



**TELUS COMMUNICATIONS COMPANY**

**Reply Comments for**

**CONSULTATION on the TECHNICAL and POLICY  
FRAMEWORK for RADIO LOCAL AREA NETWORK  
DEVICES OPERATING in the 5150-5250 MHz  
FREQUENCY BAND**

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## Executive Summary

1. TELUS appreciates the opportunity to provide its reply comments on the technical and policy framework for devices operating in the 5150-5250 MHz band.
2. The demand for and benefit of higher power and outdoor devices (HP&ODs) in the band are significant in terms of residential and commercial Wi-Fi and carrier offload, as detailed in our initial response to question A of the consultation and echoed by the mobile industry, vendors, technical standards bodies and consumer advocates alike – the majority of respondents. Consumers and businesses experience the industry’s generational investment in fibre to the premise through the lens of their in-home / on premise Wi-Fi access. These rule changes are keenly needed to improve the Wi-Fi quality of experience in Canada.
3. The proposals to introduce HP&ODs into the band are perfectly aligned with the policy objectives of the Spectrum Policy Framework for Canada (SPFC) in terms of economic and social benefit, responsiveness to the market, flexible use, timeliness and harmonization. TELUS believes the protection of incumbent services is manageable as it has shown to be in the US since 2014.
4. TELUS does not support deferring the review of Canadian HP&OD rules until 2020 (i.e., post WRC-19) because Canadians cannot afford to wait until then for the significant benefits. Domestic rules relating to the use of HP&ODs in this frequency band are likely to be further revised in some way after WRC-19 no matter what the Department does now to enable them. TELUS does not believe that there is any substantial impact to our business plans and services to consumers should the rules post WRC-19 be more restrictive than the new rules pursuant to this consultation because all TELUS devices are centrally managed and firmware updatable. Furthermore, any further revisions to domestic rules relating to the use of HP&ODs in this frequency band that follow from international decisions at WRC-19 will presumably be applied in the US at the same time and be supported by US vendors.
5. TELUS agrees that the Department could and should, just as the US did in 2014, depart from the international framework under the condition that HP&ODs will not cause harmful interference to other incumbent services, Canadian or foreign. Despite the view of

Globalstar, TELUS does not believe that Canada, bordered only by the US with its liberalised rules, should have to wait for regulation to be applied on a worldwide basis before taking advantage of the vibrant US U-NII-1 ecosystem. The relevant issue for the Department is the protection of Canadian incumbents, not what the application of US rules might mean for other jurisdictions on a global basis.

6. TELUS does not believe, as Globalstar suggests, that the Department should be concerned about how other jurisdictions might interpret and react to Canada liberalising its rules in line with the US in advance of WRC-19. TELUS does not believe, as Globalstar suggests, that were the Department to liberalise its rules now, that it would be predetermining Canada's position at WRC-19. In both cases, TELUS believes that being able to reference actual Canadian data under the liberalised rules when preparing for and eventually reviewing agenda item 1.16 at WRC-19 would be valuable.
7. TELUS agrees with the Department that a maximum e.i.r.p. of 4 W would be appropriate and that an elevation mask towards satellites could be an acceptable measure for incumbent satellite service protection (if deemed necessary) when modifying technical rules to allow HP&ODs in the 5150-5250 MHz band. TELUS would encourage the Department to harmonize technical rules with those of the US to the maximum extent possible, enabling Canadian service providers and vendors to leverage economies of scale in equipment manufacturing and development.
8. TELUS strongly supports a Licence Exempt (LE) approach to HP&ODs. TELUS notes that this has been the approach successfully taken in the US since 2014 with the provision that companies planning large deployments (>1000 APs) must submit a letter to the FCC acknowledging their capability to take corrective action if harmful interference to licensed services in the band should occur. Ideally, in Canada, the Department would support an expedited process to enact a LE regime for HP&ODs along the lines of the LE regime in the US.
9. TELUS would be willing to accept a coordination obligation for both indoor and outdoor "service provider installations" of HP&ODs within a certain proximity to satellite earth stations, if deemed necessary to ensure their protection. Rather than imposing a strict

*exclusion zone* boundary, TELUS proposes that service providers could coordinate with earth station licensees within a *protection/coordination zone*. The minimum distance to trigger coordination for the protection of satellite earth stations could be determined through further study, and would be smaller for indoor vs. outdoor installations. Consumer use within the *protection/coordination zone* would remain Licence Exempt.

10. The detail behind TELUS' comments follows in the main body of this document.

## TELUS' Comments on Specific Points Raised by ISED

### A.

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

11. 5150-5250 MHz is a licence exempt band rapidly growing in popularity for Wi-Fi use that has long coexisted with a number of incumbent satellite based services and users.
12. Canadian consumers and businesses (including Canada's major wireline ISPs and mobile carriers) need the proposed revisions relaxing the power restriction in 5150-5250 MHz in line with the US and other jurisdictions pre-WRC-19 to provide a material improvement in three main areas:
  - in-home Wi-Fi distribution for customers of ISPs in larger dwellings typically in suburban markets
  - enterprise and business Wi-Fi networks in commercial and industrial settings
  - carrier offload in the home and select urban and campus settings
13. Licence exempt spectrum is critical to Canadian consumers and businesses and by extension the Canadian innovation agenda and GDP sustainability and growth.
14. The importance of enabling higher power levels to provide benefit to Canadian consumers and small business cannot be overstated. As a leading-edge broadband Internet service provider, TELUS has made multi-billion dollar investments in infrastructure via our growing PureFibre network. TELUS continues to grow this investment with an ambitious goal to reach over 80% of the homes in our ILEC serving areas in BC, Alberta and Quebec within 5 years. However, while TELUS has committed to this capital investment in next-generation broadband access capabilities, the vast majority<sup>1</sup> of our residential and business

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<sup>1</sup> TELUS offers fibre service to the majority of households in its ILEC serving areas with a goal of passing over 80% of households by 2022. All of TELUS' HSIA customers are provided with a home gateway with 5 GHz Wi-Fi capability, of which no more than 5% are disabled by the customer. Of these 5% of HSIA customers where the TELUS Wi-Fi capability is disabled within the home gateway, most customers set up their own Wi-Fi capability using off the shelf LE equipment.

customers experience our gigabit fibre network through the lens of their in-home / on-premise Wi-Fi access. The same is true for all major wireline ISPs (i.e., telcos and cablecos). In other words this ruling will positively impact the broadband experiences of the majority of Canadians immediately.

15. In previous generations of broadband access, the 2.4 GHz band was sufficient in delivering a user experience that could support the full capabilities of our DSL-based access network. As our access capabilities have evolved, the increasing congestion and limited bandwidth in the 2.4 GHz band has made it ill-suited as the band for accessing next-generation services over fibre. To fill this void, TELUS has continued to invest in the development and deployment of new technologies (such as IEEE 802.11ac) on our customer premise equipment which can maximally benefit from the 5 GHz band, leveraging enhanced capabilities which are enabled by its wider supported bandwidths. However, the reach of these capabilities becomes limited in larger dwellings (such as multi-storey detached homes) when undue power restrictions are enforced due to losses incurred when Wi-Fi signals penetrate drywall, plywood, and other common housing materials.
16. More specifically, allowing HP&ODs in the 5150-5250 MHz band will enhance coverage for next-generation Wi-Fi technologies, enabling new capabilities for consumers that are enabled by 160 MHz bandwidth channels. By increasing the allowable power levels in the 5150-5250 MHz band, a contiguous 160 MHz channel will be available at 1W e.i.r.p. when combined with adjacent spectrum in the 5250-5350 MHz band. Similarly, a second 80 MHz channel with 4W e.i.r.p., when combined with spectrum in the 5725-5850 MHz band, will enable 160 MHz of “full power” aggregated spectrum using 80+80 MHz channel bonding. Newly developed 802.11ac “Wave 2” access points will leverage these wider channel bandwidths to deliver real-world gigabit Wi-Fi access as the ideal complement for next-generation gigabit wireline fibre access networks.
17. The advances in Wi-Fi technology are occurring at a rapid pace and the differences in regulation between Canada and the US are delaying the release and detracting from the performance of Wi-Fi products in Canada. Going forward, the 802.11ax standard, which aims to increase the overall efficiency of Wi-Fi, passed Draft 1.0 in 2016 and is expected to

pass Draft 2.0 in 2017. While the final ratification of the standard is planned for 2019, it is expected that Wi-Fi vendors will be manufacturing 802.11ax products in mass quantities as early as Q4, 2017. Harmonizing the regulations between Canada and the US (in particular, allowing the use of HP&OD in the 5150-5250 MHz band) would give Canadians access to 802.11ax products as soon as they are generally available in the US. In addition, with the introduction of higher modulation rates (i.e., 1024-QAM) in the 802.11ax standard it is even more important to allow a maximum e.i.r.p. of 4 W in the 5150-5250 MHz band so that Canadians can reap the full benefits of this next-generation Wi-Fi technology.

18. In our internal lab testing, TELUS has assessed the impact of power restrictions on 5 GHz wireless performance. In this comparison, we have measured the TCP throughput for different attenuation levels, comparing the 5150-5250 MHz range (under Canada's older "non-harmonized" power rules) with the 5725-5850 MHz band (whose rules are similar to those proposed for HP&ODs in this consultation). In high SNR conditions, the maximum per-user (peak) data rate increased by approximately 20% in the higher power channel. A far more dramatic result was observed in high attenuation scenarios; there, throughput gains of nearly 300% validate the impact of increasing power levels, resulting in a direct benefit to the customer experience through increased data rates and expanded coverage.
19. In considering the relaxation of power limitations in technical rules to allow HP&ODs in the 5150-5250 MHz band, TELUS emphasizes to the Department the benefit of harmonizing regulatory requirements with those of the US. At present, the use of different regulatory limits between Canada and the US have forced TELUS and other service providers into difficult compromises in specifying equipment with their vendors which are designed for Canadian consumers. Under disparate regulations such as the 5150-5250 MHz power limit rules, we are forced to either a) sacrifice performance by using hardware designs intended for the US market but with firmware adjustments that attempt to provide best device performance while complying with Canadian domestic technical requirements, or b) increase cost and delay time-to-market by customizing hardware designs for the Canadian market. By harmonizing our rules in the 5150-5250 MHz band with those of the US, Canadian service providers will be able to deliver next-generation technologies to

consumers without sacrificing performance or introducing additional overhead and delays associated with regional development requirements.

20. While in home wireless distribution is the critical driver of need, Wi-Fi in the home is also extremely important for Canadian mobile customers looking to avoid using the data in their mobile data buckets when using their smartphones in the home. The ability to provide in-home coverage across the entire premises is therefore very important to Canadians.
21. Going forward, as the Internet of Things (IoT) gains momentum in the home in Canada, the ability to provide reliable and high-performance in-home coverage across the entire premises will become increasingly important to Canadians. While billions of IoT devices will connect directly to mobile networks (wide-area IoT), the projected number of short-range IoT devices (i.e., those connected by unlicensed RLAN technologies such as Wi-Fi) is an order of magnitude higher.<sup>2</sup> The industry has observed rapid adoption of connected devices (smart TVs, connected lights, locks, thermostats, cameras, and more), with new applications emerging on a daily basis. Introducing support for HP&ODs in the 5150-5250 MHz band will play a key role in providing uniform coverage across Canadian households while decreasing congestion in order to support the massive connectivity requirements that IoT growth will demand.
22. As noted by Rogers<sup>3</sup>, TELUS agrees that “the Department must maintain its technology-neutral, facilities-based policies and that any changes that may benefit one wireless technology should be applicable to others. For example, the Federal Communications Commission (FCC) has recently approved the operation of LTE-U base stations that operate in unlicensed channels in the U-NII-1 (5150-5250 MHz) and the U-NII-3 (5725-5825 MHz) bands. Any changes to the RLAN policy that may benefit technologies such as Wi-Fi should also apply to LTE-U/LTE-LAA, as well as other wireless technologies that meet all relevant radio regulations.”

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<sup>2</sup> Ericsson Mobility Report, November 2016. (<https://www.ericsson.com/assets/local/mobility-report/documents/2016/ericsson-mobility-report-november-2016.pdf>)

<sup>3</sup> Rogers comments, para 7

**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 also apply.

23. While several respondents have noted the risk of potential impacts, it is important to recognize the lack of any material impact in the US after three years.
24. The US will bring 5 years of experience supporting HP&ODs to WRC-19. Canada would benefit by getting approximately 2 years of its own real world impact data prior to WRC-19 vs deferring to the US experience.
25. TELUS notes that there is a large body of relevant material on this subject to be found in the record of the FCC First R&O<sup>4</sup>.

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<sup>4</sup> FCC 14-30, First Report and Order, April 1, 2014, in the matter of Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz band, ET Docket No. 13-49

**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.

26. The regulatory approach needs to balance the risks and the rewards. Our response in part A has detailed the considerable rewards. The risks are of very low probability. The reality in the US is that opening this band up to Licence Exempt HP&OD use has not been a problem at all in terms of interference while benefiting consumers and businesses tremendously.
27. TELUS agrees with the Department that a maximum e.i.r.p. of 4 W would be appropriate and that an elevation mask towards satellites could be an acceptable measure for incumbent satellite service protection (if deemed necessary) when modifying technical rules to allow HP&ODs in the 5150-5250 MHz band.
28. TELUS strongly encourages the Department to harmonize technical rules with those of the US to the maximum extent possible, enabling Canadian service providers and vendors to leverage economies of scale in equipment manufacturing and development.
29. TELUS strongly supports a Licence Exempt (LE) approach to HP&ODs just as all devices in the band are currently. TELUS notes that this has been the approach successfully taken in the US since 2014 with the provision that companies planning large deployments (>1000 HP&ODs) must register these with the FCC and acknowledge their capability to take corrective action if harmful interference to licensed services in the band should occur. TELUS notes that Globalstar agreed to this approach<sup>5</sup>. Ideally, in Canada, the Department would support an expedited process to enact a LE regime for HP&ODs along the lines of the LE regime in the US. Requiring consumers to register their devices and provide details on installation would be difficult to enforce and would introduce costly regulatory and administrative burdens.

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<sup>5</sup> Id, p. 12, Footnote 62.

30. WISPs have suggested that if the technical rules for the 5150-5250 MHz band were modified specifically to support their delivery of last mile fixed access services to their c.240,000 customers (i.e., requiring that “antennas meet mask requirements consistent with a 2’ high-performance parabolic antenna”<sup>6</sup>), interference could be minimized and well managed. TELUS does not disagree that such a constraint would be sufficient for the protection of satellite systems, but protests loudly at the notion of adopting such stringent requirements which would serve to benefit less than 1% of Canadians. All Canadians desperately need these changes and a broad and flexible Licence Exempt approach is needed to maximize the benefit of allowing HP&OD use. A minimally prescriptive framework imposing the “likely” requirements noted by the Department in question B of the Consultation (e.g., a maximum e.i.r.p. of 4W and an elevation mask towards satellites) would be far more appropriate. This would allow service providers to determine the combination of transmitted power levels and upward-facing antenna gain restrictions on a per-deployment basis that satisfy the design requirements of their outdoor installations while offering protection to satellite systems.
31. TELUS acknowledges the concern expressed by the Department in this consultation regarding the protection of satellite earth stations. However, introducing a light licensing regime would be wholly inappropriate in its application as a national policy for the sake of protecting a very limited number of satellite earth station installations. Given that the Licence Exempt approach (which TELUS views as both feasible and necessary in supporting innovation in this unlicensed band) appears inherently incompatible with the creation and enforcement of exclusion zones, TELUS proposes a more balanced approach that would apply in proximity to satellite earth stations in lieu of exclusion zones. TELUS would be willing to accept a coordination obligation for both indoor and outdoor “service provider installations” of HP&ODs within a certain proximity to satellite earth stations, if deemed necessary to ensure their protection. Rather than imposing a strict exclusion zone boundary, TELUS proposes that service providers could coordinate with earth station licensees within a protection/coordination zone. The minimum distance to trigger

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<sup>6</sup> CanWISP comments, para 18. ABC Communications proposes the same antenna mask requirement for satellite protection in paragraph 7 of their comments.

coordination for the protection of satellite earth stations could be determined through further study, and would be smaller for indoor vs. outdoor installations, but would be expected to be no larger than the 25 km specified by the Department in the study cited in this consultation. Consumer use within the protection/coordination zone would remain Licence Exempt, as consumers would be expected to deploy HP&ODs within their homes providing a natural interference protection for satellite earth stations.

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