the view that allowing licence-exempt use in the 6 GHz band would provide an appropriate balance between licensed and licence-exempt use, especially with the upcoming 3500 MHz, 3800 MHz and millimetre wave auctions for commercial mobile broadband services. In its reply comments, TekSavvy noted that the exclusively licensed spectrum held by

Canadian mobile network operators is among the highest in industrialized economies. Furthermore, it argued that coexistence with current 6 GHz incumbents and IMT services would be very difficult if the spectrum were to be used for commercial mobile systems.

34. In the reply comments, CanWISP, Cogeco, DSA, TekSavvy, Shaw, Wi-Fi Alliance and Xplornet reiterated their opposition to waiting for the WRC-23 decision, citing concerns about coexistence of incumbents and IMT services, which would result in disruptions and significant relocation costs to incumbent services, as well as concerns that mobile performance would be limited due to significantly reduced permitted power levels needed for coexistence if incumbents were not relocated. Wi-Fi Alliance argued that waiting for the WRC-23 decision would run counter to the goal of international harmonization, given the trend towards the use of this spectrum for Wi-Fi applications in other countries and the view that it would foster regulatory uncertainty for the 6 GHz incumbent services, as well as impede technological advances for RLAN technologies and use cases. CanWISP indicated in its reply comments that reserving the upper portion of the 6 GHz band for a potential future auction would create an artificial and unnecessary spectrum scarcity, slowing down the pace of innovation and competition in the provision of broadband services across Canada, especially in underserved areas, which would further impede the bridging of the digital divide.

Discussion

35. With the majority of respondents supporting ISED's proposal to allow licence-exempt RLAN use in the full 5925-7125 MHz band, ISED continues to be of the view that releasing the entire 1200 MHz of spectrum will immediately unleash the full potential of the 6 GHz RLAN technology. Moreover, making the full 6 GHz band available for licence-exempt use as soon as possible will maximize the social and economic benefits that Canadians will derive from this spectrum.

36. The increased demand for broadband Internet and, consequently, the spectrum required to support Wi-Fi enabled devices and applications for remote working and virtual learning, has been demonstrated over the past year with the COVID-19 pandemic. Notably, current Wi-Fi capacity and speeds are the main constraint, even in homes with high-speed wireline connections, when a family unit is utilizing numerous Wi-Fi enabled devices. This discrepancy will only become more amplified as available wireline speeds increase. The additional licence-exempt spectrum will provide the improvements needed in Wi-Fi throughput for homes and businesses and reduce congestion between neighbours living in close proximity. The additional spectrum will also support the ability for small wireless Internet service providers to provide cost-effective enhanced broadband connectivity in rural and remote areas.

37. Over 60% of mobile data traffic is offloaded on Wi-Fi technology today and this is expected to increase in the coming years. With the release of the full 6 GHz band for licence-exempt use, existing and emerging commercial mobile operators will be able to increase the ability to offload data traffic from exclusively-licensed bands to this newly released licence-exempt band. Such cost savings could be passed on to consumers in the form of lower prices.

38. A number of countries in the Americas and in Asia have released or are consulting to release spectrum for licence-exempt use in the 6 GHz band. As such, RLAN ecosystems for the full 1200 MHz are already available and Canadians will be able to take advantage of economies of scale.

39. ISED has performed detailed technical analysis on the coexistence of RLANs with existing users. Furthermore, ISED has reviewed and analyzed various technical studies submitted in other jurisdictions with similar incumbent users. ISED is of the view that, under the proposed licence-exempt approach, existing licensed users such as public safety agencies, major telecom operators for backhaul connectivity, satellite service providers and broadcasters will be able to continue to operate and grow in this band. Conversely, if ISED were to consider making some of this spectrum available for commercial mobile services, sharing of the band with the existing users would likely no longer be possible, and displacement of some or all of existing users would be required.

40. ISED has noted the arguments cited by some respondents towards their position for releasing only the 5925-6425 MHz band and withholding the release of the 6425-7125 MHz band in case international momentum develops in favour of commercial mobile use of the 6425-7125 MHz band following WRC-23. However, ISED is of the view that delaying the release of the spectrum would not meet the policy objectives outlined in section 2, as it would hinder access to affordable broadband services for Canadians in rural and urban areas and would negatively impact the opportunities for innovation. Furthermore, ISED notes that through the upcoming 3500 MHz auction and planned 3800 MHz and millimetre wave auctions, significant amounts of spectrum will be made available for licensed commercial mobile services.

41. With regards to CSSIF and SES's suggested alignment of the proposed text for footnote Cxx with the existing footnote C39A, ISED notes that both parties clarified that licence-exempt RLAN applications must comply with the policy and technical framework established by ISED. ISED's proposed text reflects these requirements to a greater extent than the current text for footnote C39A, which only mentions using the corresponding band in accordance with the established maximum power levels.

Decisions

D1

ISED will allow licence-exempt RLAN use in the 5925-7125 MHz band.

D2

ISED will update the CTFA as shown in table 1 by adding footnote Cxx.

7. Introduction of licence-exempt operation in the 6 GHz band

42. In the Consultation, ISED proposed to allow the operation of the following three classes of RLANs:

- standard-power RLANs (both indoor and outdoor) with automated frequency coordination (AFC) control
- low-power indoor-only RLANs without AFC control
- very low-power RLANs (both indoor and outdoor) without AFC control

Standard-power RLAN operation

43. **Operating bands:** In the Consultation, ISED sought comments on the introduction of standard-power access points (APs) for indoor and outdoor operation under the control of an AFC system in the 5925-6425 MHz sub-band, the 6425-6525 MHz sub-band, and the 6525-6875 MHz sub-band. Furthermore, comments were specifically sought on the equipment availability of standard-power RLAN devices for 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.

Summary of comments

44. Apple, CanWISP, CEA, Cogeco, DSA, Federated Wireless, HPE, Intel, Joint Filers, PIA, PIAC, Qualcomm, RABC, Shaw, TekSavvy, WBA, Wi-Fi Alliance and Xplornet supported indoor and outdoor standard-power RLAN operation under the control of an AFC system in the 5925-6875 MHz band. The majority of these respondents supported the proposal to allow access to the additional 100 MHz of spectrum in the 6425-6525 MHz sub-band, noting that it would bring benefits of spectrum contiguity and larger channel bandwidths, which would further help to mitigate the risk of interference to incumbent services by spreading the energy over a wider portion of the band. According to the Joint Filers, no barriers would be created from a technology or manufacturing perspective for standard-power devices in the 6425-6525 MHz sub-band in Canada. Furthermore, RABC noted that Mexico is also looking at allowing standard-power RLAN operations in the 6425-6525 MHz sub-band.

45. GVF and Inmarsat urged ISED to limit operation in the 5925-6875 MHz to indoor-only applications at lower power levels equivalent to those adopted by the EU/CEPT in this band. SES also asked ISED to limit RLAN deployments to low-power indoor-only operations, similar to Europe and Korea. The Province of Ontario raised concerns that the risk of interference to incumbents from outdoor standard-power RLAN operation would be higher, due to the lack of building wall attenuation.

46. BCE, Huawei, MIG, Québecor, Rogers and TELUS, who advocated for introducing licence-exempt use only in the lower 500 MHz of the 6 GHz band (as discussed in section 6), supported standard-power operation only in the 5925-6425 MHz band. Inmarsat indicated that the 6425-6525 MHz sub-band is used to provide feeder links for its mobile-satellite service network.

47. DSA, Federated Wireless, HPE, Intel, WBA and Xplornet expressed support for extending standard-power RLAN operation up to 6930 MHz. In its reply comments, Xplornet noted that this spectrum can be leveraged immediately by rural broadband providers without compromising any future potential need for this spectrum by broadcast auxiliary services. Apple, PIAC, WBA and Wi-Fi Alliance urged ISED to allow standard-power RLAN operation in the entire 1200 MHz of the band.

Discussion

48. Standard-power RLANs will support improved broadband Internet access for a large number of users in both residential and commercial contexts, including in rural and remote areas. Standard-power RLANs will also serve existing and emerging high-bandwidth applications in outdoor and indoor high-density venues, such as industrial areas, sporting arenas, and campuses. Given these benefits and the support from numerous stakeholders, ISED will allow the introduction of standard-power APs for indoor and outdoor operation under the control of an AFC system in the 5925-6875 MHz band.

49. ISED also notes that the comments from equipment manufacturers and those involved in developing the AFC for the U.S. market indicated confidence that no barriers would be created from a technology or manufacturing perspective for standard-power devices in the 6425-6525 MHz sub-band in Canada. Furthermore, the regulatory spectrum authority in Mexico is also considering to extend standard-power RLAN operation into the 6425-6525 MHz sub-band, which would broaden the ecosystem for this sub-band.

50. In response to commenters who proposed that ISED extend standard-power RLAN operation further, into the 6875-6930 MHz frequency range, ISED will not be permitting the operation of standard-power RLANs in this frequency range at this time to allow flexibility for additional spectrum for broadcasting auxiliary services if needed in the future. ISED will monitor trends in broadcasting auxiliary services and, depending on the uptake, ISED could reconsider its decision to allow standard-power RLANs in the 6875-6930 MHz range through a future technical consultation.

51. In response to some commenters who suggested extending standard-power RLAN operation to the 6930-7125 MHz band, ISED is of the view that, given the nomadic nature of ENG systems, providing protection through an AFC would unduly complicate the AFC system model, as their location and time of operation is determined by the demands to provide the communications infrastructure for breaking news as and when it occurs. At this time, ISED is of the view that releasing the 950 MHz in the 5925-6875 MHz frequency range for standard-power operation will be more than adequate to encourage broad uptake of standard-power RLAN deployment in the band.

52. To enable sharing of spectrum while protecting incumbents, the standard-power devices will be required to operate under the control of an AFC system, which will further impose suitable restrictions on the operation of the standard-power devices. Power limits placed on the operation of standard-power devices (as discussed below) together with the requirement to operate only in conjunction with an AFC system will ensure adequate protection of incumbents.

Decision

D3

Standard-power RLANs under the control of an AFC system will be permitted to operate on a licence-exempt basis in the 5925-6875 MHz frequency range.

53. **Operating power levels:** ISED sought comments on the operating power levels identified in the Consultation. ISED proposed that the standard-power devices would be subject to a maximum permitted e.i.r.p. of 36 dBm per channel, a maximum permitted power spectral density of 23 dBm/MHz and that standard-power RLAN operation would only be permitted on specific frequency channels, with e.i.r.p. dictated by the AFC system. Moreover, to address coexistence with fixed-satellite services (FSS), ISED sought comments to limit the standard-power RLAN's maximum e.i.r.p. to 125 mW per channel at elevation angles above 30 degrees over the horizon.

Summary of comments

54. Respondents generally supported a maximum permitted e.i.r.p. of 36 dBm and a maximum permitted power spectral density of 23 dBm/MHz as these limits would enable data rates in the Gbps range and increased coverage, while still minimizing potential interference to incumbent systems. However, some respondents proposed alternate values for the operating power limits.

55. CanWISP, Rogers, TELUS, Wi-Fi Alliance and Xplornet recommended a higher maximum e.i.r.p. limit, for example, the value of 42 dBm that is currently being considered in the U.S., while keeping the same power spectral density limit of 23 dBm/MHz. Notably, to better serve rural communities, Xplornet argued that a maximum e.i.r.p. of 42 dBm would better position this spectrum for rural broadband applications by providing increased coverage and throughput capabilities. CanWISP, supported by Rogers, proposed a power spectral density limit of 60 W/MHz (48 dBm/MHz) in low population areas, mainly achieved through directional antennas. Rogers further noted that appropriate protection for licensed fixed service incumbents could be achieved by mandating the requirement for professional installations for rural and remote deployments and larger exclusion zones under the control of an AFC system. Rogers recommended adopting a lightly-licensed regime for higher power rural Fixed Wireless Access (FWA) operations in the 6 GHz band, should ISED ultimately adopt the CanWISP proposal.

56. TELUS argued that better indoor coverage with a maximum e.i.r.p. of 42 dBm will provide a better end-user experience of broadband services. Furthermore, TELUS noted that outdoor APs would benefit from higher power to serve users at greater distances relative to indoor use. In their reply comments, TELUS noted that the higher output powers, as proposed by CanWISP and Xplornet in order to effectively serve rural communities, can only be supported in licensed bands, together with the appropriate coordination and coexistence framework that must be defined when using a licensed spectrum band. Wi-Fi Alliance proposed that ISED consider a higher e.i.r.p. limit coupled with a maximum transmit power limit (e.g. 30 dBm) specifically for fixed point-to-point RLANs, and allow

them to employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power, thereby encouraging the use of higher gain, highly directional antennas. It argued that a higher e.i.r.p. operating limit, combined with a limited transmit power, would allow additional flexibility for wireless Internet service providers, relieving congestion in, and building on the success of, point-to-point applications in the 5 GHz band.

57. Conversely, GVF and Inmarsat urged ISED to limit power levels to those adopted by the EU/CEPT for indoor-only applications, specifically a maximum e.i.r.p. of 23 dBm and power spectral density of 10 dBm/MHz. Both respondents argued that lower power values would reduce the risk of harmful interference to existing and future FSS operations. With the EU adopting these power limits, GVF suggested that there should be an established equipment ecosystem with ample economies of scale. CSSIF recommended that ISED review the records and decisions in jurisdictions beyond the U.S. to determine appropriate e.i.r.p and power spectral density limits for licence-exempt devices, particularly for standard-power devices operating outdoors.

58. Intel, Joint Filers, RABC, Rogers and TELUS supported the use of a vertical elevation mask limiting the outdoor standard-power RLAN's maximum e.i.r.p. to 125 mW at elevation angles above 30 degrees above the horizon, as a means to protect satellite systems operating in the band. CSSIF, DND and those RABC commenters representing the satellite industry, proposed to reduce the angle at which this limit would be applied to no greater than 15 degrees to protect the portion of the geostationary arc visible from Canadian latitudes. Rogers was of the view that, should a 30 degree elevation mask (for outdoor devices only) not be found to provide sufficient protection for incumbent FSS operations in limited parts of Canada, (e.g. extreme west or east, or the Far North), then additional protection measures should only apply to those geographic areas.

59. In response to comments from satellite operators expressing interference concerns with a vertical elevation mask of 30 degrees and above, CanWISP and TekSavvy proposed that ISED consider requiring AFC systems to include spatial exclusion zones in northern remote areas to address satellite operators' concerns. In contrast, Wi-Fi Alliance was of the view that any vertical mask is unnecessary since there are significant separation distances between RLAN devices and space-based satellite receivers, which provide ample isolation to mitigate against harmful interference. Wi-Fi Alliance noted that imposing an exclusion zone requirement would create additional burden to the introduction of standard-power RLAN in Canada.

Discussion

60. ISED is of the view that the co-existence between licensed users and standard-power RLANs can be achieved through appropriate technical requirements imposed on standard-power APs, which include appropriate power limits. On the proposals to increase the e.i.r.p. and power spectral density limits, ISED believes that the proposed e.i.r.p. and power spectral density limits will provide an appropriate balance between the flexibility of RLAN operation and the protection of other RLAN systems and

licensed users. For this reason, ISED intends to adopt the originally proposed maximum permitted e.i.r.p. of 36 dBm and maximum permitted power spectral density of 23 dBm/MHz.

61. Moreover, harmonizing Canadian rules to the maximum extent possible with those being implemented in the U.S. and other international markets will bring economies of scale and support faster deployment in Canada. ISED will, however, continue to monitor U.S. and other international developments on RLAN power limits, and should experience in Canada and other jurisdictions show that increases in power levels beyond the initial Canadian levels indicated here would be consistent with ensuring protection of incumbent licensed users, updates could be made through future revisions of applicable technical standards without revisiting this decision.

62. For the protection of FSS satellite-based receivers from standard-power devices operating outdoors, the effectiveness of a vertical elevation mask limiting the standard-power RLAN's maximum e.i.r.p. to 125 mW at elevation angles above 30 degrees above the horizon has already been demonstrated through experience in other bands. As noted by both TELUS and Shaw, the [5150-5250 MHz band](#) has allowed high-power outdoor devices subject to the same power and e.i.r.p. elevation mask limitation as proposed for the 6 GHz band. In fact, as the limit set for 5150-5250 MHz is intended to protect satellites operating in low-Earth orbit (LEO) much closer to the Earth's surface (approximately 1,400 km altitude in the 5150-5250 MHz band compared to 36,000 km altitude in the 6 GHz band), the absence of interference complaints received by ISED in the 5150-5250 MHz band suggests that establishing an elevation angle requirement with Canada's most populated southern areas in mind has been effective. ISED's studies confirm that a more stringent vertical mask would not be necessary. As Shaw highlighted, Canada has a significantly lower population density compared to the U.S. Aggregate interference into satellite beams covering Canada is expected to be less than those covering the U.S. or Europe due to Canada's lower population density and consequently, lower Wi-Fi deployment density. ISED disagrees with Wi-Fi Alliance's proposal to eliminate the elevation mask as this is one of the mitigation measures to reduce the risk of interference to satellite operations in the band.

63. ISED intends to adopt a vertical elevation mask limiting the standard-power RLAN's maximum e.i.r.p. to 125 mW at elevation angles above 30 degrees above the horizon.

64. **Other operating parameters:** BCE and SES were of the view that the proposed rules for standard-power RLANs are incomplete since they did not include the technical requirements for client devices communicating with standard-power APs. Moreover, if standard-power operation is allowed, BCE urged ISED to mandate the standard-power client devices to operate only under control of a standard-power AP at the same power limits as those adopted by the FCC (i.e. maximum e.i.r.p. of 30 dBm and PSD of 17 dBm/MHz). SES further noted FCC's limits for client devices do not include a vertical elevation mask, which leaves them able to emit up to 30 dBm upwards towards access points and potentially the geostationary arc.

65. While the Consultation did not touch upon allowing mobile operation, Apple suggested modelling regulations on the FCC's AFC rules and allowing mobile operation. HPE also proposed to allow for mobile standard-power operation under AFC control, which is currently being considered by the FCC, as it would address important applications without adding complexity to the AFC systems.

66. Federated Wireless, Intel, Joint Filers, Qualcomm, RABC, Sasktel, Sony, Rogers, TELUS and Wi-Fi Alliance proposed that standard-power RLANs associated with an AFC that ceases operation must either transfer to another operational AFC or shut down. Rogers also suggested that ISED implement measures to mitigate grey market or non-compliant standard-power devices not following AFC rules.

Discussion

67. ISED agrees with stakeholders that technical requirements such as power limits for client devices are necessary. These technical requirements will be defined when developing the applicable technical standards, including a requirement to operate only under the control of a standard-power AP.

68. ISED does not see a need to impose a vertical elevation mask for client devices as these are generally mobile, operate more in the receive mode than the transmit mode and are generally designed to use as little power as necessary.

69. In relation to mobile operation, ISED does not propose to permit mobile operation in the 6 GHz band at this time. ISED will continue to monitor international developments and intends to revise the applicable technical standards to enable such use should a significant ecosystem develop.

70. ISED will address the case of standard-power RLANs associated with an AFC that ceases operation in the course of developing the applicable technical standards. In general, non-compliant standard-power devices will be dealt with through ISED's compliance and enforcement program.

Low-power indoor-only RLAN operation

71. In the Consultation, ISED sought comments on the introduction of low-power indoor only APs throughout the frequency range 5925-7125 MHz, subject to a maximum permitted e.i.r.p. of 30 dBm per channel and a maximum permitted power spectral density of 5 dBm/MHz. Furthermore, the low-power RLAN devices would be required to implement a contention-based protocol feature (e.g. listen-before-talk).

Summary of comments

72. Commenters expressed a high degree of consensus in favour of permitting low-power, indoor-only devices. The majority of commenters who supported the introduction of licence-exempt operation in the full 1200 MHz of the 6 GHz band also supported the introduction of low-power, indoor-only use

throughout the 5925-7125 MHz frequency range. Those commenters who advocated for introducing licence-exempt use only in the lower 500 MHz of the 6 GHz band (as discussed in section 6), supported low-power operation only in the 5925-6425 MHz band.

73. The majority of respondents supported the proposed maximum e.i.r.p. of 30 dBm and power spectral density of 5 dBm/MHz for low-power APs. Some stakeholders advocated for higher e.i.r.p. and power spectral density limits, arguing that they would provide significant benefits to end users while not adversely increasing the risk of interference to incumbents. Apple proposed increasing the power spectral density limit to 10 dBm/MHz, while a number of commenters, including DSA, HP, Intel, Qualcomm, Québecor, Rogers, Shaw and Wi-Fi Alliance, proposed 8 dBm/MHz. Furthermore, BCE suggested that ISED monitor the pending FCC decision in the Further Notice of Proposed Rulemaking (FNPRM) on increasing the maximum e.i.r.p. to 33 dBm and the power spectral density to 8 dBm/MHz for low-power indoor only RLAN devices before finalizing these limits for Canada.

74. GVF indicated concerns with commenters urging higher RLAN power limits, which they argued could eventually cause harmful interference into fixed-satellite service receivers in space, particularly if the indoor-only restriction is not met in practice. In the reply comments, Rogers opposed increasing the power spectral density limit to 10 dBm/MHz since this power level could ultimately increase the risk of interference to fixed service stations.

75. While supportive of introducing low-power indoor RLAN operation, BCE, Federated Wireless, GVF, Province of Ontario, Rogers, SaskTel and TELUS raised concerns with the possibility of interference to fixed service stations in some conditions. Some of these stakeholders made reference to CTIA's field measurement results submitted to the FCC. Federated Wireless proposed the use of the AFC system for low-power indoor devices to mitigate the risks of interference. GVF and the Province of Ontario expressed concern on how compliance with the indoor-only restriction could be ensured. The Province of Ontario noted that limiting the output power of low-power devices to 250 mW (24 dBm) would help mitigate the risk of receiving interference from these devices if used outside despite the indoor-only restriction.

76. Most stakeholders also raised the need to adopt power limits not only for APs, but also for client devices. Specifically, SES noted that the FCC imposed more stringent e.i.r.p. and power spectral density limits for client devices (24 dBm and -1 dBm/MHz, respectively). It recommended that ISED adopt these limits in order to harmonize indoor equipment ecosystems between Canada and the U.S.

77. The commenters generally supported ISED's proposal to require contention-based protocols for low-power indoor operation. However, TELUS, supported by Rogers in their reply comments, argued that while contention-based protocols would perform well at facilitating coexistence amongst licence-exempt devices, they would be ineffective in protecting licensed incumbents since licence-exempt devices cannot detect low-power fixed service signals near a victim receiver.

Discussion

78. Considering that the majority of respondents were in favour of allowing low-power indoor-only APs in the 1200 MHz of the 6 GHz band, ISED will permit low-power indoor APs to operate in the 5925-7125 MHz band.
79. On the proposals to allow a higher e.i.r.p. of 33 dBm and a power spectral density of 8 dBm/MHz, while these higher limits could offer more flexibility in accommodating for a larger variety of use cases, ISED's proposals of 30 dBm and 5 dBm/MHz are in line with the current U.S. rules that will be implemented broadly in low-power APs coming to market. Furthermore, the proposed limits provide an appropriate balance between competing concerns. As a result, ISED intends to adopt the following operating power limits for APs: maximum permitted e.i.r.p. of 30 dBm per channel, and maximum permitted power spectral density of 5 dBm/MHz.
80. ISED will continue to monitor the discussions in the U.S. concerning increases to the operating power limits. ISED will also consider changes applied in broader markets, and may modify the technical rules as necessary to maximize the utility of the Wi-Fi ecosystem while ensuring protection of incumbent licensed users, following the initial deployment and use of low-power indoor APs. Any potential future changes in power levels would be done in consultation with stakeholders through future revisions of applicable technical standards.
81. Concerning the protection of incumbent fixed services, ISED has performed an assessment of various studies examining the coexistence of low-power indoor APs with licensed services (submitted to the FCC related to the 6 GHz NPRM 18-147, as well as the conclusions made by the FCC in Report and Order (FCC-20-51)), as well as regulatory proceedings in other countries. ISED notes that some studies concluded that there is a risk of potential interference. However, ISED finds that these studies focused on a number of worst-case geometrical configurations occurring simultaneously and the use of simplified assumptions, which are unlikely to happen in practice. ISED concluded that low-power indoor RLANs can coexist with incumbent licensed services in the 6 GHz band with the appropriate limits in place, thus supporting ISED's goal of enabling technologies and approaches that will support the increased sharing of spectrum.
82. If, in a rare case, interference were to occur to a licensed system, ISED has robust tools and processes that it can use to investigate and identify the source of such interference and require the undertaking of corrective measures to resolve the issue.
83. ISED is of the view that adequate protection of FSS systems in particular would be ensured through the establishment of relatively low power limits and requiring indoor-only operation. To ensure that APs will be restricted to indoor operation, ISED will establish rules such as requiring that APs not be weather-proofed, requiring integrated antennas in the APs and prohibiting the device capability to attach to external antennas. These details will be addressed following the Decision, in the course of

developing the applicable technical standards in consultation with stakeholders.

84. ISED agrees with stakeholders that power limits for client devices are necessary. ISED will aim to generally harmonize with rules adopted by the FCC for indoor-only operation of low-power RLAN devices, including the APs and client devices. Following the Decision, ISED will be determining these details while developing the technical rules and standards for RLAN devices in consultation with stakeholders, including the RABC.

85. In response to some commenters, including Rogers and TELUS, who raised the concern that contention-based protocols will not be able to protect fixed services, ISED's studies have shown that the risk of interference to outdoor fixed services from low-power indoor devices is negligible. Contention-based protocols are intended to permit fairness in spectrum sharing among users and thus prevent RLAN devices from transmitting continuously or at heavy-duty cycles, which will contribute to mitigating interference, for both licence-exempt users and licensed users. Therefore, low-power devices will be required to use a contention-based protocol as one of the measures to mitigate interference.

86. Concerning the suggestion by Federated Wireless to require low-power indoor APs to operate under the control of an AFC system, ISED does not believe it is necessary given that coexistence with licensed services is already achievable with the technical measures proposed. Furthermore, requiring low-power indoor APs to operate under the control of an AFC system will add complexity and increase the cost of low-power indoor RLAN operation.

Decision

D4

Low-power indoor-only RLANs will be permitted to operate on a licence-exempt basis across the 5925-7125 MHz band with the use of a contention-based protocol (e.g. listen-before-talk).

Very low-power RLAN operation

87. ISED also sought comments on the introduction of very low-power RLAN devices throughout the frequency range 5925-7125 MHz for indoor and outdoor use, subject to a maximum permitted e.i.r.p. of 14 dBm per channel and a maximum permitted power spectral density of -8 dBm/MHz. Furthermore, the very low-power RLAN devices would be required to operate with the use of a contention-based protocol (e.g. listen-before-talk).

Summary of comments

88. Apple, CCSA, CEA, Cogeco, DSA, PIAC, RABC, Teksavvy, WBA, Wi-Fi Alliance and Xplornet supported the proposals for very low-power operation throughout the frequency range 5925-7125 MHz for indoor and outdoor use. The commenters who generally advocated for introducing licence-exempt use only in the lower 500 MHz of the 6 GHz band, as discussed in section 6, reiterated

their concerns with allowing very low-power operation across the full band. In the same vein, SaskTel supported very low-power operation in the frequency range 5925-7025 MHz for indoor and outdoor use. Apple, BCE, CSSIF, DSA, GVF, HPE, Huawei, Inmarsat, Intel, Joint Filers, MIG, Qualcomm, Québecor, RABC, Rogers, SaskTel, SES, Shaw, TELUS and Wi-Fi Alliance raised specific concerns and/or recommendations with respect to very low-power operation, including operating power levels and potential interference, described in the subsequent paragraphs.

89. Overall, respondents supported a maximum e.i.r.p. power limit of 14 dBm, noting that the value aligns with the FCC's FNPRM, as well as with the rules for very low-power devices in Europe and South Korea. MIG noted interference concerns from outdoor very low-power operation to incumbent systems and expressed the view that the adoption of the lowest power level of 4 dBm would reduce co-channel interference risk, while also noting that the final decision of the FCC is still not known. BCE and TELUS urged ISED to wait until an FCC decision is made on the power limits of very low-power RLANs.

90. For the power spectral density limit, there was a divergence between the proposed value of -8 dBm/MHz and other suggested values by stakeholders. Values of 10 dBm/MHz were proposed by Apple, -5 dBm/MHz proposed by the Joint Filers, and 1 dBm/MHz proposed by DSA, HPE, Intel and Wi-Fi Alliance. Some commenters noted the difficulty of maintaining a reliable link at -8 dBm/MHz, especially for devices operating on 20 MHz channels. This limit would therefore, in their view, stifle the rapidly evolving 6 GHz very low-power ecosystem and could preclude innovative use cases, such as wearables. The Joint Filers noted that the most likely channel bandwidth for very low-power operations will be 80 MHz, requiring a power spectral density of -5 dBm/MHz. DSA, HPE, Intel and Wi-Fi Alliance suggested an alternative of 1 dBm/MHz, which would align with the technical rules in Europe and South Korea; they argued that this would be the most advantageous for very low-power devices since it would enable a wider variety of innovative applications. In the reply comments, Rogers opposed the higher power spectral density limits proposed by some commenters, arguing that the potential aggregate interference from indoor and outdoor usage presents a risk to licensed operations. HPE, Intel and Wi-Fi Alliance suggested the use of transmit power control (TPC), which is a well-established mitigation factor in the 5 GHz band, to further reduce interference risk from very low-power devices.

91. BCE, MIG, RABC, Rogers and TELUS raised concerns about the potential for interference to fixed service stations in certain scenarios by very low-power devices, particularly from those operating outdoors. These commenters urged ISED to consider lower e.i.r.p. and power spectral density limits to reduce interference from very low-power outdoor devices, and to evaluate the results of various studies submitted to the FCC. They further indicated that the results showed a possible impact on the reliability of fixed microwave links from the emissions of very low-power devices at the proposed limits in the FCC's FNPRM. CSSIF suggested that ISED review decisions in other jurisdictions when determining the e.i.r.p. and power spectral density limits. CSSIF, GVF and SES also recommended that ISED limit the number of very low-power devices transmitting simultaneously in a channel to mitigate the risk of aggregate interference. GVF, Inmarsat and SES expressed general concerns about outdoor licence-

exempt operation, and suggested that ISED only allow very low-power indoor operation to protect FSS uplinks.

92. Qualcomm and Shaw, supported by Rogers and 5GAA in the reply comments, encouraged ISED to take measures to protect dedicated short-range communications (DSRC) and cellular vehicle-to-everything (C-V2X) receivers operating in an adjacent band from the out-of-band emissions of very low-power RLANs operating inside vehicles. 5GAA supported Qualcomm's recommendations of two measures to protect DSRC and C-V2X receivers: preventing very low-power devices from accessing the lowermost channels of the U-NII-5 band (5925-6425 MHz) and imposing a more stringent power spectral density limit on very low-power operation in the 5925-6425 MHz sub-band such that it would encourage licence-exempt use of channels of 160 MHz or wider.

93. The respondents generally supported the use of a contention-based protocol. RABC and TELUS were of the view that the protocol would be useful for facilitating coexistence amongst licence-exempt devices, but also noted that such protocols would be ineffective in protecting licensed incumbents, such as fixed services, from interference.

Discussion

94. Next generation short-range wireless applications such as high-speed tethering, mobile augmented reality, in-vehicle entertainment and personal healthcare applications require devices that operate at very low power. Such applications could be facilitated through devices that will be characterized by a prolonged battery life, lower cost, and compact size. As such, allowing both indoor and outdoor very low-power operation in the entire 6 GHz band will give more flexibility and enable innovative use cases. As supported by most stakeholders, ISED will permit both indoor and outdoor very low-power operation with the use of a contention-based protocol in the entire 6 GHz band, to allow Canadians to fully benefit from the different uses cases associated with these types of devices. ISED reiterates that contention-based protocols are intended to permit fairness in spectrum sharing among users and thus prevent RLAN devices from transmitting continuously or at heavy-duty cycles, which will contribute to mitigating interference, for both licence-exempt users and licensed users.

95. The operating power limits for very low-power devices have been decided in some countries including Brazil, Europe and South Korea. Brazil's regulator Anatel has allowed an e.i.r.p. limit of 17 dBm and a power spectral density limit of -8 dBm/MHz for very low-power devices. South Korea's regulator has allowed a maximum e.i.r.p. of 14 dBm, with maximum power spectral density limit of 1 dBm/MHz for channels less than 20 MHz, -2 dBm/MHz for channels less than 40 MHz, -5 dBm/MHz for channels less than 80 MHz, and -8 dBm/MHz for channels less than 160 MHz. European regulations allow a maximum e.i.r.p. of 14 dBm, with maximum power spectral density of 1 dBm/MHz, with 10 dBm/MHz for narrowband channels. The decisions are still pending in some other countries including the U.S., where the FCC is consulting on the e.i.r.p. limit in the range of 4 to 14 dBm for a 160 MHz channel and a power spectrum density limit of -8 dBm/MHz. To enable Canadians to fully

benefit from the emerging products by leveraging economies of scale, ISED intends to harmonize the power limits for very low-power operation in the 6 GHz band with those used in other markets.

96. Based on its studies, including analyses from other countries, ISED is of the view that very low-power devices operating indoors or outdoors will not cause harmful interference to incumbents such as satellite and fixed service licensees at the proposed operating power limits. ISED has also noted the proposal by some stakeholders to use transmit power control in conjunction with the operating power limits to protect existing incumbent services. ISED agrees that transmit power control in very low-power devices would further help to mitigate the risk of harmful interference, by managing the operating power levels more efficiently.

97. ISED notes that, after the closing of the Consultation, Broadcom, Cisco, Facebook, Intel and Qualcomm provided a joint proposal to the FCC on measures to enable the use of very low-power RLAN devices while protecting DSRC and C-V2X receivers operating below 5925 MHz. The proposal included an out-of-band emission level of -37 dBm/MHz at 5925 MHz and very low-power devices must prioritize operation in channels above 6105 MHz. ISED believes it is important that services in adjacent bands be protected from very low-power operation in the 6 GHz band.

98. As the ecosystem for very low-power RLAN devices is still developing, ISED will address the details of very low-power operation, including the operating power limits, the inclusion of transmit power control, the out-of-band emission limits requirements and other details following the Decision, through the development of applicable technical standards.

Decision

D5

Indoor and outdoor very low-power RLAN devices will be permitted to operate on a licence-exempt basis across the 5925-7125 MHz band with the use of a contention-based protocol (e.g. listen-before-talk).

8. Automated frequency coordination system

99. The Consultation proposed that, in order to enable sharing of spectrum while protecting existing incumbent users, standard-power RLANs would be required to operate under the control of an AFC system approved by ISED. ISED sought comments on:

- the harmonization of the AFC system model with the U.S.
- implementation considerations
- the approach to coexistence calculations and interference protection
- general matters related to AFC implementation

Harmonization with the U.S.

100. In the Consultation, ISED sought comments on its proposal to introduce a simple centralized database-driven AFC system model, similar to that defined by the FCC for the U.S. market, to control the operation of standard-power APs.

Summary of comments

101. In general, there was broad support from the respondents, specifically from Apple, CanWISP, DSA, Federated Wireless, HPE, Intel, Joint Filers, PIA, Qualcomm, Québecor, RABC, RED, Rogers, Shaw, TELUS, Wi-Fi Alliance and Xplornet, towards harmonizing with the U.S. AFC system model. These commenters noted that harmonization would bring significant advantages for the Canadian market by creating economies of scope and scale to produce a robust equipment market, minimizing the Canadian AFC system development time thus increasing speed-to-market, and facilitating international border coordination with the use of common AFC systems. Rogers, Shaw and TELUS also emphasized prioritizing Canadian-specific needs; for example, Rogers emphasized the differences in incumbency in Canada and the U.S. and the need to protect U.S. TV auxiliary users in the U-NII-6 band (6425-6525 MHz) near the border.

102. Intel and the Joint Filers suggested that ISED enable both centralized (where the protection calculations would be done in a limited number of central databases), decentralized (where the protection calculations could, for example, also be done in individual standard-power APs) and hybrid architectures, towards ensuring a vibrant AFC ecosystem and continued innovation. HPE suggested that ISED should adopt a flexible set of rules that will allow different AFC implementations to accommodate a wide range of use cases and deployment scenarios.

103. CSSIF, GVF, Inmarsat and SES emphasized that AFC systems must be required to communicate with each other to account for aggregate emissions. These commenters suggested active and real-time control of the number of allowed RLAN devices, with an allowed maximum number of simultaneous transmitters initially set by ISED, and possibly adjusted over time in response to actual observed aggregate interference. In its reply comments, Rogers opposed the proposal by these satellite stakeholders, noting that most of the uplink interference to satellites of concern to these satellite operators will be arriving from devices located in the U.S., particularly from aggregated emissions of licence-exempt devices in the extreme east and west and the Far North of the U.S. Furthermore, Rogers noted that significant challenges for estimating aggregate interference must be solved, including how any AFC system will know about the decisions made by all the standard-power devices across North America regarding the channel frequencies chosen at any time. Rogers did not believe that Canada should unilaterally introduce an aggregate interference requirement for Canadian AFC administrators, especially considering the relatively limited emission from Canadian standard-power operations. In their view, any implementation of aggregate noise calculations should first be implemented into U.S. AFC systems before mandating such a requirement in Canada.

104. Some commenters provided input on other aspects of the AFC system; for example, TELUS emphasized the importance of an industry-wide standard protocol for communication between AFC and RLANs.

Discussion

105. As noted in the Consultation and supported by the majority of respondents, significant benefits are anticipated if Canada adopts an AFC system model that is harmonized to the maximum extent possible with the centralized AFC system model being implemented in the U.S. and other international markets. Allowing the freedom to choose between centralized or distributed AFC models or a combination of these models as proposed by some of the respondents could benefit innovation and market differentiation. Given the size of the Canadian market, ISED does not anticipate that these options will be designed specifically for Canada. Further, from ISED's perspective, the centralized AFC system model provides the benefits of consistency, simplicity and ease of interference resolution. Therefore, ISED intends to develop the rules and standards for operation of a centralized AFC system. ISED will continue to monitor developments in this domain and will make modifications and improvements accordingly, in subsequent evolution of the AFC system architecture.

106. In response to comments proposing that AFC systems account for aggregate emissions from standard-power RLAN devices, ISED's studies do not indicate that aggregate interference is a sufficient cause for concern to justify the increase in AFC system complexity that would result from mandating AFC-AFC synchronization and the development of a new Canada-only approach to protection and channel availability calculations. In the case of fixed service receivers, a few devices closest to the antenna direction would dominate any risk of interference. For fixed-satellite services, the impact from aggregate emissions in the U.S. will be much bigger in comparison to the emissions from Canada. ISED is of the view that requiring the AFC system model to take into consideration AFC-AFC synchronization and the proposal to set a maximum for the number of simultaneous transmitters, so as to address the risks posed from aggregate interference, will result in an increase in complexity of AFC system implementations that will be a deterrent to attract automated frequency coordination system administrators (AFCSAs) to operate in Canada. Therefore, ISED declines the proposal to adopt an aggregate emissions approach.

107. An industry-wide standard for the communication protocol between AFC and RLANs will benefit the implementation of the standard-power RLAN ecosystem. Since a variety of technologies (e.g. Wi-Fi 6E, 5G NR-U, others) will be operating in the band, ISED anticipates that any needed standardization of device-to-database communication protocols will be addressed through voluntary standards processes, for example via the multi-stakeholder groups in the U.S. that are currently addressing the AFC system implementation details. The market will then drive the uptake of one or more such protocols. Not regulating a specific protocol to be used will also allow the protocol(s) to evolve with changes in the technology.

Implementation considerations

108. In the Consultation, ISED sought comments on key implementation considerations such as obtaining incumbent information from ISED's Spectrum Management System (SMS) database; the required periodicity of AFC updates of this information; and data to be obtained from standard-power APs.

Summary of comments

109. In regard to obtaining incumbent information, commenters were of the view that the existing data elements collected in ISED's SMS database are adequate to support AFC protection contour calculations. Rogers, Shaw, TELUS and Wi-Fi Alliance provided input relating to the importance of ensuring the quality of data within ISED's SMS so that AFC system calculations provide correct results, though there were differing views as to the division of responsibility in ensuring this accuracy between ISED and the incumbent licensees. A number of other suggestions were provided regarding the best means to access ISED's data, protection of personal information and indemnification of AFC system operators from errors resulting from deliberately false information that may be entered into ISED's database. All respondents supported ISED's proposal that AFC databases be required to update the information they obtain from ISED on at least a daily basis.

110. Both DND and the Province of Ontario raised concerns that the release of their stations' information to spectrum sharing database administrators would result in this information entering the public domain when this information, although not classified, is currently "non-disclosed" to the public. DND suggested blocking the associated geographical areas related to assignment of their locations and frequencies in the AFC systems. Shaw noted that the AFC system does not release incumbent information to standard-power devices that connect to it, and proposed that alternative arrangements should be made for the AFC system to ensure the security of the technical data for public safety and military sites.

111. In regard to the information that standard-power APs are required to provide to AFC systems in order to enable the required computations, a number of views and detailed proposals were provided on different data elements. In general, there was a wide variation in views on the needed level of information that should be transmitted by APs. It varied from as few as two elements suggested by some commenters to detailed lists of data fields provided by other commenters.

Discussion

112. As proposed by ISED and supported by many of the commenters, the incumbent data in ISED's SMS database (for example, operating frequency, bandwidth, the make and model of the antenna in use, antenna polarization, antenna height and receiver locations) will be the primary source of incumbent information used by AFC systems to calculate exclusion zones. The necessary licensee data will be made available in electronic format.

113. It is imperative that licensees review their data quality in the SMS database to ensure that their data is adequate, accurate and up to date. Licensees whose data is incomplete, faulty or outdated will risk not obtaining sufficient protection from licence-exempt standard-power APs, if the AFC system has to rely on poor quality of licensee data. The provision of accurate and current data remains, as always, the responsibility of the licensee under the terms of their licence and as such any interference resulting from incorrect licence information will be the sole responsibility of the licensee.

114. In Canada, the 6 GHz band is used by both commercial and government licensees. The licensee information for some government uses, such as public safety, is not disclosed in ISED's SMS database. In the process of developing the technical rules and standards following the Decision, ISED will work collaboratively with these stakeholders to determine the way forward to ensure the security of the information for this class of licensees, including the requirement that frequency assignments and associated geographical locations are not publicly disclosed.

115. Licensee data changes much less frequently than on a daily basis. As such, a minimum of a daily update of the AFC system with licensee data from ISED's SMS database, and a corresponding update of computed exclusion zones, will be adequate to ensure that the incumbent licensee's data is current.

116. ISED is of the view that only the minimum necessary information that is required to perform the interference calculations should be required by APs to an AFC system. It will be important to harmonize this information with other jurisdictions, including the U.S., in order to ensure Canadian access to the broad 6 GHz equipment ecosystem.

Approach to coexistence calculations and interference protection

117. ISED sought comments on its proposal that fixed service systems (i.e. fixed microwave and one-way fixed point-to-point television auxiliary stations) and radio astronomy sites would be protected from the risk of harmful interference by standard-power devices using an AFC system.

118. ISED also sought comments on harmonizing the interference protection criteria used to compute the exclusion zone, wherever possible, with those used by the U.S. This includes the use of an interference-to-noise (I/N) objective of -6 dB. The computation of exclusion zones would be based on the interference contributions from individual interferers and would aim to minimize interference to both co-channel and adjacent channel transmissions.

Summary of comments

119. BCE, CEA, DND, DSA, Federated Wireless, HPE, Intel, Joint Filers, PIA, Qualcomm, Québecor, RABC, RED, Rogers, SaskTel, Shaw, Sony, TekSavvy, TELUS, Wi-Fi Alliance and Xplornet supported ISED's proposal to require AFC systems to protect licensed fixed service and radio astronomy sites from standard-power APs. The respondents generally agreed with the proposed model of exclusion zones defined by the incumbent protection criteria stated in the Consultation.

120. Apple, Rogers and TELUS raised concerns about the risk of interference should a standard-power AP be operated aboard a drone and supported prohibiting the use of standard-power APs in drones. If drone operation is permitted, Rogers was of the view that adequate protection mechanisms would need to be put in place.

121. As previously noted, CSSIF, GVF and SES were of the view that AFC systems should be used to protect satellite-based receivers by taking into account the aggregated emissions from standard-power RLAN devices. The commenters suggested active and real-time control of the number of allowed RLAN devices, with an allowed maximum number of simultaneous transmitters in a given frequency channel initially set by ISED, and this number could be possibly adjusted over time in response to actual observed aggregate interference.

122. DSA, Federated Wireless, HPE, Intel, Qualcomm, Rogers, Shaw, Sony and Wi-Fi Alliance generally supported aligning with the U.S. rules for determining exclusion zones wherever possible, including the use of an I/N of -6 dB. However, some of the commenters did not agree with the proposed I/N of -6 dB. Comments from BCE and TekSavvy expressed concerns that the FCC rules do not offer sufficient protection to incumbents. SaskTel and TELUS suggested that ISED should consider an I/N of -10 dB, particularly near urban areas, because of the higher risk of aggregate interference from multiple standard-power RLAN systems that are likely to be in operation. TELUS expressed concerns that the interference risk to the fixed service main beams could be considerable, depending on the relative heights of the fixed service antennas and the standard-power AP antennas. On the other hand, the Joint Filers were of the view that an I/N of -6 dB is more conservative than necessary to protect against harmful interference. In the reply comments, Rogers disagreed with the proposal to use an I/N value of -10 dB, arguing that it was overly restrictive, and noted that the Frequency Coordination System Association (FCSA) uses an I/N of -6 dB for its interference analysis calculations. Furthermore, Rogers stated that choosing an I/N of -10 dB could complicate coexistence and coordination at the U.S. border, since the FCC has adopted the same I/N value of -6 dB proposed by ISED.

123. Some respondents, including Rogers and TELUS, provided additional comments related to interference resolution. TELUS suggested that ISED must be involved if fixed service stations experience interference despite standard-power access points being under control of an AFC system. Rogers proposed that ISED should have a process to resolve interference claims; for example, by ensuring that ISED's regional offices are appropriately resourced to quickly assist operators with any investigations into interference to licensed services. Rogers further proposed that ISED ensure that the

protection mechanisms in the AFC system and ISED processes to resolve interference could potentially evolve over time, based on feedback from Canadian licensed operators.

Discussion

124. ISED will require AFC systems to protect licensed fixed service stations and radioastronomy sites and will take the impact from potential drone operation into account in the development of the applicable technical standards.

125. As discussed in previous paragraphs, ISED's studies do not indicate that aggregate interference is a sufficient cause for concern to justify the increase in AFC system complexity that would result from mandating a new Canada-only approach to protection of satellite systems. The vertical elevation mask limiting the standard-power RLAN's maximum e.i.r.p. to 125 mW per channel at elevation angles above 30 degrees above the horizon will provide the required protection for these services.

126. Among commenters who are operating incumbent systems, views were divided on whether -10 dB or -6 dB is a more appropriate criterion. ISED notes that the difference between the two proposed levels amounts to only 0.5 dB of difference in the potential effect on an incumbent system's link budget and therefore any resulting impact on incumbent system reliability, even in the worst case, would be small. Furthermore, ISED notes that the protection provided by the I/N criterion of -6 dB is equivalent to the typical protection threshold used for the coexistence between point-to-point systems.

127. Based on these considerations, ISED is of the view that an I/N criterion of -6 dB will adequately protect incumbents in this band. ISED intends to harmonize the interference protection criteria, wherever possible, to those used by the U.S. and, given that the harmonized I/N criterion is expected to be protective, there is no reason to depart from harmonization in this case. Therefore, ISED intends to require AFC systems to implement an I/N criterion of -6 dB.

128. The AFC systems managing the channels that standard-power devices can operate on are expected to sufficiently protect incumbent services in the band from harmful interference based on this approach. Should the services experience harmful interference, ISED is prepared to respond quickly to address such interference reports.

Decisions

D6

ISED will adopt an AFC system that is practical, consistent with the Canadian public interest and harmonized with the U.S. to the maximum extent possible.

D7

Canadian AFC rules will include a requirement to protect licensed fixed service systems and radioastronomy sites.

General matters related to automated frequency coordination implementation

129. In the Consultation, ISED sought input on additional matters related to AFC implementation concerning privacy and security, business models, exit strategies, the agreement with AFC administrators, the designation of multiple AFC systems, incremental implementation, exploiting synergies and any additional considerations.

Summary of comments

130. Commenters provided a variety of input concerning privacy and security. The comments included proposing that the AFC system security and privacy aspects be addressed through discussions with the RABC and that the AFC system be hosted in Canada and operate according to Canadian security and privacy laws. Commenters also proposed that ISED should give high priority to the security and privacy requirements in the implementation of AFC systems, particularly since some of the fixed services are used by government and public safety organizations.

131. Commenters provided detailed comments on the variety of business models and approaches that are anticipated to be used by AFCs as well as some new possibilities that might develop. In addition, a wide variety of views and considerations were offered on how to address, from both a proactive and reactive perspective, the exit from the Canadian market of an approved AFC, if this should come to pass.

132. A plethora of comments were received for the approach and conditions for agreements between ISED and AFC operators. Commenters suggested allowing audit, investigation and enforcement rights to licensed users or ISED on their behalf, and also provided their views on the hosting of the AFC system in Canada or in other jurisdictions. Suggestions were also provided for improvements to the wording of the terms of the agreement, relating to set-up, ongoing operation and terminating the agreement with ISED.

133. In relation to the potential for ISED to designate multiple AFCs, BCE, CanWISP, DSA, Federated Wireless, Intel, Joint Filers, Qualcomm, Québecor, RABC, Rogers, RED, Sony, Shaw, TELUS and Wi-Fi Alliance supported designating multiple AFCs and generally indicated that competition amongst AFC administrators should provide the necessary motivation and opportunity for

innovation and increased consumer choice. On the other hand, TekSavvy raised several concerns noting its opposition to having multiple AFCs and indicated that it would prefer that ISED designate a single centralized AFC operator for Canada. Some commenters recommended that ISED consider alternative approaches in the absence of an approved AFC administrator. Xplornet suggested that at least two of the AFC systems have a nationwide coverage and always be running to guarantee efficient use of the 6 GHz spectrum, even if it meant having an ISED-run AFC system as a last resort.

134. On ISED's proposal to allow incremental AFC system implementations by covering limited geographic areas and/or limited portions of the available spectrum, BCE, CanWISP, CEA, DSA, Federated Wireless, PIA, Québecor, Shaw, TekSavvy, Wi-Fi Alliance and Xplornet expressed their support for the incremental implementation of AFC systems in Canada. These commenters noted several benefits with incremental implementation of an AFC system, including reducing barriers to entry for AFC system providers, managing the challenges of starting up and sustaining an AFC-driven business ecosystem, allowing AFCSAs to de-risk the AFC implementation, and facilitating an innovative and competitive AFC marketplace in Canada. Conversely, CommScope, HPE, Intel, Joint Filers, Qualcomm, RED and Rogers opposed or expressed concerns that incremental implementation may make the provider's business case more challenging, thereby negatively impacting adoption of an AFC system in Canada.

135. In relation to exploiting synergies between the database-driven spectrum sharing models in other bands, BCE, CanWISP, CCSA, CEA, CommScope, Federated Wireless, PIA, Québecor, Rogers, Shaw, RED, Wi-Fi Alliance and Xplornet broadly supported the alignment of technical and administrative requirements of AFC systems across different bands and uses, provided the system model would not deter the harmonization of the AFC system with that being implemented in the U.S. and other international markets. The respondents noted that exploiting synergies has the potential to accelerate the development and deployment of spectrum sharing database systems, reduce costs and stimulate innovation. Respondents suggested that, to the extent that ISED is contemplating a regulatory regime to encourage any synergies, it should be lightweight, allow for maximum flexibility and be related to the administrative rules and procedures rather than technical rules, as the latter may differ based on the current use of the band and the proposed approaches to share the band.

136. On other issues raised, PIA proposed that public safety agencies should be able to register their devices with AFC operators to obtain a dynamically higher priority to access the spectrum due to their lifesaving mission. In the reply comments, Rogers argued that ISED should reject such a proposal, since national networks using licensed spectrum already provide priority access for emergency services. Finally, Rogers proposed that fixed service users should be able to download fixed services data from the AFC system to check validity.

Discussion

137. ISED agrees with the commenters' views that AFC system security requirements be developed in consultation with the stakeholder, including the RABC. ISED will establish procedural and technical requirements developed via the consultation through eligibility requirements and contract terms applicable to AFCSAs.

138. ISED appreciates the detailed suggestions provided on potential business models, considerations relating to the potential exit of AFCs once approved and the sample agreement text, and will consider this input when finalizing its technical rules and agreements.

139. The designation of multiple AFCSAs in Canada will promote a competitive market for the users. Ensuring at least two of the AFC systems have nationwide coverage and are always running in order to support continuity of service would be the optimal operating situation. Differences in performance and quality that could arise from multiple AFC systems running simultaneously would motivate competitive market forces to decide the success of the best AFC systems, with users migrating to those systems. ISED is confident that allowing multiple commercially operated AFC systems will generate sufficient interest from stakeholders to deploy and deliver consistent quality of service to support the proliferation of standard-power RLANs. To support a sustainable ecosystem in Canada for standard-power RLAN operation under the control of an AFC, ISED will allow the designation of multiple commercial AFC systems for operation in Canada.

140. ISED will monitor the uptake of AFC system services in the 6 GHz band and will accordingly determine the subsequent steps with respect to ensuring access to standard-power RLAN use, if needed. As a last resort, ISED could take the initiative to pursue alternate options, such as itself providing an AFC system to facilitate the deployment of standard-power RLANs in Canada.

141. ISED will support flexible implementation of AFC systems in Canada, as best suited for developing a sustainable and competitive market for standard-power RLAN operation. ISED has also noted the concerns (such as boundary issues) and suggestions from stakeholders related to the technical aspects and challenges of the AFC system implementation. ISED will take into consideration the technical issues raised when developing the applicable technical standards for AFC system operation, following the Decision.

142. Database-driven spectrum sharing methods generally have broad common objectives, primarily protecting incumbent users from harmful interference, and enabling the use of the band by a new set of users through identifying the channels that are available for use by them. ISED recognizes that the details of the technical rules may differ based on the current use of the band and the proposed approaches to share the band, since in any given band, the incumbent users and the new users could have different characteristics and requirements. At a high level, leveraging commonalities in the bands employing database-driven spectrum sharing mechanisms can provide ISED with opportunities to optimize administrative processes and associated spectrum management tools. While doing so, ISED

will be cognizant of the need to allow flexibility and innovation in the use of respective bands, the importance of accounting for differences in technical and business aspects, and the need to prioritize harmonization with U.S. and international ecosystems.

143. On the issue of priority access, ISED appreciates that public safety agencies could benefit from obtaining a higher priority from AFC systems to access spectrum for standard-power RLAN use. However, licence-exempt systems in general operate on a best-effort access basis that would make it very difficult to deliver the degree of reliability that would be implied by a promise of priority access. In addition, from the regulatory perspective, such an approach would represent a significant departure from the principle of equal access to licence-exempt spectrum. Therefore, ISED does not intend to mandate priority access.

144. With respect to the comments proposing that the AFCSA provide access to fixed service datasets being used by the AFC to check validity, ISED does not expect any concerns with the incumbent licensee data used by AFCSAs as it will be obtained from ISED's SMS, and ISED's evaluation and review processes for AFCSAs will be rigorous. ISED reiterates that it is in the best interest of incumbent licensees to ensure that the data in the ISED SMS database is adequate, accurate and up to date.

9. Next steps

145. As a result of the decisions made in this document, ISED will update the CTFA. Furthermore, in consultation with the RABC and other stakeholders, ISED will develop the applicable technical standards for the equipment described above and the standards and procedures related to AFC systems and AFCSAs.

10. Obtaining copies

146. All spectrum-related documents referred to in this paper are available on ISED's [Spectrum Management and Telecommunications](#) website.

147. For further information concerning the process outlined in this document or related matters, contact:

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