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Innovation, Science and Economic Development Canada
c/o Senior Director, Spectrum Licensing Policy Branch
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Re: Consultation on Releasing Millimetre Wave Spectrum to Support 5G

These comments are filed by ViaSat, Inc. (“ViaSat”)¹ in response to the above-referenced consultation. ViaSat appreciates the opportunity to comment on the proposed licensing framework in the above noted bands.

Yours truly,

Christopher J. Murphy
Associate General Counsel, Regulatory Affairs

¹ ViaSat, Inc. is the parent company of WildBlue Communications Canada Corporation. ViaSat has contracted with Xplornet Communications Inc. for all of the residential ViaSat-2 capacity and has purchased all gateways and ground equipment for the Canadian market (Press Release, May 1, 2014), <https://www.viasat.com/news/xplornet-takes-canadian-capacity-viasat-2-satellite>.

Consultation on Releasing Millimetre Wave Spectrum to Support 5G

ViaSat appreciates Innovation, Science and Economic Development's (ISED) initiating this consultation process on millimetre wave spectrum in the 28 GHz, 37-40 GHz and 64-71 GHz frequency bands. As a leading provider of both satellite and terrestrial broadband communications solutions and as the operator of a growing fleet of a Ka-band spacecraft, ViaSat welcomes the opportunity to comment on ISED's consultation. ViaSat's comments focus on the 27.5-28.35 GHz band ("28 GHz Band"), the 37.5-40 GHz band, and the 64-71 GHz band.

The 28 GHz Band has been available for use by satellite networks since ISED first opened the Ka band for commercial licensing and has remained available for satellite use for two decades. Access to the 28 GHz Band has been an essential part of the design of ViaSat's ground-breaking, high-throughput broadband satellite networks, which are revolutionize the industry, enabled the delivery of high-quality broadband service to end users across Canada and providing Canadians with an effective competitive alternative to both wired and wireless terrestrial broadband providers. The 28 GHz Band is essential to the ViaSat spacecraft currently in operation, as well as to the even more advanced ViaSat spacecraft under development that will serve the Canada in the next few years. In addition, satellite broadband services are part of the ecosystem for delivering 5G services in the future.

ViaSat and its Canadian partners' network of earth stations will continue to expand as ViaSat launches its next-generation spacecraft authorized by ISED, acquires more customers, and continues to expand its infrastructure to maintain its ability to deliver broadband service at levels that are competitive with terrestrial alternatives. To illustrate, ViaSat-1, which was brought into operation in 2011, supports a throughput of approximately 150 Gbit/s and relies on a network of earth stations that aggregate traffic and interconnect to the Internet backbone. When it was launched, ViaSat-1 had more than 10 times the throughput of the other Ka-band satellites in orbit at that time.² ViaSat's second-generation high-capacity satellite will double this capability, will have the capability to support speeds well over 100 Mbit/s,³ and will require more earth stations to aggregate and interconnect traffic. With the long-planned deployment of multiple third-generation ViaSat high capacity satellites, each of which will provide over 1 Terabyte per second (1,000 Gbit/s) of throughput and will support even higher speeds,⁴ ViaSat will require many more such earth stations, albeit much smaller in size, to aggregate and interconnect traffic.

ViaSat uses, and has continued plans to use, the 28 GHz Band for a number of purposes, most critically for its earth station facilities that aggregate traffic and provide interconnection to the Internet and other critical terrestrial networks. Those facilities for WildBlue, ViaSat-1 and ViaSat-2 are located throughout the Canada, and are close to where most of ViaSat's customer

² See *ViaSat-1 FAQ*, available at https://www.viasat.com/sites/default/.../viasat-1_faq_1_10_v5.pdf.

³ See *ViaSat Q2 2015 Earnings Conference Call* (Nov. 9, 2015), available at <http://investors.viasat.com/events.cfm>.

⁴ *Id.*

base is located—in and around the *populated* parts of the nation. Those facilities have coexisted successfully for years with the terrestrial fixed service.

With the proper planning and a suitable regulatory framework, ViaSat also believes that its 28 GHz Band earth station facilities can continue to coexist with the new mobile wireless services that ISED proposes to introduce into the 28 GHz Band. ViaSat commends ISED for recognizing the need to ensure that certain essential satellite earth stations will be able to continue to operate even if ISED changes the operating environment in the 28 GHz Band by allowing new terrestrial mobile services. However, ViaSat does not believe that ISED’s proposal goes far enough, as it does not ensure the continued operation of the earth stations that are essential to the next-generation ViaSat spacecraft currently under development.

Based on the existing regulatory framework, the satellite industry has invested billions of dollars that must be protected going forward. Fortunately, coexistence between terrestrial mobile operations and ViaSat’s critical 28 GHz Band earth stations is feasible as long as terrestrial mobile operators design and deploy their networks to accept a reasonable amount of unwanted energy from satellite earth stations.

ViaSat also supports proposals to allow the licencing of a broad range of earth stations, including blanket-licensed user terminals, under the existing secondary designation in the 28 GHz Band for satellite earth stations. Sharing technologies, such as database solutions, thoughtful siting and existing sharing and satellite and terrestrial network radio frequency management techniques, can enable broad sharing between satellite and terrestrial networks in ways that were not feasible at the time the current Ka-band band plan was adopted twenty years ago.

The 37.5-40 GHz band also is important for the continued support and growth of the satellite broadband industry, particularly as the Ka band becomes increasingly congested. ViaSat and other satellite operators have begun laying the groundwork to use this spectrum in future generation satellite networks based on the existing co-primary designation for the band. Given that ISED proposes to fundamentally change the nature of the terrestrial uses for this band (*i.e.*, by allowing mobile services), it is appropriate also to reconsider the existing limitations on satellite operations in this band. In particular, increasing the power limits for space-to-earth transmissions could allow satellite operators to use this spectrum more effectively without impacting terrestrial users. Moreover, the operating environment in this band is conducive to flexible use by any type of satellite earth station (even user terminals on a secondary basis), because the earth stations operate in receive-mode in this band.

ViaSat supports ISED’s proposal to authorize unlicensed wireless operations under Part 15 of the Commission’s rules in the 64-71 GHz band to complement similar operations in the adjacent 57-64 GHz band.

Finally, ViaSat hopes that that representatives of the satellite and terrestrial wireless industries can work together to understand the parameters of their respective networks in an effort to explore the means by which the 28 GHz Band and the 37.5-40 GHz band could be shared and bring the benefits of 5G services to all Canadian over multiple network technologies. ViaSat continues to be available to seek to find a path forward that allows all interested parties to

maximize the use of those bands. That said, at this juncture, it is clear that in order for sharing to work in the 28 GHz Band or the 37.5-40.0 GHz band, all parties need to invest in new technology and contribute to creating an environment where spectrum can be used intensively and efficiently. One type of user should not have to bear the entire burden of sharing where other types of users in a greenfield deployment can implement reasonable measures to accommodate shared uses, including populating databases that alert other spectrum users of their operations, or employing modern antenna technology that helps eliminate the effect of sources of unwanted energy.

ViaSat's comments on specific ISED proposals are explained below:

Question 4-1: Given the disruptive nature of 5G, will new business models and network applications develop that may require policy and regulatory consideration from ISED? Please describe potential new business models and network applications as well as their benefits to Canadians.

Satellite broadband services are also part of the anticipated 5G ecosystem or network of networks. As part of the ongoing standards studies and various 5G vision discussions, satellite services are being included as part of the solution. ViaSat urges ISED to take this fact into account in any policy and regulatory considerations that encourage competition, innovation, and investment in broadband infrastructure for *all* Canadians.

Question 5-1: ISED is seeking comments on developing a flexible use licensing model for fixed and mobile services in the 28 GHz and 37-40 GHz frequency bands, and allowing licence-exempt use of the 64-71 GHz frequency band ahead of WRC-19 and before 5G technology standards are finalized.

ViaSat supports the introduction of flexible use licensing model for fixed and mobile services in the 28 GHz and 37-40 GHz bands. Any new services in the bands, however, must take into account existing users' requirements, like satellite broadband services, that are growing and need additional spectrum, like 28 GHz and 37-40 GHz for gateways and user terminals. As competition grows and consumer broadband requirements expand, satellite services also must have access to additional spectrum resources, just like terrestrial services.

ViaSat encourages ISED to allow licence-exempt use of the 64-71 GHz frequency band as early as possible.

Question 6-1: ISED is seeking comments on the changes proposed above to introduce flexible use licensing in the 28 GHz band, including consequential changes to the CTFA domestic 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.

ViaSat supports ISED's proposal to continue having soft partitioning to promote spectrum sharing and introduce flexible use licensing in the 28 GHz band, including consequential changes to the CTFA domestic footnotes and the policy on this band, as long as ISED ensures that satellite broadband services have protected access to grow and compete in the band for gateways

and user terminals, both fixed and mobile, taking into account 5G deployment. These type of policies considerations will ensure maximum spectrum utilization into the future depending on how 5G actually deploys.

ViaSat does not think that it makes sense to continue to limit earth stations to large antennas for feeder links only. Smaller antennas are being deployed, including for feeder links as satellite technology advances, making this provision obsolete. Smaller gateway antennas are also easier to deploy and provide greater opportunities for low-cost siting and shielding, making spectrum sharing even easier.

In addition, there is no need to ban ESIMs, any kind of ESIMs, without further study. While it is appropriate for ISED to continue to allow maritime and airborne ESIMs on a case-by-case basis, there is no need to exclude land-based ESIMs from that same category. The antenna control and network management capabilities of today's satellite broadband networks allow for a high degree of control. In places where 5G may not deploy in the near-term or ever, it would make no sense to categorically prohibit an important and growing class of satellite broadband user terminals, because ESIMs only operate under control of a NCMC and are location aware. They can be dynamically commanded to avoid operating within an area where 5G has deployed. Therefore, ViaSat urges ISED to allow all ESIMs on a case-by-case basis and continue to study broader policies and rules to permit access for all services.

Question 6-4:

A. ISED seeks comments on its proposal to require site-by-site coordination between proposed flexible use terrestrial stations and FSS earth stations in the 28 GHz band when a pre-determined trigger threshold is exceeded.

ViaSat does not think that it would be wise to leave satellite broadband access to site-by-site coordination without some type of framework for both parties. While ISED should expect terrestrial and satellite licencees to be able to work together to resolve any deployment issues, it is important for ISED to ensure there are basic 'rules of the road' that will ensure both spectrum users have equitable access. One spectrum user, especially a potential competitor, should not have gatekeeper status over another party.

B. If site-by-site coordination is proposed, what coordination trigger and value would be the most appropriate (e.g. PFD or distance threshold)?

For future earth stations, those not covered by grandfathering, ISED should consider developing a reasonable PFD value that takes into account real world deployments of both satellite earth stations and terrestrial 5G networks. The PFD value should be based upon a reasonable value for I/N, such as -6 dB.

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

Aside from grandfathered earth stations, ISED should not prescribe specific methods for meeting particular values at this point, but instead, provide guidance on a general deployment environment and allow satellite and terrestrial operators to find ways to meet those reasonable requirements. This will allow both parties to use existing and potentially future sharing techniques without creating a specific method for doing so.

Question 6-5:

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 28 GHz band.

ViaSat agrees with ISED's view that it would not be appropriate to limit the areas in which fixed-satellite services can be deployed in Canada. Satellite earth station licencees have successfully deployed earth stations with terrestrial services for many years. Because it is not known at this time how 5G mobile services will be deployed, it would not make sense to adopt rules that prohibit satellite deployment. In particular, there is no need to limit the growth of FSS earth stations in core urban areas or near major infrastructure, even where 5G may deploy.

The 28 GHz band has long been a future growth band for satellite broadband services and is now seeing deployment of satellites, gateways and user terminals capable of operating in the band. Growth in these bands is necessary to accommodate satellite broadband user demand. ViaSat believes that with a balanced spectrum sharing approach, ISED can authorize robust 5G deployment and allow satellite broadband growth in the bands as well, even near urban cores. As ViaSat explained above, satellite earth stations are getting smaller, including for feeder link gateways, making spectrum sharing through natural and made-made techniques more possible than ever, including in urban areas, close to good fiber. Therefore, ViaSat does not believe that there should be blanket or substantial restrictions on satellite earth station access to the 28 GHz band, but that a measured approach to spectrum management is appropriate until more is known about how 5G terrestrial services will actually deploy.

In any case, all existing and previously planned satellite earth stations that were designed and planned prior to ISED's proposed changes in the band should be protected. For example, ViaSat and its Canadian partners expect to be filing for gateway and user terminal access to the band in the near term to allow use of the band on the new ViaSat-2 satellite. The same can also be expected for future ViaSat-3 satellites that are already under design and construction based on the current regulatory and legal spectrum frameworks in the band.

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.

ViaSat believes that geographic restrictions are not necessary and that gateways and user terminals should be allowed anywhere they can share with terrestrial 5G services, when they deploy. For example, ViaSat has demonstrated through measurements in the U.S. that by roof mounting an earth station and using reasonable shielding on the sides of the roof, unfettered operation of 5G equipment providing services below roof level is possible. If necessary, satellite

broadband systems can find ways to switch frequencies or avoid use of frequencies when sharing with terrestrial services is not possible.

Question 6-6: ISED is seeking comments on whether it should impose any limits on the aggregate emissions of the terrestrial services. If limits are proposed, ISED is inviting detailed proposals on why they should be implemented, and what the limits should be.

ViaSat has studied the issues associated with potential satellite receiver interference from possible terrestrial 5G deployments. At this point in time, it is not very clear what the typical 5G deployment will be in mmWave bands, particularly because of the propagation characteristics. One of the use cases that has been studied, however, described in simulations in the FCC's Spectrum Frontier proceeding, involves a 5G base station pointed upward, toward the top floor or roof of a building, which could occur when a 5G operator is trying to serve mobile users inside or on top of that building. ViaSat has explained in the FCC proceeding that such uses, as well as any other 5G uses that generate unwanted energy toward the orbital arc, pose a risk of both co-channel interference and adjacent channel interference into satellite receivers. That is, the 5G uses could generate (i) interference into satellite receivers operating in the 28 GHz band (27.5-28.35 GHz), as well as (ii) interference into satellite receivers operating in the adjacent 28.35-28.6 GHz band. Under certain deployment scenarios, this could threaten the ability of satellite operators to close satellite service links in the presence of enough interference. Similar to how satellite earth stations employ an off-axis e.i.r.p. density mask to protect other satellite services and an e.i.r.p. density limit toward the horizon, an e.i.r.p. density mask toward the GSO arc could be employed for 5G without limiting in any real way their operations terrestrially.

Question 6-7: ISED proposes that all existing FSS earth stations and those in applications pending approval for operation would be permitted to continue to operate under the current conditions of licence as described above. Comments are sought on this proposal.

ViaSat generally agrees with ISED's proposal to grandfather existing earth stations that are licenced or applied for in the band, with one important exception. ViaSat strongly requests that ISED extend the proposed grandfathering to the effective date of the new rules being adopted as part of this consultation and include earth stations associated with satellite networks applied for before the consultation was issued. In particular, ViaSat applied for market access for the ViaSat-2 FSS network (UK-KA-1) on April 13, 2017 and was granted market access on June 1, 2017.⁵ ViaSat and its Canadian partners have gateway earth stations under construction and in some cases, have completed construction and will be filing shortly to seek authorizations for critical gateway facilities for the ViaSat-2 satellite as well as fixed and mobile user terminals that will be capable of operating on the 28 GHz frequencies. It would not be appropriate to have expected ViaSat or its Canadian partners to have anticipated the changes proposed by ISED in this consultation when it began designing and constructing the ViaSat-2 network over five years ago and before it was published in June. In addition, it could have the unintended and

⁵ ISED Authorization Letter for VIASAT-2 for service from 69.9° W.L. from Shari Scott, A/Director, Space Services Operations, dated June 1, 2017 to Daryl Hunter, Senior Director, Regulatory Affairs, ViaSat, Inc., ISED File No. 3150-1 (676778 CP).

unnecessary consequence of limiting critical broadband services to Canadians. Therefore, ViaSat requests that ISED adopt the same approach to grandfathering that the FCC did in the Spectrum Frontiers proceeding and extend grandfathering to all earth stations filed before the effective date of any 28 GHz band changes adopted as a result of this consultation. This grandfathering extension should apply for any replacement satellite networks as well.

Question 7-1: ISED is seeking comments on the proposal to implement flexible use licensing in the frequency band 37-40 GHz, including the consequential changes to CTFA footnote C51, while continuing to allow for fixed-satellite service (space-to-Earth) in the band.

ViaSat agrees with ISED's proposal to continue to allow for satellite deployment in the 37.5-40 GHz band with limitations designed to impose minimal constraints on terrestrial services. ViaSat is currently designing satellites that will begin use of the Q/V bands in the 2022 timeframe, so these bands are considered one of the few places that satellite services can expand as the Ku and Ka bands get used more extensively. ViaSat agrees that it makes sense to seek shareholder input on a mechanism to accommodate multiple services and would be willing to participate in that process. ViaSat, as previously discussed above, does not think that ISED should adopt a provision in the rules (e.g., MOD C51 (CAN-17) that specifically calls out "small numbers of large antennas for feeder links" as the primary example of FSS earth stations that will operate in the band. While these may be the main type of satellite earth stations used for feeder links today, satellite network designs are changing and earth stations are getting much smaller. Therefore, it makes little sense to prescribe a particular number or size of earth station when coexistence is really the only issue.

Question 7-2: ISED is seeking comments on whether a moratorium on the issuance of new licences under the New Licensing Framework for the 24, 28 and 38 GHz Bands and Decision on a Licence Renewal Process for the 24 and 38 GHz Bands is required at this time.

ViaSat does not believe that licencing moratoriums, if they are intended to include satellite services, are necessary or useful in these bands.

Question 7-4:

A. ISED seeks comments on the proposal to require site-by-site coordination between proposed flexible use terrestrial stations and FSS earth stations in the frequency band 37.5 -40 GHz when a pre-determined trigger threshold is exceeded.

ViaSat supports the adoption of a PFD coordination trigger, as discussed above. In addition, as the deployment of terrestrial fixed and mobile uses in these bands is still difficult to understand, as well as the propagation characteristics for these terrestrial services, ViaSat believes that the appropriate course of action for ISED is to continue to work with stakeholders to develop efficient spectrum sharing techniques, based on specific network characteristics, once they become clearer. It does not make sense to prejudge the types of networks and sharing techniques that may be available until more is known about the spectrum use cases and typical equipment designs.

B. If site-by-site coordination is proposed, what coordination trigger and value would be the most appropriate (e.g. PFD or distance threshold)?

See above.

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

See above.

Question 7-5:

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 frequency band 37.5-40 GHz.

ViaSat would caution ISED to be careful about adopting geographic restrictions at this point. There should not be any specific restrictions on earth station deployments until more is known about the type of 5G terrestrial networks that will operate in these bands. In addition, ISED should not assume that earth stations will be small in number and very large. This may not be in the case in the future. Earth stations should be permitted anywhere they can fit in without causing significant disruption to terrestrial networks. In addition, renewals of earth station licences and replacements of existing earth stations in the same area should be permitted.

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?

See comment above.

Question 7-6: It is proposed that, should SRS and/or MSS systems be deployed, flexible use licensees in the band 37.6-40 GHz may be subject to technical provisions to facilitate co-existence. Comments are sought. ISED notes that any such technical provisions would be established through a future consultation process.

MSS is one possible use case for these bands by satellite services in the future. ViaSat would look forward to participating in a consultation on the technical and regulatory framework to allow those types of applications and services to be deployed.

Question 8-1: ISED is seeking comments on its proposal to designate the band 64-71 GHz for licence-exempt operations on a no-protection, no-interference basis.

ViaSat supports ISED's proposal to designate the band 64-71 GHz for licence-exempt operations on a no-protection, no-interference basis. It makes sense to harmonize this spectrum with the approach taken by the FCC in the United States. This will permit North American - wide service to be developed.