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Innovation, Science and Economic Development Canada
c/o Senior Director, Spectrum Licensing and Auction Operations
235 Queen Street, 6th Floor
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Re: Canada Gazette Notice No. SLPB-004-18
Consultation on Revisions to the 3500 MHz Band to Accommodate Flexible Use and Preliminary Consultation on Changes to the 3800 MHz Band

Intelsat US LLC ("Intelsat"), Inmarsat ("Inmarsat"), and SES S.A. ("SES") appreciate the opportunity to comment on the *Consultation on Revisions to the 3500 MHz Band to Accommodate Flexible Use and Preliminary Consultation on Changes to the 3800 MHz Band*, Canada Gazette Notice No. SLPB-004-18 (the "Consultation" and "Preliminary Consultation," respectively). Both Intelsat and SES have numerous satellites on the *List of foreign satellites approved to provide fixed-satellite services (FSS) in Canada* that provide services in Canada utilizing the 3450-3650 MHz (the "3500 MHz band") and 3650-4200 MHz (the "3800 MHz band") frequencies. Collectively, Intelsat and SES provide roughly half of the C-band services provided to Canadians.[1] Inmarsat operates C-band feeder links and telemetry, tracking, and command ("TT&C") functions that are critical to support mobile-satellite service ("MSS") operations in Canada and across the Americas.

Intelsat operates the world's first Globalized Network, delivering high-quality, cost-effective video and broadband services anywhere in the world. Intelsat's globalized network combines its expansive satellite backbone with terrestrial infrastructure, managed services, and an open, interoperative architecture to provide customers with a new generation of network services. Thirty-four satellites operated by Intelsat have been approved for use in Canada – and all but three of these satellites include C-band frequencies.

Inmarsat operates a global satellite communications system of 13 geostationary orbit ("GSO") space stations offering diverse services in the L-, S-, and Ka-bands. Inmarsat's global L-band satellites provide a plethora of services including mobile voice and data, Internet of Things applications, and vital safety of life services relied upon worldwide by governments, enterprises, and individuals. These L-band satellites

[1] *See Canada C-band Market Analysis* by Northern Sky Research filed in the proceeding of the Canadian Radio-television and Telecommunications Commission (Oct. 2014) that culminated in *Review of Telesat Canada's price ceiling for C-band fixed satellite services,* Telecom Decision CRTC 2016-127.

require access to C-band spectrum for feeder links and TT&C operations. Inmarsat's C-band earth station located in Weir, Quebec Canada is one of two sites that provide feeder link and TT&C services to support Inmarsat's L-band MSS services in Canada and across the Americas.

SES, with its Canadian subsidiary Ciel Satellite Limited Partnership, is one of the world's largest commercial communications satellite operators, with both GSO and non-geostationary orbit ("NGSO") satellites providing telecommunications services. SES operates 16 satellites that have been approved to provide FSS in the 3625-4200 MHz band in Canada, and this capacity is being used to provide valuable services to Canadians. For example, SES provides 12 transponders of capacity on the SES-2 satellite to the Kativik Regional Government, which delivers critical C-band communications capability to more than 14 communities in the Nunavik region. Along with providing faster internet and other services to residents in the region, SES's C-band service also enables important connectivity for schools, hospitals, and government facilities.[2] Although services to remote areas may be less likely to be impacted by terrestrial 5G in the near term, SES's ability to provide these services is dependent on the ability to provide C-band capacity across North America. If that ability were limited in some way, the business case for building replacement or expansion C-band satellites may become more difficult to make.

As Innovation, Science and Economic Development ("ISED") noted in its *Consultation on the Spectrum Outlook 2018 to 2022*, satellite systems play a vital role in providing communications capabilities in rural, remote and northern areas as well as providing services in urban areas. Satellite is also adept at providing services quickly in response to emergencies, such as natural disasters when terrestrial telecommunications infrastructure may be disabled, unavailable, or over capacity.

Satellite networks are long-term investments - satellites take years to design, construct, and launch. One of the earliest and most critical determinations made in the planning phases for a new satellite is the spectrum that will be used. Once a satellite has begun construction, any design changes are costly, both in terms of time and investment, and in some cases may even be impossible. Similarly, on-orbit satellites cannot be changed. Therefore, the satellite industry requires regulatory certainty, particularly with regards to spectrum. A number of the satellites approved by ISED to provide services in C-band have been launched in the past five years, such as the Intelsat 35e satellite that launched just last year. Provided the continued ability to use C-band spectrum in Canada, satellites such as Intelsat 35e will be able to offer service to Canadians for decades.

In these comments Intelsat, Inmarsat, and SES focus on the questions raised by ISED in the Preliminary Consultation. As a general point, Intelsat, Inmarsat, and SES encourage ISED to forgo any changes to the 3800 MHz band at this time. Unlike the spectrum below 3650 MHz, the 3800 MHz band is heavily used for the broad distribution of video content and the provision of data services to remote communities. Furthermore, as ISED notes in the Preliminary Consultation, many satellite antennas receiving video content may not even be known to ISED. Therefore, protecting these antennas could be a complicated and drawn out task.

ISED has already successfully identified 300 MHz of mid-band spectrum from 3400-3700 MHz for mobile services in Canada. This spectrum should be fully utilized by the mobile terrestrial industry before the more complicated review of the 3800 MHz band is undertaken. Additionally, if ISED changes the allocation in the 3800 MHz band in the future, it should ensure that current and future satellite use is protected.

[2] SES Expands Government Services Portfolio in Canada, available at https://www.ses.com/press-release/ses-expands-government-services-portfolio-canada (Jan. 5, 2016).

Q14 – ISED is seeking preliminary comments on how to optimize the use of the 3650–3700 MHz band, including the potential use of a database access model.

The 3650-3700 band is used in Canada by numerous C-band satellites. Many C-band satellites providing service to Canadian users support this frequency band. Therefore, the primary FSS allocation is an important part of the Canadian Frequency Allocation Table and should remain so for years to come.

Intelsat, Inmarsat, and SES recognize that there is already a primary mobile allocation in the 3650-3700 MHz band, and that new FSS earth stations, as of June 11, 2009, are only authorized on a secondary basis. Intelsat, Inmarsat, and SES are not opposed to the deployment of 5G in this band. However, FSS satellites need to have continued access to the 3650-3700 MHz band, and ISED should accordingly allow the operation of current and new FSS earth stations in this band, particularly in areas where mobile operators will not deploy mobile networks. Additionally, ISED should continue to maintain the list of grandfathered earth stations contained in SAB-001-09. Inmarsat has plans to launch additional satellites that include the 3550-3700 MHz band for feeder link operations, so continued access to this band is critical.

If mobile services are authorized in the 3650-3700 MHz band, it is critical that ISED establish appropriate out of band emissions limits that will protect FSS receivers operating in the 3700-4200 MHz band and evaluate if in-band power limits are required on mobile transmitters to avoid overload of FSS low-noise block amplifiers operating in the adjacent bands. The signals received at the earth station are very weak and subject to interference from high power adjacent band terrestrial transmitters. As noted above, the services provided by satellites in the 3700-4200 MHz band are critical to Canadians and demand a very high level of reliability. The introduction of out of band emissions and high power adjacent band transmissions from mobile services below 3700 MHz could dramatically impact the reliability of those satellite services.

Q15 – ISED is seeking comments on the importance of the 3700–4200 MHz band to future FSS operations.

As ISED clearly recognizes in the Preliminary Consultation, the 3700-4200 MHz band remains an important workhorse of the satellite industry. The heavy use by FSS operators is reflected by the approximately 50 C-band FSS satellites that are currently licensed or approved for use in Canada by ISED. The demand for C-band satellite services is robust and continues to grow as innovations in the band support new satellite service offerings. Several satellite operators, including Intelsat and SES, recently launched C-band satellites that provide coverage over Canada and have plans for future satellites that include C-band communications payloads that will offer a multitude of services in the country. Future Inmarsat satellites will also include TT&C carriers in this frequency band. Intelsat, Inmarsat, and SES expect strong demand for C-band satellite services to continue in Canada and in the rest of North America, particularly in under- and unconnected areas where satellite provides an unmatched communications platform.

The importance of C-band for satellite communications is mainly due to its superior propagation conditions, as lower frequencies are less susceptible to rain attenuation. Other spectrum bands, such as the Ku- or Ka-bands, are not adequate substitutes for the reliability provided in C-band because their propagation conditions cannot ensure the same quality of service required for broadcasting services.

Instead the Ku- and Ka-bands are complementary to the C-band, as their propagation conditions are more suitable for other services.

Intelsat, Inmarsat and SES recognize that there is a parallel proceeding occurring in the United States addressing C-band frequencies. Specifically, the U.S. Federal Communications Commission ("FCC") has initiated a rulemaking proceeding to consider whether to make part or all of the 3700-4200 MHz band available for terrestrial wireless broadband services. However, the FCC's activities do not reflect the best approach for Canada. The spectrum landscape in the 3700-4200 MHz band in Canada is very different from the landscape in the United States. Unlike the United States, Canada has the opportunity to open up 300 MHz of spectrum for 5G mobile terrestrial deployment in the 3400-3700 MHz band, while continuing to take into account protection of existing FSS sites and access to additional FSS earth stations on a case by case basis. In contrast, in the United States there is only 150 MHz of spectrum available for terrestrial 5G deployment below 3700 MHz due to other service designations.

Q16 – ISED is seeking comments on whether unlicensed operators in the 3700–4200 MHz band should be required to submit their technical parameters to ISED to assist in frequency management.

Co-frequency sharing in the same geographic area without exclusion zones and other measures to protect earth stations is not technically feasible, and as ISED has pointed out in the Preliminary Consultation, the number and location of unlicensed TV-receive only ("TVRO") stations and cable head ends are unknown. Without precise information on the location and scope of deployment of earth stations, it is impossible for ISED to protect them.

Intelsat, Inmarsat and SES recognize that the registration of satellite receive only antennas can be arduous and costly, particularly for entities with numerous antennas or smaller entities with limited staff and financial resources. To avoid an undue burden, any required submission of information on receive only antennas should be balanced with the burden of the submission. ISED should only require the minimum amount of information necessary to protect the stations in question and should allow the entities submitting information to do so in one filing per entity.

Q17 – ISED is seeking comments on which steps Canada should take to optimize the use of the 3700–4200 MHz band in consideration of the current services being provided and the developing technologies that would permit the use of new services in this band (e.g. exclusion zones).

As noted above, Canada should focus on opening-up the 3400-3700 MHz band for 5G deployment resulting in 300 MHz of spectrum for mobile terrestrial deployment, while maintaining protection for existing FSS earth stations and access for further deployment of specific FSS earth stations on a case by case basis. ISED should ensure mobile operators develop and maximize use of spectrum below 3700 MHz before considering reallocating any of the spectrum above 3700 MHz for terrestrial use. In doing so, Canada could satisfy the demand for mid-band spectrum for Canadian consumers not just in the short-term but also in the longer term.

Q18 – ISED is seeking comments on the challenges and considerations related to the coexistence of other services, such as mobile and/or fixed wireless access, in the 3700–4200 MHz band.

Co-frequency sharing in the C-band downlink spectrum risks harming incumbent satellite operations and significantly constraining terrestrial 5G operations. FSS receive earth stations are susceptible to

interference from terrestrial transmissions, and increases in interference levels could lead to disruption of critical C-band satellite services. To avoid disruption to consumers, ISED would need to impose large protection zones around each satellite earth station. The exact size of these protection zones would need to be determined, but would likely be in the tens to hundreds of kilometers.