Submission of

SES Americom, Inc., New Skies Satellites B.V., SES Satellites (Gibraltar) Ltd, and Ciel Satellite L.P. (together "SES")

in response to SMSE-014-20: *Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band*

January 19, 2021

Introduction

SES Americom, Inc., New Skies Satellites B.V., SES Satellites (Gibraltar) Ltd, and Ciel Satellite L.P. (together "SES") hereby submits its comments on the *Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band* ("Consultation") issued by Innovation, Science and Economic Development Canada's ("ISED") on November 19, 2020.[1]

The SES group of companies is a global provider of satellite and connectivity solutions headquartered in Luxembourg with operations around the world. SES provides services to broadcasters, governments, telecommunications companies, and enterprises in all parts of the world. Through its subsidiaries, SES operates a fleet of over 50 geostationary ("GEO") satellites in multiple frequency bands, including in the 5925-7125 MHz band with coverage of Canada. SES is also the operator of the innovative O3b constellation of 20 high-throughput, low-latency satellites in Medium Earth Orbit ("MEO"). In 2021, SES will be launching its fourth GEO High Throughput Satellite (HTS), SES-17, as well as its next-generation of MEO satellites called mPOWER, which will provide even more throughput and flexibility. Together, SES's satellites cover 99% of the world's population. Through its affiliate Ciel Satellite L.P., SES also operates the Canadian-authorized Ciel-2 satellite in the Ku-band Broadcasting Satellite Service frequencies at 129° W.

Responses to Questions

Q1
ISED is seeking comments on the timelines for the availability of:

- ***a. low-power equipment ecosystems, both Wi-Fi 6E and 5G NR-U***
- ***b. standard-power equipment ecosystems, both Wi-Fi 6E and 5G NR-U, under the control of an AFC***
- ***c. AFC***

No comment.

Q2
ISED is seeking comments on its proposals to allow licence-exempt RLAN use in the 5925-7125 MHz band.

The 5925-7125 MHz frequency band, especially the 5925-7025 MHz portion of the band, is used extensively and intensively for a wide range of satellite services, for both government and commercial applications, including for broadcast distribution across Canada and broadband connectivity to Canada's rural areas and the North. More than a dozen geostationary satellites operated by SES or its affiliates are authorized to provide service in Canada using various portions of this band. The band is also used extensively for the fixed service, including for public safety services.

[1] ISED, SME-14-20, *Consultation on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band, available at* https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11643.html.

SES does not oppose the introduction of licence-exempt RLAN use in the 5925-7125 MHz, provided that adequate measures are in place to protect the primary Fixed Satellite Service (FSS) and Fixed Service (FS) in the band.

Q3
ISED is seeking comments on the proposed footnote Cxx and the changes to the CTFA as shown in table 2.

The footnote for RLANs applicable in the 5925-7125 MHz band should adhere closely to the existing footnote C39A in the CFTA, which applies to similar licence-exempt devices in the adjacent 5725-5825 MHz band. Specifically, SES recommends using the text of footnote C39A with the following modifications to reflect the more detailed regulatory framework required for the 5925-7125 MHz band:

> CXX~~39A~~ The frequency band 5 925-7 125~~5 725-5 825~~ MHz is designated for use by licence-exempt wireless local area networks and devices in accordance with the established spectrum policy and technical framework~~maximum power levels~~, and based upon not interfering with, or claiming protection from, licensed services."

Q4
ISED is seeking comments on the proposed rules for standard-power RLANs:

- ***a. indoor and outdoor operation would be permitted***
- ***b. RLAN access points would only be permitted to operate under the control of an AFC system in the 5925-6875 MHz frequency range***
- ***c. maximum permitted e.i.r.p. would be 36 dBm***
- ***d. maximum permitted power spectral density would be limited to 23 dBm/MHz***
- ***e. use of a vertical elevation mask, with a maximum e.i.r.p. of 125 mW at elevation angles above 30 degrees over the horizon, would be required***

At the outset, SES notes that the technical conditions for standard-power RLANs proposed by ISED are incomplete. The parameters mentioned in Q4 mirror those adopted by the U.S. Federal Communications Commission ("FCC") for standard-power *access point* devices. However, the FCC adopted different technical conditions for standard-power RLAN *client* devices communicating with such access points: maximum EIRP of 30 dBm and maximum EIRP density of 17 dBm/MHz.

SES is concerned that allowing "standard-power" outdoor RLANs in 5925-6875 MHz would lead to aggregate interference into primary FSS uplinks operating in the same band. While the FCC concluded, based on a study by RKF Engineering ("RKF Study"),[2] that aggregate interference from RLAN devices in the United States is not expected to cause the I/N of typical

[2] Frequency Sharing for Radio Local Area Networks in the 6 GHz Band, prepared by RKF Engineering Services, LLC, Attachment to Ex Parte Filing of Apple Inc. *et al*., FCC GN Docket No. 17-183, filed Jan. 25, 2018 ("RKF Report").

FSS uplinks to exceed -20 dB,[3] it does not mean that the aggregate interference issue can be ignored. If anything, aggregate interference from RLAN devices into Canadian C-band satellite services requires more serious consideration since the uplink beams of C-band satellites serving Canada will typically also cover the continental United States. They will thus "see" interference from RLAN devices in both countries (or beyond, depending on the coverage of the beam footprint).

According to ITU Recommendation S.1432, the aggregate interference budget for FSS uplinks from all non-primary interference sources (e.g. licence-exempt RLANs) is 1% of system noise or an I/N of -20 dB.[4] The RKF Study relied upon by the FCC showed that, based on detailed assumptions including about 2% of outdoor usage, that U.S. RLAN devices will result in an I/N of -21.9 dB by 2025,[5] *i.e.*, it would consume nearly all of that -20 dB I/N budget reserved for non-primary services.

Admittedly, an I/N of -20 dB is quite a low aggregate interference threshold. Nevertheless, it is the one specified in ITU Recommendation S.1432 for non-primary interference sources. But even if a higher aggregate interference threshold is used, at high enough levels of RLAN deployments, especially outdoors, even an I/N or -13.5 dB or -10.5 dB could be exceeded by 2025. The European Communications Committee ("ECC") conducted its own detailed, parametric RLAN/FSS compatibility studies in this band, using agreed assumptions, and found (unsurprisingly) that levels of aggregate interference into FSS uplinks were quite sensitive to the levels of outdoor RLAN deployment.[6] In particular, the ECC found that if the proportion of outdoor deployments in Europe was 5% instead of 2%, then the aggregate I/N of -13.5 dB or -10.5 dB would be approached or exceeded for some FSS satellites serving Europe.[7] This led Europe to prohibit "standard-power" outdoor RLAN operations, and to instead limit RLAN devices to low-power indoor-only operations, and very-low-power outdoor operations.[8]

RLAN proponents may argue that historically outdoor RLAN deployments have not exceeded 2%, so the assumptions in both the RKF and ECC studies show a worst-case FSS interference scenario that will never happen. SES hopes that is true. However, creating a special class of "standard-power" RLAN device for outdoor use would seem to encourage higher levels of outdoor deployment than the historical level. Moreover, licence-exempt RLAN deployments will not stop in 2025. The lesson from both the RKF and ECC studies remains the same: at sufficiently high levels of outdoor RLAN deployments, aggregate interference into FSS uplinks will become a serious issue.

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[3] FCC, *Unlicensed Use of 6 GHz*, FCC 20-51, at ¶ 92 (2020), *available at* https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses.

[4] *See* ITU-R Recommendation S.1432-1, *Apportionment of the allowable error performance degradations to fixed-satellite service (FSS) hypothetical reference digital paths arising from time invariant interference for systems operating below 30 GHz*, *recommends* 4 (2006), *available at* https://www.itu.int/rec/R-REC-S.1432/en.

[5] *See* Letter from Apple, Broadcom, et al. to FCC (Jan. 25, 2018), *attaching* RKF Engineering, *Frequency Sharing for Radio Local Area Networks in the 6 GHz Band*, at 4, 42 (2018).

[6] *See* ECC Report 302, Sharing and compatibility studies related to Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) in the frequency band 5925-6425 MHz, at 4, 106-107, Annex A6.1 (2019), *available at* https://docdb.cept.org/download/cc03c766-35f8/ECC%20Report%20302.pdf.

[7] *Id.*

[8] *See* ECC Decision (20)01 (Nov. 2020), *available at* https://docdb.cept.org/document/16737.

In SES's view, a vertical elevation mask that limits the EIRP to 21.5 dBm at 30 degrees or greater above the horizon (as adopted by the FCC) would help, but may only delay the onset of aggregate interference. In particular, it should be noted that the vertical elevation mask would apply only to access point devices, with client devices allowed to operate at up to 30 dBm EIRP in the vertical plane. Moreover, in Canada, a 30-degree elevation mask would still expose large sections of the geostationary arc to "standard-power" emissions of up to 36 dBm allowed for access points.

As a result, SES would ask ISED to consider different or additional measures for the protection of FSS uplinks from aggregate interference in Canada. One method of doing so would be to limit RLAN deployments to low-power indoor-only operations, as both Europe and Korea have done. Europe, for instance, only allows indoor RLANs at EIRP levels up to 23 dBm and an EIRP density of 10 dBm/MHz (i.e. lower EIRP but higher EIRP density than the FCC). Similarly, Korea limited RLANs to indoor operations at EIRP levels up to 24 dBm. In both Europe and Korea, only very-low-power licence-exempt devices (EIRP 14 dBm) were allowed to operate outdoors. This approach might also be attractive if AFC implementation in Canada is more complicated than in the U.S. because of the need to protect non-public, public safety FS links.

However, if ISED allows outdoor "standard-power" RLAN devices as the FCC has done, then SES urges ISED to consider at least a modified vertical elevation EIRP limit for access points starting at 15 degrees above the horizon instead of 30 degrees. Such a modified mask would ensure that far more of the geostationary satellite receivers visible from Canadian latitudes are not exposed to potentially the full EIRP and EIRP density allowed for outdoor standard-power RLAN access points. SES understands that such a measure is easily achievable with proper installation. Moreover, because standard power access points would generally need to point towards the ground to serve client devices, such an operating condition would not substantially impact service. Of course, this still leaves the client devices emitting up to 30 dBm upwards towards these access points, and potentially the geostationary arc.

In addition, ISED should consider requiring the AFC system in Canada to be capable of protecting against aggregate interference into FSS uplinks. The FCC rejected the use of the AFC to control for aggregate interference to the FSS on the grounds that calculating the interference from all outdoor RLAN devices in the direction of the geostationary arc in real-time would be too complicated. However, in SES's view, it need not be that complicated. The only capability that the AFC system needs is the ability to limit the number of simultaneous transmissions in a given frequency channel for all devices within its control. This maximum number of simultaneous transmissions can be set by ISED based on offline simulations, without the need for real-time computation. Importantly, this maximum number can be fine-tuned over time based on actual real-world observations of aggregate interference into FSS uplinks. Thus, if ISED believes that aggregate interference will not be an issue in the near term, the maximum number could be set initially at a very high number. But if the FSS operators are later able to demonstrate that RLAN deployments are causing aggregate interference problems into their uplinks, then there will at least be mechanism to control for aggregate interference at such time.

Q5
ISED is seeking comments on allowing access to the additional 100 MHz of spectrum in the 6425-6525 MHz sub-band for standard-power operation.

See response to Q4 regarding measures to protect primary FSS uplinks from standard power outdoor operations in 5925-7075 MHz. SES would also note that cross-border coordination will be necessary between Canadian use of standard-power RLANs in 6425-6525 MHz and U.S. use of the same band for TV auxiliary services.

Q6
ISED is seeking comments on the equipment availability of standard-power RLANs in the 6425- 6525 MHz band and the impact on the development of AFC systems for Canada due to a potential lack of international harmonization for that sub-band.

SES provides no comments on standard-power equipment availability in the 6425-6525 MHz band.

Q7
ISED is seeking comments on the proposed rules for low-power indoor-only RLANs:
a. operation would be permitted indoor only across the 5925-7125 MHz band
b. the use of a contention-based protocol (e.g. listen-before-talk) would be required
c. maximum permitted e.i.r.p. would be 30 dBm
d. maximum permitted power spectral density would be limited to 5 dBm/MHz

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

ISED's proposal for Low Power Indoor operation aligns with the U.S. rules for low-power indoor access point devices. SES notes, however, that the FCC imposed more stringent EIRP and EIRP density limits of 24 dBm and -1 dBm/MHz respectively for client devices connected to such access points. SES recommends that the Department adopt both the access point and client power limits adopted by the FCC so as to harmonize the indoor equipment ecosystem in the U.S. and Canada.

As explained above, in SES's view, limiting RLAN devices in 5925-7125 MHz to low-power indoor-only operations is more likely to provide long-term protection for FSS uplinks from aggregate interference than allowing standard-power outdoor operations (as the ECC concluded in ECC Report 302 and ECC Decision (20)(01)).

Q8
ISED is seeking comments on the proposed rules to allow very low-power RLAN devices:

a. ***operation would be permitted indoors and outdoors across the frequency range 5925-7125 MHz band***
b. ***the use of a contention-based protocol (e.g. listen-before-talk) would be required***
c. ***maximum permitted e.i.r.p. would be 14 dBm***
d. ***maximum permitted power spectral density would be limited to -8 dBm/MHz***

SES opposes standard-power outdoor RLAN deployments as posing risks of aggregate interference into FSS uplinks. However, very-low-power operations with a maximum EIRP of 14 dBm, combined with an EIRP density limit of -8 dBm/MHz, may be acceptable. Both Europe and Korea adopted this EIRP limit for very-low-power outdoor operations. The FCC has deferred consideration of very low power operations to a subsequent proceeding in order to consider the potential for interference into the FS.

Q9
ISED is seeking comments on potential business models for AFC administrators to operate their AFC systems in Canada.

SES does not take a position on potential business models for AFC systems. If there are multiple AFC databases and/or database operators, they must communicate with each other or a central AFC database to ensure consistency of information and to account for aggregate emissions.

Q10
ISED is seeking comments on its proposal to permit the approval of multiple, third party AFC systems, taking into account the potential for the development of a sustainable market for AFC systems in Canada.

If there are multiple AFC databases and/or database operators, they must communicate with each other or a central AFC database to ensure consistency of information and to account for aggregate emissions.

Q11
ISED is seeking comments on potential exit strategies if the AFC administrator decides to cease operation in Canada.

If there are multiple AFC databases and/or database operators, they must communicate with each other or a central AFC database to ensure consistency of information and to account for aggregate emissions.

Q12

ISED is seeking comments on adopting an AFC system model that is harmonized to the maximum extent possible with the AFC system model being implemented in the U.S. and other international markets.

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

As explained in the response to Q4 above, ISED should consider requiring the AFC for Canada to be capable of controlling aggregate interference by, e.g., being able to cap the maximum number of simultaneous transmissions in each channel nation-wide. While the FCC did not require this for the U.S. AFC, it would be prudent to make this a requirement to ensure that FSS operators can have some redress in the future if, due to mass deployment of outdoor RLAN devices in this band, can have some redress. As explained above, the maximum number of simultaneous transmitters is a number that need not be calculated in real-time by the AFC, but can be set by ISED based on offline simulations. Importantly, the maximum number can be fine-tuned and adjusted over time in response to actual observed aggregate interference. Without such capability in the AFC, there would be no ability to control for aggregate interference should it occur in the future.

Q13

ISED is seeking comments on the implementation considerations for the operation of an AFC system, specifically:

- ***a. information required from licensed users***
- ***b. interference protection criteria for computation of exclusion zones***
- ***c. c. information required from standard-power Aps***
- ***d. frequency of AFC update of licensee information***
- ***e. security and privacy requirements***

For an AFC to control for aggregate interference into FSS uplinks, it would need to be able to limit the number of AFC devices that can simultaneously transmit in each frequency channel at any given time.

Q14

ISED is seeking comments on any additional considerations, limits or general concerns that should be taken into account in setting detailed standards and procedures for AFC operation.

In providing comments, respondents are requested to include supporting arguments and rationale and take the Canadian context into consideration in their response.

No comment.

Q15

ISED is seeking comments on its proposal to require AFC systems to protect the following types of licensed stations from standard-power APs:

- ***a. fixed microwave stations***
- ***b. fixed point-to-point television auxiliary stations***
- ***c. radio astronomy stations***

In providing comments, respondents are requested to include supporting arguments and rationale.

No comment.

Q16
ISED is seeking comments on the sample agreement related to the designation and operation of an AFC system in Canada.

To the extent multiple AFC database developers and/or operators might be selected, the agreement must account for the need for the databases to communicate with each other, or with a central database, to ensure consistency of information and to implement aggregate interference protections.

Q17
ISED is seeking comments on the proposed approach to incremental implementation of an AFC system in Canada.

So long as the AFC system once fully implemented is designed to prevent aggregate interference to FSS uplink receiver, SES does not have comments on the specific implementation timeline.

Q18
ISED is seeking comments on the objective to maximize the potential for synergies, where possible, in defining the technical and administrative requirements for the respective databases addressing different bands under different technical regimes.

In SES's view, any potential synergies from defining similar technical or administrative requirements for the databases used to enable opportunistic use of spectrum, must be a secondary consideration to the need to protect the primary, allocated services in a frequency band from interference. The database developed for one band (e.g. TV White Space or U.S. CBRS) may not be suitable for another band (e.g. 6 GHz) simply because the allocated services in the band are different and require different measures to ensure interference protection.

In the case of the 6 GHz band, there are primary FSS uplinks in the band that are susceptible to aggregate interference (which are not present in the TV White Space or CBRS bands). As SES has submitted, ISED should first determine that the AFC database developed in 6 GHz should control for aggregate interference, and then consider whether there are synergies to be had from adopting a database developed in another band without FSS uplinks. It should be noted that the U.S. CBRS database appears to account for aggregate interference into FSS downlink earth stations, so it is at least conceivable that an AFC in 6 GHz may be required to have the capability to control for aggregate interference. See response to Q4 above for what the AFC would need to be able to do in order to address aggregate interference.