

Before
INNOVATION, SCIENCE, AND ECONOMIC DEVELOPMENT CANADA
Ottawa, ON K1A 0H5

In the Matter of)	
)	
Consultation on the Technical and Policy Framework)	Canada Gazette, Part I
for Radio Local Area Network Devices Operating)	Notice No. SMSE-002-17
in the Band 5150-5250 MHz)	January 28, 2017

COMMENTS OF MICROSOFT CORPORATION

Microsoft Corporation ('Microsoft') files these comments in response to the Innovation, Science, and Economic Development Canada ("ISED") 'Consultation on the Technical and Policy Framework for Radio Local Area Network Devices Operating in the Band 5150-5250 MHz' ('Consultation')¹. Microsoft agrees that ISED should permit high power and outdoor operation ("HPOD") of licence-exempt ("LE") radio local area network ("RLAN") devices in the 5150-5250 MHz band. Under the current rules, only indoor LE-LAN use is permitted between 5150-5250 MHz, with a maximum of 200 mW e.i.r.p. and a power spectral density (PSD) of no more than 10 mW (10 dBm) in any 1 MHz of bandwidth.

Microsoft proposes ISED develop a detailed LE regime for HPODs, harmonized to the greatest extent possible with the rules the United States Federal Communications Commission

¹ Notice No. SMSW 002-17 – Consultation on the Technical and Policy Framework for Radio Local Area Network Devices Operating in the 5150-5250 MHz Frequency Band, Canada Gazette, (January 28, 2017).

(FCC) adopted in 2014 for the 5150-5250 MHz band ('5 GHz Report and Order')², and implement them in advance of the World Radiocommunication Conference in 2019 (WRC-19) with justification under Section 4.4 of the International Telecommunication Union (ITU) Radio Regulations. Adoption of such harmonized rules will increase the supply of LE spectrum available in the lower 5 GHz band available to Canadian Wi-Fi^{®3} users, who then can immediately take advantage of the larger channel sizes that can be used both indoors and outdoors to meet the continued growing demand for mobile data. Such harmonization would also increase the size of the addressable market for LE Wi-Fi devices operating between 5150-5250 MHz and thus provide incentives for manufacturers to produce a wider variety of products for the lower 5 GHz band.

Concurrently, ISED should increase the maximum e.i.r.p level and PSD limit permitted indoors between 5150-5250 MHz to match that of the HPODs (but with no reduction in vertical antenna gain as the contribution to aggregate noise would be negligible) and harmonize its rules for client devices operating in range with those in the United States to take advantage of greater economies of scale.

The Department is seeking comment on the following three questions:

- Question A

The demand for and the benefits, if any, of allowing HPODs in the 5150-5250 MHz frequency band before WRC-19.

² See Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band, First Report and Order, 29 FCC Rcd. 4127 (2014).

³ Wi-Fi[®] is a trademark of the Wi-Fi Alliance.

- Question B

The Potential impacts on domestic and foreign satellite systems in the 5150-5250 MHz frequency band of authorizing HPODs use prior to WRC-19 on the basis of a maximum e.i.r.p. of 4 W. Requirements for an elevation mask towards satellites and an exclusion zone of 25 km around receiving earth stations to protect all satellite systems would likely apply.

- Question C

Should the Department proceed to authorize HPODs use prior to WRC-19, what regulatory approach would best ensure a balance of timely deployment and the protection of other existing and future services in the 5150-5250 MHz frequency band? Also, indicate any, and all considerations that should be given to equipment standards, technical requirements, eligibility criteria and/or conditions of licence depending on the relevant approach.

Response to Question A

Between 2015 and 2020 Wi-Fi traffic in Canada is projected to grow from 58 percent of Internet traffic to 65 percent, representing an annual growth rate of 10 percent⁴. Additionally, the number of Wi-Fi hotspots in Canada is projected to grow from 0.8 million to 10.2 million between 2015 and 2020⁵.

The primary spectrum bands used for Wi-Fi are the 2400-2483.5 MHz band ('2.4 GHz band') and several segments of the 5 GHz band operating under different rules⁶. Indoor and

⁴ Cisco, VNI Complete Forecast Highlights Tool, http://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html#, (visited March 15, 2017).

⁵ Ibid.

⁶ See 'Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices'; Innovation, Science and Economic Development Canada, RSS-247, Issue 2, ISED Canada, February 2017.

outdoor LE Wi-Fi operations are permitted in the 2.4 GHz band. LE Wi-Fi operation between 5250-5350 MHz, 5470-5600 MHz and 5600-5725 MHz requires the use of Dynamic Frequency Selection (DFS). The 2.4 GHz band supports concurrent operation of three independent 20 MHz channels or concurrent operation of an independent 40 MHz and 20 MHz channel.

Although the 2.4 GHz LE spectrum band is being used very efficiently, it has become saturated during certain times of day in heavily trafficked areas such as city centers, apartment buildings, and public venues. This congestion imposes a large cost on consumers because Wi-Fi is the most heavily used method of wireless broadband connectivity, and the 2.4 GHz band is the core Wi-Fi band today. The 5 GHz band is also used for LE-LAN. Only indoor operations for LE-LAN are permitted between 5150-5250 MHz. Indoor and outdoor operations are permitted in the DFS bands with a maximum e.i.r.p. of 1W. Due to the additional cost and complexity of implementing DFS, these bands are typically accessed by enterprise LE-LANs rather than by consumer LE-LAN devices. Indoor and outdoor operations are permitted in the 5725-5850 MHz at up to 4 W e.i.r.p. Thus, it is the most heavily used segment of the 5 GHz band for Wi-Fi. Meeting the increased consumer demand for indoor and outdoor LE-LAN (Wi-Fi) capacity requires more spectrum that can be used at higher e.i.r.p levels and greater use of the spectrum already available for LE-LAN operations in the DFS band.

Improved LE access to the 5 GHz band, as recommended by ISED, has notable potential to help address the need for additional LE spectrum. The 5 GHz band offers the potential of a greater number of channels and larger channel sizes. In particular, the IEEE 802.11 ac standard allows for channel sizes of 80 MHz and 160 MHz. If ISED permits outdoor use of 5150-5250 MHz, it would allow an 80 MHz HPOD channel within that 100 MHz band, and a contiguous

outdoor 160 MHz channel between 5150-5350 MHz that would be subject to the rules for the 5250-5350 band. It would also allow outdoor use of a non-contiguous 160 MHz wide Wi-Fi channel composed of an 80 MHz channel between 5150-5250 MHz aggregated with an 80 MHz channel between 5725-5850 MHz. Larger channels allow for Wi-Fi with higher data rates and 160 MHz-wide channels enable gigabit Wi-Fi. Enabling these larger channels would also enable the introduction into the Canadian market of a wide range of new broadband products capable of operating indoors / outdoors at higher data rates than is now possible. The ability to use higher powers outdoors in the 5 GHz band will provide Canadian Wi-Fi users with improved range, coverage and throughput characteristics – not just to their homes but to their wireless devices outside their homes.

Response to Question B

The FCC's 5 GHz Report and Order, which went into effect in 2014, allows high-power outdoor LE operations up to 4 W e.i.r.p. between the 5150 and 5250 MHz. The FCC noted that the sole Mobile Satellite Service (MSS) provider operating in the band has the capability to monitor increases in noise levels at its satellites. Consequently, it anticipated the MSS provider would be able to report any change in the noise level resulting from the amended rule and could "provide specific details as to how it is affecting its operations"⁷. Microsoft is not aware of any complaints filed at the FCC alleging harmful interference to MSS operations from high-power outdoor LE operations between 5150 and 5250 MHz or raising issues regarding aggregate noise. For this reason, Microsoft believes that ISED can authorize HPOD use prior to

⁷ See '5 GHz Report and Order' at 46.

WRC-19 with a maximum e.i.r.p of 4 W, using as its starting point the FCC's technical, operational, and reporting rules designed to protect MSS earth stations using the 5150-5250 MHz band for uplink operations, and then fine-tune them, if necessary, to reflect any differences on the ground in Canada.

Microsoft recognizes that the one significant difference between Canada and the United States with respect to operations in the 5150-5250 MHz frequency band is that the Canadian Space Agency and Department of National Defence operate a satellite earth station in Ottawa using frequencies between 5150 and 5216 MHz. The space-to-earth downlink needs to be protected from any harmful interference that could be caused by nearby HPODs. The consultation paper proposes a 25-km exclusion zone around the site, but does not provide the basis and assumptions used to derive that distance. Additional information on how the size of the exclusion zone was established would be helpful in evaluating different mitigation options. For example, does ISED assume that the antenna will be angled so that the maximum e.i.r.p. above 30-degrees elevation is limited to 125 mW (21 dBm) as in the FCC 5 GHz Report and Order⁸? Are there simple ways of making the earth station more resilient? Regardless, Microsoft believes that the exclusion zone should not apply to indoor operations between 5150-5250 MHz.

⁸ See '5 GHz Report and Order' at 37.

Response to Question C

Microsoft does not believe that any of the three regulatory approaches as presented ensures the balance sought between timely deployment of HPODs and the protection of other existing and future services in the 5150-5250 MHz spectrum band.

Deferring the review of Canadian HPOD rules until after WRC-19 is unnecessary.

Microsoft is an ITU Sector Member and is participating in ITU Working Party 5A where studies are being conducted that are called out in Resolution 239 (WRC-15) regarding the 5 GHz RLAN agenda item (1.16) at WRC-19. We believe it is premature to assume any outcome from WRC-19 (or even the timely completion of the studies themselves) because of complexity in regions where countries are smaller and incumbents operating in neighbouring administrations may have diverse protection requirements. Meanwhile, Canada's only land border neighbour has a functioning set of rules that seems to allow for successful sharing with incumbents while increasing the utility of outdoor Wi-Fi. Finally, even if WRC-19 does approve HPOD use as contemplated, the demand for outdoor Wi-Fi channels will likely be saturated in many Canadian urban centers long before devices based on that outcome will be available.

Microsoft considers the approach whereby ISED develops a detailed LE regime specifically for HPODs and then attempts to amend the Radio Regulations at WRC-19 as equivalent to the approach presented above. The difference is that here, ISED is developing the exact proposal it wants, but here again, there is no guarantee it will be accepted in part or its entirety, or amended in an acceptable manner. Again, all throughout this period, the supply of Wi-Fi spectrum for large channels that can be used for both indoor and outdoor use is falling further behind the demand.

The middle approach - to require users to obtain a licence to operate HPODs subject to specific licensing conditions and possibly making these licences available only to radiocommunications providers - would create a high barrier for individual users to operate an HPOD, such as a restaurant or coffee shop providing Wi-Fi to its customers seated outdoors; a company providing Wi-Fi to its employees across its campus; a university wanting to deploy a high-capacity Wi-Fi canopy across its campus to students and faculty; at public facilities such as parks; and individuals interested in operating an HPOD in their backyard. Limiting HPODs to radiocommunications providers also raises competition issues if the availability of HPODs proves a significant competitive advantage, and outdoor use of that spectrum at higher power levels can only be provided by a limited set of actors.

Microsoft proposes that ISED develop a detailed LE regime for HPODs using the FCC's 5 GHz Report and Order as its starting point. Ideally, the rules for HPOD use can be harmonized between the two countries to the greatest extent possible. ISED might also consider adopting a reporting requirement along the lines developed by the FCC for service providers operating large numbers of HPODs in the band across their networks. These large-scale HPOD operators would have to submit a letter to ISED acknowledging that, should harmful interference to licensed services in this band occur, they will take corrective action. It makes sense that the large-scale HPOD operators would have to take corrective action as the issue debated in the FCC proceeding (and most likely in this proceeding) was the potential aggregate noise caused by the sum of HPOD Wi-Fi devices operating in the 5150-5250 MHz band. With respect to protecting the earth station downlink operating in 5250-5216 MHz from harmful interference, additional information is needed to identify the range of mitigation options.

Such an approach would minimize the regulatory burden on small-scale HPOD users but not remove them. As LE devices, HPODs cannot cause harmful interference to the fixed- and mobile- satellite service stations that operate in the 5150-5250 MHz band, nor claim protection from interference. Thus, ISED can apply Article 4.4 of the Radio Regulations once it has settled on the required technical and operational rules for HPOD operations.

Sincerely,

A handwritten signature in blue ink, appearing to read "Michael Daum", with a long horizontal flourish extending to the right.

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