

Submission of the 6 GHz Mobile Interest Group (MIG) in response to:

*Canada Gazette, Part I, December 5, 2020, Notice No. SMSE-014-20:
Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band*

January 19th, 2021

EXECUTIVE SUMMARY

The Mobile Interest Group (MIG) is pleased to provide a joint-contribution in response to the Innovation, Science and Economic Development Canada (“ISED”) consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz band SMSE-014-20 – November, 2020 (“Consultation”). The MIG consists of the following Canadian operators:

- BCE Inc.
- Rogers Communications Canada Inc.
- Saskatchewan Telecommunications
- Telus Communications Inc.

and manufacturers:

- Ericsson Canada Inc.
- Huawei Technologies Canada Co., Ltd.
- Nokia
- Samsung Electronics Canada Inc.

MIG supports ISED in its commitment that all Canadian consumers, businesses and public institutions have access to the latest wireless telecommunications services. A robust competitive wireless industry drives the adoption and use of digital technologies and enhances the productivity of the Canadian economy. A strong wireless sector will help relaunch Canada’s economy from COVID by supporting new wireless applications in vertical industries such as healthcare, agriculture, education, manufacturing, and transportation. 5G has arrived and it is driving the global adoption of wireless broadband services and will provide a catalyst in Canada on the road to recovery.

Spectrum is the oxygen that fuels the wireless industry and additional spectrum for licensed and licence-exempt use enables providers to increase network capacity to meet traffic demands and supports the provision of next-generation wireless technologies. The development and deployment of new wireless services is essential to Canada maintaining its position as a global leader in innovation and will keep Canada at the forefront of digital development and adoption through its world-class wireless infrastructure.

Canadian consumers benefit from the economies of scale that result when manufacturers produce equipment for global markets resulting in access to the latest device ecosystem. By ensuring that the spectrum being made available reflects global trends, Canada will continue to position itself to benefit from the next generation of smartphones and other advanced wireless devices.

With respect to the 6 GHz band, MIG urges ISED to consider the following:

- The global trend is to authorize licence-exempt services in the band 5925-6425 MHz, while there is no apparent trend for the band 6425-7125 MHz.
- WRC-23 Agenda Item 1.2 is studying the viability of an IMT identification in the band 6425-7025 MHz in ITU Region 1 and in the band 7025-7125 MHz globally.

- Mobile service has primary allocation for the entire band 5925-7125 MHz globally in the radio regulations.
- The benefits associated with the propagation characteristics of 6 GHz (i.e. balanced coverage and capacity similar to 3.5 / 3.8 GHz) make it an ideal band for IMT.
- The 6 GHz band is one of the few remaining opportunities for sufficient mid-band spectrum to support relentless, ever-growing capacity requirements – including large, contiguous channels best suited for 5G, IMT-2020 technologies and beyond.
- 5G's significant positive financial and social impacts on Canada and Canadians.

Recommendation 1: MIG recommends that ISED postpone the decision for the upper portion 6425-7125 MHz until post-WRC-23 when the ecosystem for licensed and licence-exempt is well understood. More specifically, Canada could align with the U.S. in the short-term to enable licence-exempt operation in the 500 MHz of the lower 6 GHz band from 5925-6425 MHz while deferring decisions for the upper 6 GHz (6425-7125 MHz) until post-WRC-23.

Allowing licence-exempt operation throughout the 6 GHz band will make the possibility of a later reversal to allow licensed operations in the upper part of the band more difficult as devices proliferate and become ubiquitous.

Recommendation 2: MIG urges ISED continue applying its principle of technology neutrality in making a decision on the 6 GHz band noting Recommendation 1.

Recommendation 3: MIG recommends that ISED carefully consider the protection of incumbent services, both current and future deployments, in making the decision on 6 GHz, particularly, co-existence of licence-exempt and licensed services. The importance of incumbent fixed services cannot be underestimated for users including mobile service providers, utilities, and public safety users.

Recommendation 4: MIG recommends that ISED carefully monitor and assess the implementation of AFC in the U.S. and other international markets, as well as how effective the AFC system proves to be with respect to the protection of incumbent services. This information will be valuable to properly assess and define AFC requirements, as well as standards and the certification process suitable for the Canadian market.

Recommendation 5: MIG recommends that ISED carefully consider the characteristics of the Canadian incumbent systems as well as the interference characteristics of Radio Local Area Network (RLAN) interference characteristics for defining appropriate protection criteria for use by an AFC system. Appropriate maximum power limits for unlicensed devices not operating under control of an AFC system should also be considered.

Recommendation 6: MIG urges ISED to consider the market trends, user behaviours and the balance in the amount of spectrum available for licence-exempt and licensed services in making the decision on the 6 GHz band.

Members of the MIG would be pleased to work further with ISED and other industry stakeholders to assist in this important planning process. Please note that MIG actively participated in the development of the Radio Advisory Board of Canada (RABC) response. In addition to our input to the RABC submission, below please find a detailed discussion and recommendations on issues pertinent to this consultation.

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1. WHO WE ARE

The 6 GHz Mobile Interest Group (MIG) is comprised of following Canadian operators:

- BCE Inc.
- Rogers Communications Canada Inc.
- Saskatchewan Telecommunications
- Telus Communications Inc.

and manufacturers:

- Ericsson Canada Inc.
- Huawei Technologies Canada Co., Ltd.
- Nokia
- Samsung Electronics Canada Inc.

We commend ISED (the Department) for its commitment to making more mid-band spectrum available for new wireless services with this important consultation on the 6 GHz band.

2. DETAILED DISCUSSION OF RECOMMENDATIONS

We absolutely agree with ISED’s assessment that in releasing different frequency bands for various uses, ISED must consider *“factors that are specific to Canada, such as the existing uses of the band and the need to increase spectrum access in rural areas. It also considers factors such as international band allocation, the evolution of wireless technology, current and emerging technical standards, and the ecosystem for network and end-user equipment. As a result, Canadians benefit from having access to a much bigger global marketplace, economies of scale, lower prices, and timely introduction of new wireless services and devices to Canada.”*¹ Let us examine these aspects in more detail.

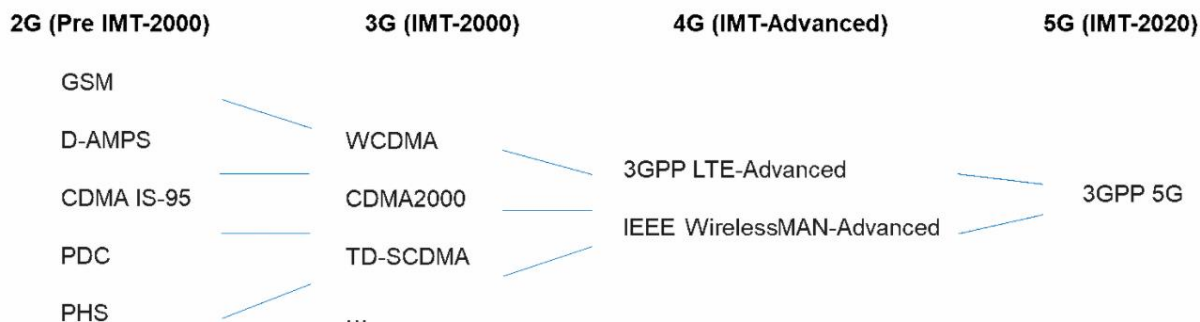
A. BENEFIT FROM HAVING ACCESS TO A MUCH BIGGER GLOBAL MARKET PLACE

The Canadian wireless industry and Canadians in general have benefited from having access to a major global ecosystem based on 3GPP global standards. 3GPP has become a global standards organization that allows countries and companies, large and small, to participate in defining standards, designing and developing commercial products on an unprecedented global scale. *“Global operation and economies of scale are key requirements for the success of mobile telecommunication systems. In order to achieve this goal, ITU-R established the concept of IMT, which includes a harmonized timeframe for future development, taking into account technical, operational, and spectrum-related aspects. Since then, ITU-R has been striving for harmonized global standards all through the process of IMT-2000 and IMT-Advanced. Today, with the global consensus on 3GPP 5G technologies as IMT-2020 standards, we are very close to reaching that goal”*²

¹ Page 1, paragraph 5, Consultation.

² <https://www.delloro.com/knowledge-center/white-papers/harmonized-itu-imt-2020-standards-of-3gpp-5g-technologies-lay-the-foundation-for-a-successful-global-ecosystem/>

FIGURE 1: ITU-R Progress toward the global harmonization of IMT technologies³



This global scale is one of the key reasons for 5G’s worldwide affordability and its incredible acceptance relative to other technologies. According to the Ericsson Mobility Report, a total of 220 million 5G subscriptions were expected by the end of 2020 and 3.5 billion by 2026⁴.

In terms of economic benefits, Qualcomm recently released a study showing some staggering numbers even with the negative effect of the COVID-19 pandemic⁵.

- *“The growth trajectory of sales enabled by 5G remains virtually unchanged, reaching \$13.1T in 2035, despite the downshift in the long-term growth trajectory of the overall global economic output caused by the pandemic”.*
- *“5G-enabled job growth is forecasted to be greater than previously expected - up from 22.3 to 22.8M over the next 15 years”.*
- *“Global 5G CAPEX and R&D is up 10.8% from last year's forecast to \$265B annually over the next 15 years”.*

One important aspect of 5G that has not been widely discussed is that 5G is seen as a key component for Canada’s fight against climate change⁶, for example:

- 5G will allow network operators to be more energy efficient on a per unit output level. Energy used by a general 5G cell site will be 8-15% of what is currently used by a similar 4G cell site. Even with a thousand-fold traffic increase over the next 10 years, the entire network’s energy consumption will be half the current level.
- 5G will enable ground-breaking use cases allowing for a more connected society and enable new technologies that contribute to reductions to our carbon footprint in various vertical industries such as autonomous vehicles or intelligent energy networks. In addition to carbon abatement, new use cases can increase the precision in monitoring the environment and combatting other forms of environmental degradation.

Some equipment manufactures also discussed 5G’s ability to meet the ever increasing traffic demands, while drastically reducing energy consumption of mobile networks, which, otherwise would increase and be unsustainable in terms of cost as well as environmental impact – this

³ Ibid

⁴ <https://www.ericsson.com/en/mobility-report>

⁵ <https://www.qualcomm.com/invention/5g/economy>

⁶ <https://www.newswire.ca/news-releases/investment-in-5g-is-key-to-canada-s-fight-against-climate-change-816111509.html>

ability is also known as “breaking the energy curve” – meaning energy consumption does not increase with the data traffic delivered as in previous mobile wireless generations⁷.

It’s evident that technologies based on 3GPP standards have become the global standard with unprecedented scale, scope and adoption. Making use of these standards will continue to have significant positive financial and social impacts on society. Therefore, MIG urges ISED to consider these aspects in making the decision on the 6 GHz band for Canada.

B. INTERNATIONAL BAND ALLOCATION

It is recommended that ISED adopt a prudent and balanced approach in making decisions for the band 5925-7125 MHz, taking into consideration the following international developments:

- USA: FCC has issued rules for unlicensed use of 5925-7125 MHz band.
- Latin America: A number of consultations are ongoing in Latam (e.g. Brazil, Argentina, Colombia, Mexico, Peru) for the entire band or only for the band 5925-6425 MHz. Chile has decided to allocate the entire band for indoor only, licence-exempt low power use.
- Europe: Licence-exempt operation is being limited to the lower part of the 6 GHz band (5925-6425 MHz). The upper part of the 6 GHz band is under discussion for IMT identification at WRC-23 (Agenda Item 1.2):
 - 6425-7025 MHz band in ITU Region 1.
 - 7025-7125 MHz band globally.
- UK: Ofcom plans to continue reviewing use of the upper 6 GHz band to determine what the optimal use may be (“Improving spectrum access for Wi-Fi Spectrum use in the 5 GHz and 6 GHz bands”, page 20, para 4.40)⁸.
- China: The Chinese Regulator supported potential IMT identification for the whole 6 GHz band (5925-7125 MHz) at WRC-19 and is expected to provide contributions towards WRC-23 AI 1.2 on this matter. China has supported identification of the whole 6 GHz band to IMT at recent ITU meetings. The 6 GHz band trials on high power macro base stations are planned for 2021.

From the preceding discussion, it would appear there is a global trend towards keeping the band 5925-6425 MHz licence-exempt, while there is no apparent trend in the band 6425-7125 MHz. The most likely explanation is significant existing use by fixed service and the prevailing WRC-23 agenda item for identification of the band 6425-7025 MHz for IMT in Region 1 (of the ITU) and the band 7025-7125 MHz globally. Noting that there is an allocation to the mobile service in the Radio Regulations across the entire 5925-7125 MHz band, MIG would encourage

⁷ <https://www.ericsson.com/en/about-us/sustainability-and-corporate-responsibility/environment/product-energy-performance>

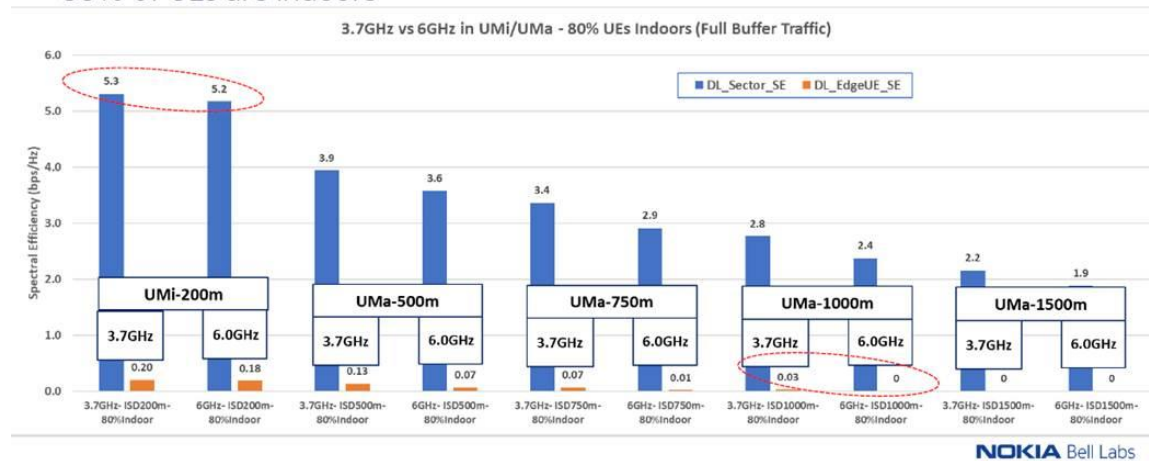
⁸ Improving spectrum access for Wi-Fi Spectrum use in the 5 GHz and 6 GHz bands - “Our decisions in this statement are with regards to the proposals set out in the January 2020 consultation to open the lower 6 GHz band. By opening access to an additional 500 MHz we are increasing the number of channels available to support growth and innovation, with a more efficient use of the bandwidth available as a result of the new Wi-Fi 6 standard. We will continue to review use of the upper 6 GHz band to determine what the optimal use may be.” https://www.ofcom.org.uk/data/assets/pdf_file/0036/198927/6ghz-statement.pdf

the Department to follow suit with a similar allocation in the Canadian Table of Frequency Allocations and postpone the decision on use of the 6425-7125 MHz band.

C. THE EVOLUTION OF WIRELESS TECHNOLOGY

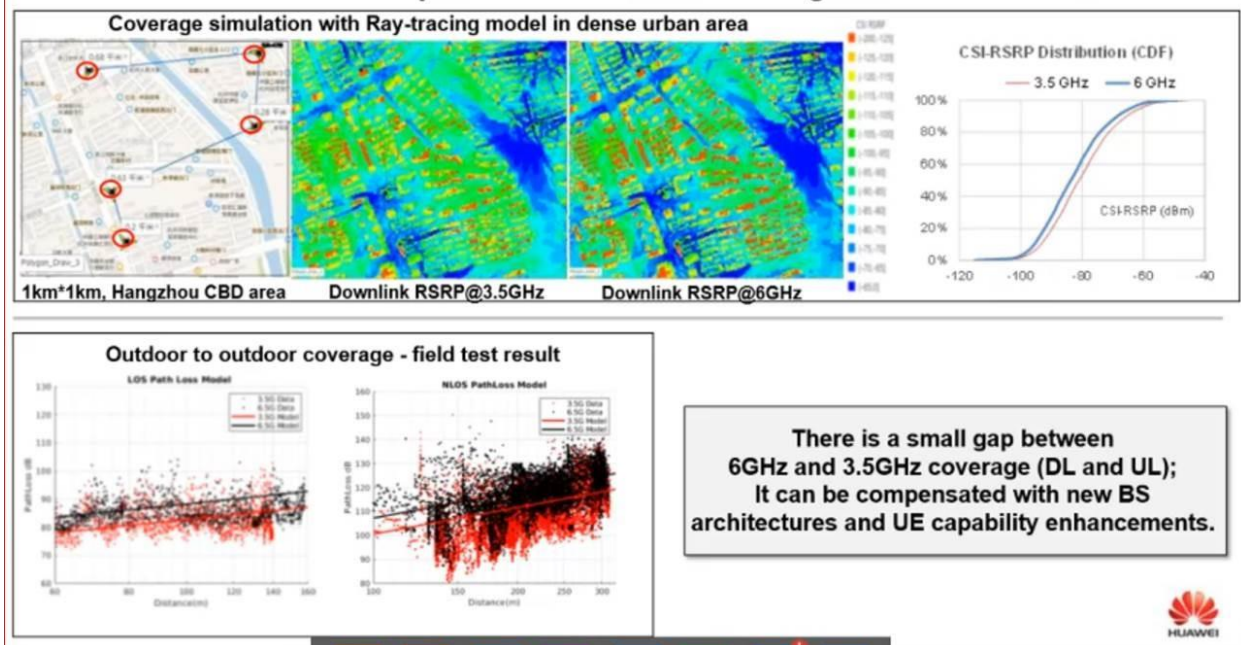
Mid-band spectrum is a vital component of universal 5G connectivity. Besides the 3.3-4.2 GHz band, the 6 GHz band would be the only mid-band spectrum for IMT. Studies from Nokia Bell Labs, reproduced below, have shown that comparable spectrum efficiency is achievable between 3.5 GHz and 6 GHz, assuming similar inter site distance and transmit power for the two bands and considering technological evolution to compensate for the propagation loss at higher frequencies.

Performance Comparison – 3.7GHz vs 6GHz 80% of UEs are indoors



Similar conclusions are drawn in studies from Huawei, including field test results, as shown below. The comparable performance of IMT systems at 6 GHz and 3.5 or 3.8 GHz frequency ranges illustrates how valuable spectrum at 6 GHz is for IMT.

6 GHz IMT licensed band provides wide area coverage as 3.5 GHz band



The above simulations and analysis clearly identify the benefits associated with the propagation characteristics of 6 GHz (i.e. balanced coverage and capacity similar to 3.5 / 3.8 GHz making it an ideal band for IMT). In addition to the 3.3-4.2 GHz band, 6 GHz is one of the few remaining opportunities for sufficient mid-band spectrum to support relentless, ever-growing capacity requirements – including large, contiguous channels best suited for 5G, IMT-2020 technologies and beyond.

Recommendation 1: MIG recommends that ISED postpone the decision for the upper portion 6425-7125 MHz until post-WRC-23 when the ecosystem for licensed and licence-exempt is well understood. More specifically, Canada could align with the U.S. in the short-term to enable licence-exempt operation in the lower 6 GHz, 5925-6425 MHz while deferring decisions for the upper 6 GHz (6425-7125 MHz) until post-WRC-23.

Allowing licence-exempt operation throughout the 6 GHz band will make the possibility of a later reversal to allow licensed operations in the upper part of the band more difficult as devices proliferate and become ubiquitous.

D. CURRENT AND EMERGING TECHNICAL STANDARDS, AND THE ECOSYSTEM FOR NETWORK AND END-USER EQUIPMENT

3GPP-based unlicensed technologies have standards currently under development⁹. 5G NR-U equipment ecosystems for low-power and standard power will be leveraged by 3GPP band n96 covering the 5925-7125 MHz spectrum range for the U.S. market. NR-U core requirements for both UE and BS are formally finalized for 3GPP Rel-16; there are still open issues related to wideband operation and capabilities.

3GPP will discuss in early 2021 the need for a new 3GPP band for NR-U operation in the 5925-6425 GHz band, according to European regulations for unlicensed operation in this band¹⁰. Another alternative for the 5925-6425 GHz band is updating the existing 3GPP band n96 with appropriate network signaling. This work should be completed in the 3GPP Rel-17 time frame. 5G NR-U equipment is expected to be available by 2H2021 or 2022.

It is worth noting that 3GPP has approved the creation of a Work Item placeholder for 5G NR licensed operation in the 6 GHz band¹¹. This Work Item should address the upper part of the 6 GHz band (6425-7125 MHz) for Europe and Russia, and the whole 6 GHz band (5925-7125 MHz) for China. As usual, 3GPP work will start only after some relevant regulation is approved.

Recommendation 2: MIG urges that ISED continue applying its principle of technology neutrality in making a decision on the 6 GHz band noting Recommendation 1.

E. EXISTING USES OF THE BAND

MIG concurs with ISED's description of incumbent services in section "6. Current use of the 6 GHz band in Canada" in the Consultation: fixed, fixed satellite, astronomy and other services. MIG would like to reiterate the importance of the 6 GHz band for microwave point-to-point long-haul applications – which is vital for rural areas for several users: mobile service providers, utilities and public safety users. The importance and usage of 6 GHz and the potential challenges with the introduction of licence-exempt service in the 6 GHz are highlighted in the Ericsson Microwave Outlook, Issue October 2020¹². Particularly:

“Interference from unlicensed use can cause reduced throughput and, in the worst case, complete outage of a licensed microwave backhaul link. Microwave Analytics tools can be used to indicate interference as the root cause of a link problem. But the time it takes to find the interference source and resolve the issue is essential. There are concerns that this could take days or even weeks. In theory, the AFC is a promising approach to avoid interference, but its accuracy and reliability should be proven before being relied

⁹ 3GPP Technical Specification Group Radio Access Network; NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone (Release 16), 3GPP TS 38.101-1 V16.5.0 (2020-09), (NR operating bands in Table 5.2-1 lists NR band class n96 covering the entire 6 GHz band – 5925 to 7125 MHz). It should be noted that n96 is applicable in the USA only subject to FCC Report and Order [FCC20-51] as stated in Note 14 in Table 5.2-1 of 3GPP specification 38.101-1 V16.5.0 (2020-09).

¹⁰ 3GPP work item ([RP-202116](#)) placeholder has been approved in the 3GPP TSG RAN Meeting #89e for European lower-6 GHz (5925-6425 MHz) unlicensed operation.

¹¹ 3GPP work item ([RP-202114](#)) placeholder has been approved in the 3GPP TSG RAN Meeting #89e for 5G NR licensed operation in the 6 GHz band (5925-7125 MHz).

¹² <https://www.ericsson.com/en/reports-and-papers/microwave-outlook/reports/2020>

on in the field. A cautious and conservative approach is recommended, as licensed backhaul is ultra-reliable and provides critical services”

Note that our concerns with AFC systems will be discussed in more detail below.

In contrast to licence-exempt service, the introduction of 5G-NR licensed services in the 6 GHz is being investigated and initial results indicate that co-existence between incumbent services and 5G NR licensed services is likely to be achieved¹³.

“Work in ITU-R is currently focused on defining the technical and operational parameters of both the incumbent users and 5G-NR at 6 GHz. The relevant ITU-R technical groups are expected to provide a stable set of incumbents’ parameters for sharing studies by June 2021. Similarly, 3GPP will develop the required studies of the characteristics of 5G-NR covering the 6 GHz range and communicate these to the ITU-R in the same timeframe. It is considered very important that future sharing studies are based on the same set of agreed typical parameters, so as to make the results directly comparable.

Nevertheless, some initial sharing studies between 5G and incumbents at 6 GHz based on typical parameter values which are currently being carried out by the IMT industry, indicate that coexistence is likely to be achieved”

In the same report, it was discussed that certain technology developments and suitable regulatory frameworks could facilitate the co-existence, including:

- Active Antenna Systems (AAS) using beamforming;
- Propagation model enhancements; and
- Lower spectral power density of 5G signals.

Recommendation 3: MIG recommends that ISED carefully consider the protection of incumbent services, both current and future deployments, in making the decision on 6 GHz, particularly, co-existence of licence-exempt and licensed services. The importance of incumbent fixed services cannot be underestimated for users including mobile service providers, utilities, and public safety users.

F. INCREASE SPECTRUM ACCESS IN RURAL AREAS

Government goals to bring a 50/10 Mbps download/upload service to rural and underserved areas will continue to drive a need for licensed fixed wireless access spectrum. In rural Canada, there is a higher degree of dependence on licensed wireless backhaul and licensed fixed wireless access, creating a continuing need for 6 GHz licensed wireless spectrum. Allocating 1200 MHz of licence-exempt spectrum in rural areas could challenge and adversely affect the deployment of licensed systems.

The concept of spectrum sharing can be easily achieved between licensed services such as between flexible use services (e.g. mobile, FWA and backhaul) and incumbent point-to-point. In previous discussions, certain technology developments and suitable regulatory frameworks could facilitate the co-existence, including Active Antenna Systems (AAS) using beamforming, propagation model enhancements and lower spectral power density of 5G signals.

¹³ <http://www.coleago.com/app/uploads/2020/09/The-6GHz-Opportunity-for-IMT-Coleago-1-Aug-2020-002.pdf>

This mode of sharing can be implemented through coordination within a given mobile operator's use or between different operators depending on the situation. Such use will:

- Provide full protection of the incumbent fixed service;
- Maximize the spectrum usage and efficiency; and
- Effectively manage the coexistence among licensed services and avoid potential of interference.

3. OTHER TECHNICAL CONSIDERATIONS

A. AUTOMATED FREQUENCY COORDINATION (AFC)

The primary function of AFC systems is to protect incumbent licensed stations (including fixed microwave stations, fixed point-to-point television auxiliary stations and radio astronomy stations) from AFC-controlled licence-exempt access point operation, together with their associated client devices. In addition, the AFC systems should be capable of facilitating resolution of incumbent interference issues that may arise from licence-exempt operation.

Role of Industry and Regulator in Definition of Requirements and Protocols for AFC

In the U.S., the FCC has published rules in its Report and Order specifying the basic requirements for AFC operation and the operation of unlicensed devices under the control of an AFC. The FCC has decided to leave the development of the specifications of the AFC – standard power unlicensed devices communication to a newly formed Multi-Stakeholder group (MSG). The MSG¹⁴ has been tasked to ensure that the FCC requirements for AFC and AFC-controlled operations are reflected in the implementations of the AFC and AFC-controlled devices. The MSG is also encouraged “to address any issues it deems appropriate regarding interference detection and mitigation in the event that an incumbent licensee believes it may be experiencing harmful interference from standard-power or indoor low-power operations. These issues would include procedures and processes that could be followed if an incumbent licensee has, or potentially has, an interference complaint”¹⁵. Work is currently underway in the Wi-Fi Alliance (WFA) to specify an AFC-standard power unlicensed device communication protocol. To cope with any issue of the communication protocol developed by WFA with respect to 3GPP NR-U operation, WinnForum has established a 3GPP AFC Special Interest Group.

¹⁴ FCC R&O FNPRM, para 175: “To ensure that all viewpoints are considered, we encourage stakeholders comprising all sectors of the 6 GHz ecosystem to participate, including: wireless service providers with interest in providing service through standard-power and indoor low power devices, RLAN and network equipment manufacturers, potential AFC operators, fixed service vendors and operators, existing 6 GHz band incumbent licensees, ultrawideband equipment manufacturers, academic experts, testing organizations, and other 6 GHz band stakeholders.”

¹⁵ FCC R&O FNPRM, para 176.

ISED, as the regulator of radio spectrum in Canada, should take an active role in the definition of requirements and compliance test setting for both AFC operation and the AFC – licence-exempt access point communication.

Additional Requirements to Enable Incumbent Interference Tracking

ISED should consider requiring that AFC-licence-exempt access point communication protocol(s) include the capability to facilitate resolving incumbent interference issues. This can be achieved by requiring licence-exempt access points to report the frequency ranges actually brought into operation to the AFC. The AFC could log this information and make it available for use by third parties, for example during incumbent interference resolution actions. In our view, this enhancement to the AFC-licence-exempt access point communication protocol(s) does not add any significant complexity or administrative cost to AFC or AFC-controlled licence-exempt access point implementation or operation.

The reports of actual spectrum usage could also be used in the estimation of aggregate interference using field data, for example, in the process of incumbent interference resolution.

As additional benefits, frequency usage reporting and logging at the AFC will also provide spectrum usage data that can be used by ISED to understand 6 GHz spectrum utilization that will enable a data driven approach to future spectrum allocation decisions.

Recommendation 4: MIG recommends that ISED carefully monitor and assess the implementation of AFC in the U.S. and other international markets, as well as how effective the AFC system proves to be with respect to the protection of incumbent services. This information will be valuable to properly assess and define AFC requirements, as well as standards and the certification process suitable for the Canadian market.

B. PROTECTION CRITERIA

A key aspect for protection of incumbent systems is the adoption of appropriate protection criteria. In particular, for the incumbent Fixed Service, FCC has adopted I/N = -6 dB as protection criterion to be used by the AFC. In the ITU-R, recommendations for the protection of Fixed Service have used a different I/N value, with I/N = -10 dB as default value^{16,17}. It is recommended that ISED consider the characteristics of the different incumbent systems as well as the interference characteristics for defining appropriate protection criteria.

C. LOW-POWER INDOOR-ONLY RLAN

Protecting Incumbent Systems from Low-Power Indoor-only RLAN Interference

The low-power RLANs are proposed to operate indoor only. To protect incumbent systems, we recommend that ISED ensure that low-power access points remain for indoor use only.

¹⁶ [Rec. ITU-R F.758-7](#), Table 5.

¹⁷ [Rec. ITU-R F.1706](#), Section 3.3.

Additionally, it is noted that there is an ongoing discussion in the U.S. regarding lower limits for total transmit power and power spectral density for low-power indoor devices, taking into account studies that have shown there is potential of interference to Fixed Service incumbents from licence-exempt access points operating even with power spectral density of 5 dBm/MHz (equivalent to 30 dBm maximum power limit for a 320 MHz maximum channel bandwidth)¹⁸. Such studies are in response to the consideration of allowing 8 dBm/MHz¹⁹.

In the event that any of the above two measures cannot be implemented, there could be a consideration of having low-power indoor RLAN to operate under control of AFC systems, if this is technically and practically feasible.

D. VERY LOW-POWER RLAN DEVICE

Protecting Incumbent Systems from Very Low-power RLAN Device Interference

The very low-power RLAN devices are proposed to operate indoors and outdoors without the use of an AFC system. There is concern that the outdoor operation of these devices increases the chances of causing harmful interference to incumbent systems.

Additionally, it is noted that there is an ongoing discussion in U.S. regarding lower limits for total transmit power and power spectral density for such devices, taking into account studies which show potential of interference to Fixed Service incumbents from licence-exempt devices operating with power spectral density as low as -8 dBm/MHz (equivalent to 14 dBm maximum power limit for a 160 MHz maximum channel bandwidth)²⁰. We understand that an adoption of a power limit for very-low power RLAN devices' operation on the lower side of the power range being consulted by the FCC, e.g., 4 dBm for 160 MHz channel (-18 dBm/MHz PSD), would minimize the potential for co-channel interference to Fixed Service incumbents. The final decision has not yet been taken by the FCC on this topic²¹.

Recommendation 5: MIG recommends that ISED carefully consider the characteristics of the Canadian incumbent systems as well as the interference characteristics of Radio Local Area Network (RLAN) interference characteristics for defining appropriate protection criteria for use by an AFC system. Appropriate maximum power limits for unlicensed devices not operating under control of an AFC system should also be considered.

In the Consultation (para 19), ISED mentions the decision²² made by Ofcom in the UK that makes the lower 6 GHz band (5925-6425 MHz) available for Wi-Fi and other licence-exempt

¹⁸ [Nokia Comments 6 GHz FNPRM 6-29-2020.pdf, Technical Appendix - 6GHz LPI VLP FINAL 6-29-2020.pdf \(Section 4\).](#)

¹⁹ FCC R&O FNPRM, paragraph 244.

²⁰ [Nokia Comments 6 GHz FNPRM 6-29-2020.pdf, Technical Appendix - 6GHz LPI VLP FINAL 6-29-2020.pdf \(Section 3\).](#)

²¹ FCC R&O FNPRM, paragraph 243 and Section A.1. of Appendix C.

²² [Statement: Improving spectrum access for wifi – spectrum use in the 5 and 6 GHz bands.](#)

technologies. ISED also mentions in the Consultation (para 49) that it “has performed detailed technical analysis on the co-existence of RLANs with existing users. Furthermore, ISED has reviewed and analyzed the various studies 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 (20-51).”

Considering the different approaches and outcomes of studies from different parties, it may be helpful for ISED to examine the detailed technical analyses on the co-existence of RLANs with existing users against studies performed in Europe and UK²². It may be useful if ISED could share some aspects of their detailed technical analysis with interested stakeholders.

4. MARKET TRENDS, USER BEHAVIOUR AND AMOUNT OF SPECTRUM AVAILABLE FOR WI-FI TECHNOLOGIES

The Consultation references two reasons as a basis for advancing unlicensed use across the entire 6 GHz band: Wi-Fi offloading of mobile network traffic²³ and Wi-Fi provides economic values from use cases supporting IoT²⁴. When closely examining industry trends with the introduction of newer mobile broadband technologies, there has been a fundamental shift in traffic patterns and business models and we believe that both data offloading and IoT usage deserve a second look, as does the exclusive focus of this Consultation on unlicensed use in the 6 GHz band.

“Wi-Fi offload” is the traditional way in which data traffic is carried by Wi-Fi networks, complementary to mobile networks to reduce load on mobile networks. However, this complementarity exists only if there actually is a fixed broadband network to which Wi-Fi access points can be connected and the performance, price and convenience of this Wi-Fi connected to fixed broadband network are better than that of mobile networks. With very large or unlimited data packages and much high throughput of today’s mobile broadband network, mobile users tend to stay on mobile networks instead of switching or “offload” to Wi-Fi network.

This shift in traffic pattern is described in an article published by Joey Padden, Cablelabs²⁵

“It’s probably not news to anyone that indoor penetration is costly. A common industry view says that when a user is indoors, his or her data should be served by Wi-Fi to offload the burden on the cellular network. Industry reports are produced every year showing that large amounts of traffic from mobile devices are offloaded to Wi-Fi networks (e.g., ~80 percent in 2017).

However, as the industry moves toward unlimited data plans, and as mobile speeds increase, the incentives for seeking out Wi-Fi for offload are diminishing. A recent CableLabs Strategy Brief (CableLabs membership login required) provides empirical data showing that Wi-Fi data offload is declining as adoption of unlimited data plans increases. The trend, across all age groups, shows increased cellular data usage. So as

²³ Paragraph 10, page 2 of the Consultation ““Wi-Fi will continue to play a fundamental and complementary role to 5G cellular connectivity”.

²⁴ Paragraph 10, page 2 of the Consultation “economic value derived from a variety of economic contributors (e.g. broader IoT deployment, savings in wireless enterprise traffic)”.

²⁵ <https://www.cablelabs.com/converged-carriers-femtocells-spectral-efficiency-small-cell>

demand for cellular data is going up, an increasing portion is going to be crossing the walls.”

and report issued by NGMN Alliance²⁶,

“It is expected that small cells at home using NR-U technology will provide – at least – radio performance as good as what Wi-Fi 6 could do, will enable the optimization of the management of radio resources as NR-U could be connected to operators’ core network. Furthermore, the deployment of small cells at home can ensure that the traffic generated at home will be transported via the fixed network, regardless if the Wi-Fi interface of the device is switched on or off”

Regarding IoT, we believe that many types of IoT deployments will choose licensed networks. GSMA highlights why licensed spectrum is critical to IoT, and why we should take notice:

“Licensed spectrum is uniquely able to provide high quality of service guarantees over wide areas, as operators are not at risk of interference and can control usage levels. As a result, licensed cellular IoT may be the only choice for services which require concrete assurance levels such as for security and medical applications amongst others. ... As a result regulators should ensure the IoT market can be allowed to benefit from the unique benefits licensed spectrum brings”²⁷

This view is supported by AT&T roll-out of NB-IoT as described by James Blackman in an online article comparing licensed technologies NB-IoT and LTE-M with other licence-exempt technologies: *“NB-IoT and LTE-M have advantages over technologies that operate in unlicensed spectrum, such as LoRa and Sigfox, including greater protections from interference, broader coverage availability and carrier-grade security”*.²⁸

Based on the above discussion, we believe it is incompatible with the vision for Canada to be a leader in 5G for the Department to devote so much mid-band spectrum to unlicensed operations while the mid-band opportunity for licensed service remains limited.

Today, over 500 MHz of licence-exempt mid-band spectrum is already available in the 5 GHz band. Having a prudent and balanced approach for 6 GHz spectrum between licence-exempt and licensed services is the most effective near-term option for creating more licensed mid-band spectrum for 5G.

Recommendation 6: MIG urges ISED to consider the market trends, user behaviours and the balance in amount of spectrum available for licence-exempt and licensed services in making the decision on the 6 GHz band.

²⁶ <https://www.ngmn.org/publications/5g-small-cells-at-home.html> - 5G small cell at home.

²⁷ GSMA, Spectrum for the Internet of Things – GSMA Public Policy Position, (Aug. 2016).
<https://www.gsma.com/spectrum/wp-content/uploads-/2017/05/Spectrum-IOT-Position-Paper.pdf>

²⁸ James Blackman, AT&T sets 2019 schedule for rollout of NB- IoT networks in the US and Mexico, Enterprise IoT Insights (June 20, 2018) <https://enterpriseiotinsights.com/20180620/channels/news/att-sets-nb-iot-schedule-tag40>

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