CANADA GAZETTE NOTICE NO. SLPB-005-18

ADDENDUM TO THE CONSULTATION ON RELEASING MILLIMETRE WAVE SPECTRUM TO SUPPORT 5G

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COMMENTS OF BELL MOBILITY INC.

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1.0 INTRODUCTION

1. In accordance with the procedure set out by Innovation, Science, and Economic Development Canada (ISED or the Department) in Notice No. SLPB-005-18, *Addendum to the Consultation on Releasing Millimetre Wave Spectrum to Support 5G* (the Consultation), we are pleased to provide our views on the proposed release of millimeter wave (mmWave) spectrum in the 26.5-27.5 GHz frequency band (26 GHz band).

2. Making more than one GHz of spectrum in the 26 GHz band available for release, in addition to the spectrum proposed in the original mmWave consultation, is an important enabler to ensuring the timely evolution of existing wireless networks to 5G in Canada. The wider bandwidth channels available in mmWave spectrum will support the higher spectral efficiencies associated with 5G networks compared to the narrow bandwidths that are typically in use today.

3. We recommend that the Department make the 26 GHz band available prior to the World Radio Conference 2019 (WRC-19) to enable service providers to begin rolling out 5G networks and introduce advanced applications and services to Canadians as soon as possible.

2.0 QUESTION 1

Q1. ISED is seeking comments on the development of a flexible use licensing model for fixed and mobile services in the 26 GHz band (in addition to the bands currently under consultation through the mmWave Consultation), taking into account the timing of WRC-19, 5G technology standards development, international ecosystems and harmonization of spectrum use with other countries.

4. We support the development of a flexible use licensing model for fixed and mobile services in the 26 GHz band, taking into account the timing of WRC-19, 5G technology standards development, international equipment ecosystems and harmonization of spectrum use with other countries.

5. We agree with the views expressed by the Department in the Consultation that there are opportunities for Canada to take advantage of the emerging international ecosystem in the 26 GHz band. This is particularly important given that many of the preliminary international studies (Task Group 5/1) being conducted in preparation for the upcoming WRC-2019 World

Conference demonstrate that sharing among mobile broadband services and satellite services is feasible in many circumstances.

6. The assignment of the 26 GHz band and the 28 GHz band for flexible use would provide carriers with access to a critical 1.85 GHz of contiguous spectrum that would support deployment of 5G networks to Canadians.

3.0 QUESTION 2

Q2. ISED is seeking comments on the changes proposed above to introduce flexible use licensing in the 26 GHz band, including the ensuing changes to the CTFA Canadian footnotes and the policy on this band contained in SP 3-30 GHz, Revisions to Spectrum Utilization Policies in the 3- 30 GHz Frequency Range and Further Consultation.

7. We support ISED's proposal to modify footnote C47A wherein the Department would allow the introduction of flexible use licensing in the 26 GHz band, including changes to the CTFA footnotes and ISED's policy on this band as contained in SP 3-30 GHz[1].

4.0 QUESTION 3

Q3. ISED is seeking comments on the importance of harmonizing the Canadian band plan with the United States in the 26 GHz and 28 GHz bands, recognizing that the 26 GHz band is not available for 5G services in the United States at this time.

8. We agree with the Department's views expressed in the Consultation that: 1) economies of scale in equipment manufacturing facilitate Canadians having access to the latest technologies at affordable prices; and 2) economies of scale are facilitated by harmonizing Canada's band plan with those in other countries. As there is a considerable amount of international interest in releasing the 26 GHz and 28 GHz bands to support 5G services, the 26 GHz band, in particular, has the potential to become a 5G global roaming band.

9. While the 26 GHz band is not presently available for 5G services in the U.S., we nonetheless recommend that Canada proceed with making the band available as soon as possible. Given the broad international interest in the band, we believe that economies of scale will be achieved even without the release of the spectrum in the U.S. in the near and mid-term.

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1 SP 3-30 GHz, *Revisions to the Spectrum Utilization Policies in the 3-30 GHz Frequency Range and Further Consultation,* http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf05617.html

10. The Federal Government's policy objectives related to innovation and competitiveness make it even more important for Canada to proceed quickly to make the 26 GHz band available. We believe that the U.S. will eventually make the 26 GHz band available for 5G so it is a matter of when, not if, the North American market will be harmonized. Furthermore, as a large amount of contiguous bandwidth is critical to the successful implementation of 5G, and separate auctions for the two bands will cause unnecessary fragmentation across multiple operators, it is also critical to make the combined 1.85 GHz of spectrum in the 26 GHz and 28 GHz bands available concurrently.

5.0 QUESTION 4

Q4. ISED is seeking comments on the minimum block size that should be made available for the 26.5–28.35 GHz band. Is it necessary that the frequency blocks be multiples of the 3GPP channel bandwidths (50 MHz, 100 MHz, 200 MHz and 400 MHz)?

11. The mmWave frequency bands are collectively part of specifications developed for bands above 6 GHz known as Frequency Range 2 (FR2). While 50 and 100 MHz are supported bandwidths, these are not preferred channel definitions. Maximum channel efficiency occurs at the maximum bandwidth that radio technology can support. Currently the technology limit (mainly Power Amplifier) is 200 MHz; thus initial deployments of 5G in this band will be with 200 MHz radio. The use of larger bandwidths (i.e., up to 400 MHz) will be supported by Carrier Aggregation.

12. 400 MHz channels have also been defined in specification (3GPP TS38.101-1)[2] as it is expected that technology innovations will enable these larger channels. Technical studies for standards development purposes have even proposed the use of 800 MHz channels to more closely match auctions in other countries (e.g., 2 X 425 MHz channels in the U.S.; 800 MHz block in Korea).

13. Both FR1 and FR2 specifications allow for smaller bandwidths, but spectral utilisation gains and the 5G capabilities of network slicing are limited when these smaller bandwidths are employed. Therefore, smaller bandwidths are not recommended. In addition, bandwidths other

[2] Available at: https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3283).

than the standardized bandwidth values are not recommended as they will suffer unacceptable losses in spectral efficiency as the power envelopes are matched to these bandwidths.

14. Time Division Duplex fragmented holdings (in either spectrum or geographical areas) can create problems for deployment. In order to maximize the benefits of 5G, all systems need to be synchronized in: timing, uplink-downlink ratio, scalable numerology and Dynamic Uplink-Downlink partitioning. Without full synchronization, inter-operator interference will be significant and large guard bands and exclusion zones will be required. If these measures are implemented, then spectrum efficiency will suffer. This requirement is even more pronounced in lower frequency bands such as 3.5 GHz due to the increased propagation range involved.

15. This coexistence issue has been recognized by 3GPP and studies have been initiated to determine if there are some mitigation methods that might be employed. Typically, the 28 GHz band has either been licensed in extra-large blocks or all-band, or operators have decided to operate a multi-operator core network. Consequently, most licence coexistence studies (including those started by the Conference of European Posts & Telecommunications) are focusing on 3.5 GHz where the band has been fragmented with even smaller bandwidths.

6.0 QUESTION 5

Q5. a) ISED is seeking comments on whether it should impose any limits on the aggregate emissions of the terrestrial services in the 26.5–27.5 GHz band to ensure coexistence with ISS.

16. There is no obvious way to constrain aggregate interference in an effective, focused manner, other than the beamforming methods already contained in 5G terrestrial designs. Consequently, limits would need to be applied in a very general way to all operators in all countries, for all base stations and for all User Equipment (UE) in an attempt to control the power density of all deployments. As power density is directly related to performance, coverage and the number of users of a 5G system, any limit would constrain the deployment of these systems without having a clear indication of the aggregate effect on satellite operations. In any case, the technical designs of 5G should negate any such requirement.

17. A typical 5G radio at 28 GHz will function quite differently from traditional terrestrial microwave links. The difference is due to the Active Antenna Systems (AAS) and schedulers used in 5G mobile systems rather than the traditional dishes and data streams of fixed

microwave links. 5G systems will generate a dynamic distribution of energy through beamforming techniques in both the base stations and UE, rather than the predictable directed energy of microwave links. The intent of AAS is to direct energy toward the intended receiver and away from others. Fundamentally, aggregated energy toward satellites will be minimal. Likewise, the location of satellites and potential sensitivity to interference is widely variable, and in some cases, unknown, even for current satellite filings with the International Telecommunications Union. Consequently, even determining the levels of aggregate emissions would be problematic, if not impossible.

18. We expect future satellite systems to use similar AAS technologies to those being planned for 5G terrestrial services use, so they will also employ null-steering to avoid primary sources of interference.

Q5. b) If limits are proposed, ISED is inviting detailed proposals on what the limits should be, and why they should be implemented.

19. As stated in our response to Question 5.a) above, we do not believe that an aggregation emission limit is practical to determine or implement.

7.0 QUESTION 6

Q6. a) ISED is seeking comments on the proposal to require site-by-site coordination between proposed flexible use terrestrial stations and EESS/SRS earth stations in the 26.5–27.0 GHz band when a pre-determined trigger threshold is exceeded.

20. Given the short-range propagation characteristics of this band and the near line of sight requirements, the requirement for coordination should be very rare. In fact, good site selection and design of the EESS/SRS earth stations should all but eliminate the need for coordination between terrestrial stations and ESS/SRS earth stations. The requirement for site-by-site analysis of every station would also be administratively burdensome with little to no benefit.

Q6. b) If the proposed site-by-site coordination is supported, what coordination trigger and value would be the most appropriate (e.g. power flux density or distance threshold)?

21. As noted in response to Question 6.a), we do not support site-by-site coordination. However, should the Department require it, the use of a distance threshold rather than a power flux density trigger could simplify the coordination trigger. Conceptually, another distance parameter could also be used as a site selection mechanism for earth station placement.

Q6. c) ISED is also inviting proposals for specific additional technical rules for flexible use terrestrial stations and EESS/SRS earth stations (e.g. site shielding) that could facilitate more efficient sharing between terrestrial and earth stations.

22. We do not believe that additional technical rules are necessary for flexible use terrestrial stations and EESS/SRS earth stations, as shielding of earth stations should be relatively straightforward. Possible solutions could be as simple as creating a berm around the facility or planting trees around the circumference of the earth station.

8.0 QUESTION 7

Q7. a) ISED is seeking comments on whether there should be restrictions on the geographic areas in which new EESS and SRS earth stations can be deployed in the 26.5–27.0 GHz band.

23. The judicious placement of EESS and SRS earth stations well away from urban/suburban areas, entertainment complexes, shopping malls, and transportation corridors (highways and railways) would significantly reduce the need for any coordination or interference mitigation techniques.

24. If earth stations are restricted from constraining terrestrial systems, no other restrictions need to be formalized. In this regard, satellite operators will proceed to locate and design their sites so as to not constrain the deployment of terrestrial systems.

Q7. b) If geographic restrictions on EESS and SRS earth stations are proposed, ISED is inviting detailed proposals on how they could be implemented, and what areas should be targeted.

25. ISED could specifically restrict deployment within the municipal boundaries of communities over a certain population density, however, this should not supersede the general requirements of non-constraint mentioned above.

9.0 QUESTION 8

Q8. a) **ISED is seeking comments on the proposal to require site-by-site coordination between proposed flexible use terrestrial stations and FSS earth stations in the 27.0–28.35 GHz band when a pre-determined trigger threshold is exceeded.**

26. We recommend that the entire range of spectrum should be treated as a whole. Further, as indicated in our response to Question 6.a), given the short range propagation characteristics of the 27.0 - 28.35 GHz band, and the near line of sight requirements, the requirement for coordination should be very rare. To reiterate, we believe that the judicious site selection together with the appropriate design of the EESS/SRS earth stations should all but eliminate the need for coordination between terrestrial stations and ESS/SRS earth stations. Any requirement for the site-by-site analysis of every station would be burdensome with little to no benefit.

Q8. b) **If the proposed site-by-site coordination is supported, what coordination trigger and value would be the most appropriate (e.g. power flux density or distance threshold)?**

27. Refer to our response to Question 8.a) above.

Q8. c) **ISED is also inviting proposals for specific technical rules for proposed flexible use terrestrial stations and FSS earth stations (e.g. site shielding) that could facilitate more efficient sharing between terrestrial and earth stations.**

28. Refer to response to Question 8.a) above.

10.0 QUESTION 9

Q9. a) **ISED is seeking comments on whether there should be restrictions on the geographic areas in which new FSS earth stations can be deployed in the 27.0–28.35 GHz band.**

29. While FSS earth stations operating in this frequency range should not block, constrain or hinder the deployment of terrestrial systems, earth stations could be deployed if, as part of the

due diligence process, only sites that are adequately isolated from terrestrial systems are selected.

30. As we mentioned in response to Question 7, the judicious placement and design of EESS and SRS earth stations should minimize any interference to terrestrial systems without the need to impose additional restrictions or rules.

Q9. b) **If geographic restrictions on FSS earth stations are proposed, ISED is inviting detailed proposals on how they could be implemented, and what areas should be targeted.**

31. Detailed proposals on the implementation of geographic restrictions on FSS earth stations could be provided by the Radio Advisory Board of Canada.

11.0 QUESTION 10

Q10. a) **ISED is seeking comments on whether it should impose any limits on the aggregate emissions of the terrestrial services in the 27.0–28.35 GHz band to ensure coexistence with FSS space stations.**

32. Refer to our response to Question 5 above.

Q10. b) **If limits are proposed, ISED is inviting detailed proposals on why they should be implemented, and what the limits should be.**

33. Please refer to response to Question 10.a) above.

12.0 QUESTION 11

Q11. a) **Further to section 9 of the mmWave Consultation, are there any new considerations or suggested approaches regarding the licensing of flexible use mmWave spectrum, given the addition of the 26 GHz band?**

34. The ecosystems surrounding mmWave bands remain in flux within the 3GPP standards organization. On one hand, wireless operators are advocating for their specific domestic needs which could lead the ecosystem to be splintered into regional products. On the other hand,

equipment manufacturers are advocating for the development of a single band definition (yet to be numbered) covering the entire 24.25 to 29.5 GHz spectrum range. This could facilitate a single global ecosystem. Such a large band would require greater underlying flexibility to adjust to local regulatory environments (such as channel plans), but require some regulatory consistency with regard to emission limits across the band(s) in order to simplify the construction and certification of devices.

Q11. b) **ISED is also seeking comments on licensing considerations in the 26 GHz and 28 GHz bands that would encourage innovative use cases while also supporting competition for existing mobile network services.**

35. Even if a band is identified as a 5G band, it is not guaranteed that the implementation of a 5G radio in the band will provide true 5G services. The 5G radio provides increased possibilities for service types, but only if provisioned with adequate bandwidth, support bands, backhaul, fronthaul, a 5G core, datacenters, and mobile edge computing capabilities.

36. It is unlikely that any significant service will be built upon this band alone, as any cell site based on these bands will have limited range. Initially, therefore, it will be uneconomical to deploy this band except in a “hot-spot/hot-zone” manner. Consequently, the band will need to be coupled with low-band coverage assets to be effective. As such, traditional build-out obligations based on population coverage would not be appropriate for these bands.

37. Deployment of these bands will be too expensive to support a single use case. Instead, 5G networks will only be viable if they can support multiple services within a network slicing environment. Network slicing will allow for fast development of new services through open, standard interfaces. Network slicing demands large bandwidths, multiple frequency ranges, and a high bandwidth low-latency backhaul. Without these, in our view, innovation would be adversely affected.

38. Due to the expense required to deploy and maintain all of the elements required for 5G networks, including extensive retrofits of back-up power systems to support millimeter wave, licence durations should be 20 years.

13.0 CONCLUSION

39. Access to sufficient mmWave spectrum is crucial for the successful and timely deployment of 5G in Canada. Leveraging the 26 GHz spectrum band will enable the development of high quality services and a rich user experience in a wide range of use cases.

40. The proposed assignment of the 26 GHz band and the 28 GHz band for flexible use will provide wireless service providers with access to a critical amount of contiguous spectrum to support the rapid deployment of 5G networks and services to Canadians.

41. We support the development of a flexible use licensing model for fixed and mobile services in the 26 GHz band, taking into account the timing of WRC-19, 5G-technology standards development, international equipment ecosystems and harmonization of spectrum use with other countries.

42. While the 26 GHz band is not presently available for 5G services in the U.S., we nonetheless believe that Canada should proceed with making it available for 5G services as soon as possible, and ahead of the U.S. if necessary. We believe the U.S. will eventually make the 26 GHz band available for 5G and North American harmonization will be possible at that time.

43. The short-range propagation characteristics of this band would minimize the requirement for coordination between the terrestrial and satellite services. Through judicious site selection (away from urban/suburban areas, entertainment complexes, shopping malls, and major transportation corridors (highways and railways)) and the proper design of earth stations, the need for coordination or interference mitigation techniques between terrestrial stations and earth stations should be eliminated.

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