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Consultation on Proposed Allocation of 6 GHz Band

Dear Madam,

SES World Skies Singapore Pte Ltd, on behalf of the SES Group ("**SES**"), hereby provides its comments regarding the public consultation issued by the InfoComm Media Development Authority (IMDA) on *Proposed Allocation of 6 GHz Band in Singapore* ("Consultation Paper")[1] released 14th February 2023.

SES is a global satellite operator with a fleet of nearly 70 satellites in geostationary orbit as well as the innovative O3b Ka-band constellation of High Throughput Satellites in medium Earth orbit. In 2022, SES began launching the next generation of O3b satellites called "O3b mPOWER" which will provide even higher throughput and unmatched flexibility.

I Proposed Technical Requirements for Allowing RLAN Use on a Licence-exempt Basis in the Lower 6 GHz Band (5,925 MHz – 6,425 MHz)

As Wi-Fi deployments increase in the 6 GHz band (5925 MHz - 7125 MHz), aggregate interference will pose a threat to primary Fixed Satellite Service ("FSS") uplinks, and adequate measures are therefore required to limit the potential for such impact. SES is not opposed to IMDA's proposal on allocating the lower 500 MHz (5925 MHz -6425 MHz) of the 6 GHz band for RLAN / Wi-Fi use in Singapore based on the proposed technical parameters in the Consultation Paper.

SES notes the acknowledgement, at paragraph's 5 and 8 of the Consultation Paper, that some countries have demonstrated the feasibility of Wi-Fi co-existing with such incumbent services such as FSS, in the lower 500 MHz of the 6 GHz band and adjacent bands, under certain technical conditions. Notably, those adopted by the European Conference of Postal and Telecommunications (CEPT) Administrations and the United Kingdom's Office of Communications.

[1] See: https://www.imda.gov.sg/-/media/Imda/Files/Regulations-and-Licensing/Regulations/Consultations/2023/Proposed-Allocation-of-6-GHz-Band-in-Singapore--Public-Consultation-final.pdf

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In this regard, the IMDA's proposal – maximum 24 dBm EIRP, 11 dBm/MHz EIRP density for Low Power Indoor ("LPI"), and 14 dBm EIRP, 1 dBm/MHz EIRP density for Very Low Power ("VLP") outdoors – is generally consistent with operating conditions studied and adopted in South Korea as well the UK, Australia and New Zealand. In the same vein, studies conducted by the CEPT adopted a maximum 23 dBm EIRP, 10 dBm/MHz EIRP density for LPI. The CEPT levels present even more appropriate operating conditions for the protection of FSS uplinks in the band. Such levels provide an appropriate baseline for the consideration of rules for LPI and VLP RLANs in this band. Consistent with principles associated with the operation of license exempt[2] devices, SES expects RLAN operations in this band would be a non-protected basis vis-a-vis primary services such as the FSS that would continue to be protected and can be deployed without constraints in the future.

II Standard power, including for outdoor use

SES notes the Consultations Paper's reference[3] to the use of standard power devices to facilitate fixed outdoor deployment at higher power, and that as such use is still nascent and yet to be widely adopted globally, IMDA will continue to monitor the development and review the demand and feasibility to allow such use in Singapore in the future.

SES avails itself of this opportunity expressing its opposition to outdoor deployments of Wi-Fi under "standard power" (i.e., higher powered) whether under the control of an automatic frequency coordination ("AFC") system or not. Unlimited deployment of Wi-Fi, especially outdoors and at high power, poses a long-term threat of aggregate interference to FSS uplinks in the 6 GHz band. While no single Wi-Fi transmitter is expected to cause interference, an FSS uplink beam on a satellite will "see" all Wi-Fi transmitters within its coverage area. At large enough levels of Wi-Fi deployment within such coverage area, especially outdoors, aggregate interference into FSS uplinks will be observed and lead to degradation of satellite link performance.

The CEPT Electronic Communications Committee ("ECC") studied aggregate interference from Wi-Fi into FSS uplinks in the 6 GHz band. It found that by 2025, at high levels of outdoor Wi-Fi deployment (5% outdoors), aggregate interference from Wi-Fi would cause FSS uplinks to experience an I/N approaching or even exceeding the I/N allowed to be caused by a co-primary service in the same band under Recommendation ITU-R S.1432 (i.e., an I/N of -10 dB, apportioned between the Fixed Service and Wi-Fi). Following this study, the ECC established LPI and VLP limits to… "*help ensure long term protection of FSS space stations from aggregate interference from WAS/RLAN devices*." [4]

In SES's view, the U.S. approach of allowing much higher powered "standard power" Wi-Fi devices to be deployed outdoors (at up to 36 dBm EIRP and 23 dBm/MHz EIRP density for access points) discounts the risks of aggregate interference into FSS uplinks. In effect, this approach assumes that levels of outdoor deployments would be similar to historical levels of outdoor Wi-Fi deployment (i.e., lower than 5%) and would never be so great as to ever pose an aggregate interference problem for

[2] As is anticipated by IMDA, to give effect for licence-exempt RLAN use in the 5,945 MHz – 6,425 MHz band, by amending the Telecommunications (Exemption from Sections 33, 34(1)(b) and 35) Notification. See Annex A - Consultation Paper, note 4 at page 7 of the Consultation Paper.
[3] See Annex A - Consultation Paper, paragraph 4.
[4] ECC Report 302, at 4. See ECC Decision 20(01) at Table 1 and Table 2.

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FSS space stations. This is an odd assumption, as one would expect that the creation of a special class of unlicensed high-powered device for outdoor usage would result in much higher than historical levels of outdoor Wi-Fi deployments. In turn, the deployment of more outdoor Wi-Fi access points will likely lead to greater outdoor use of client Wi-Fi devices (operating at up to 30 dBm EIRP and 17 dBm/MHz EIRP density).

The U.S. did impose an EIRP limit (21 dBm) in the skyward direction (at more than 30 degrees elevation) on unlicensed outdoor Wi-Fi access points to provide some protection for the FSS against aggregate interference. However, this reduced EIRP limit is no substitute for the attenuation that would be expected from an indoor use requirement. This skyward EIRP limit also does not apply to outdoor client devices (which may continue to operate at up to 30 dBm) and remains much higher than the outdoor very low power EIRP limit (14 dBm) adopted by the ECC for the long-term protection of the FSS.

The AFC system adopted by the U.S. to manage standard power outdoor Wi-Fi access point devices is specifically not intended to provide protection against aggregate interference into the FSS. Instead, it is intended only to ensure that Wi-Fi devices protect primary Fixed Service receivers operating in the same band using a database of licensed Fixed Service locations and frequencies. SES notes, however, that an AFC system could (in theory) be designed to control aggregate interference into FSS uplinks by, for example, enforcing a nationwide limit on the total number of emitters operating at a given time.

SES is therefore of the view, there can be no assurance that license exempt Wi-Fi devices would remain “low interference potential” with respect to the primary FSS without indoor restrictions and low or very low power limits, especially when there is no reliable means of capping the aggregate emissions from Wi-Fi.

III RLAN Use on a Licence-exempt Basis in the Upper 6 GHz Band (6,425 MHz – 7,125 MHz) and/or Mobile Service in the 6 GHz Band

Whilst not addressed directly in the Consultation Paper, SES would not oppose consideration of the upper 6 GHz band for RLANs as license exempt, at the proposed power limits for the lower 6 GHz (i.e. maximum 24 dBm EIRP, 11 dBm/MHz EIRP density for LPI, and 14 dBm EIRP, 1 dBm/MHz EIRP density for VLP outdoors). It will be recalled that FSS systems operate across the full 6 GHz band and satellite operators have long term plans for the use of the band, particularly the upper 6 GHz band, where for instance 6425 - 6575 MHz is used for feeder uplinks for MSS systems, supporting safety of life services such as GMDSS and AMS(R)S. Furthermore, the band 6725-7025 MHz has a special status under the ITU Radio Regulations. As the uplink band for the ITU Appendix 30B Allotment Plan, this spectrum allocation is intended to ensure all countries have access to spectrum and orbital resources for satellites.

SES would oppose any proposed use of the 6 GHz band (upper or lower) for the Mobile Service. Any proposed outdoor use of the band for the Mobile Service would likely involve even higher power levels than “standard power” RLANs, and therefore represent an even greater long-term risk of aggregate interference into FSS uplinks (as explained above).

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IV Conclusion

In summary, SES is not opposed to IMDA's consideration to allow Wi-Fi devices operate in the entire 1200 MHz of the 6 GHz frequency band. In as much as SES is of the view, such Wi-Fi use should be subject to LPI and VLP outdoor deployments. SES would not support "standard power" (i.e., higher powered) outdoor deployments of RLANs in the 6GHz band, whether under the control of an automatic frequency coordination (AFC) system or not.

Please contact the undersigned if you have any questions.

Yours Sincerely,

/s/

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