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Consultation on the Proposed Approaches to Introduce the Next Generation of Mobile Services – 5G Mobile Services and Networks

Dear Ms. Chia,

As a leading global satellite operator with its Asia-Pacific headquarters located in Singapore, SES World Skies Singapore Pte Ltd (together with its affiliates, "SES") is deeply interested in the outcome of the Infocomm Media Development Authority's ("IMDA") Consultation Paper on "5G Mobile Services and Networks." The Consultation Paper considers a number of frequency bands used on current and future SES satellites – both geostationary and non-geostationary – for future 5G mobile use. In this regard, SES fully supports the submission made by the Satellite Associations in this Consultation,[1] but would add a few points of emphasis.

As explained in detail in Satellite Associations comments,[2] SES believes that satellites will play an important role in the future 5G mobile ecosystem. The latest and next-generation High Throughput Satellite ("HTS") and Very High Throughput Satellite ("VHTS") systems – operating in a variety of frequency bands – can and will deliver the multi-gigabit speeds needed for Enhanced Mobile Broadband ("eMBB"). Satellites already support Internet-of-Things (IoT) networks today (e.g. global asset tracking on ships and planes), and can scale to support future Massive Machine Type Communications ("mMTC"). Satellites can also support ultra-reliable and low-latency communications, especially as more HTS and VHTS constellations come on line. In fact, for 5G mobile networks to deliver applications that require the lowest latency (sub-1ms), it will be essential for commonly accessed content to be efficiently delivered to and stored at multiple cellular nodes for quick delivery – a point-to-multipoint or broadcast function at which satellites excel.

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[1] *See* Comments of Asia-Pacific Satellite Communications Council, CASBAA, Global VSAT Forum and EMEA Satellite Operators Association (filed 7 July 2017) ("Satellite Associations' Comments").
[2] Satellite Associations' Comments at 1-4.

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As a result, we would encourage IMDA to consider the spectrum needs of all parts of the 5G ecosystem (including the satellite component), and not just the needs of the terrestrial mobile component. The spectrum decisions for future 5G mobile networks should not, and need not, be mutually exclusive of satellite services.

In the C-band frequencies, SES operates 22 geostationary satellites around the world, of which two operate over Singapore and neighbouring countries, including in the extended C-band above 3.6 GHz. SES is seeing continuing demand for the C-band frequencies by satellite users, including from users in the Asia-Pacific region. We also understand Singapore's neighbours have launched a number of satellites that operate in the 3.4-3.6 GHz band, as well as in adjacent bands. It is therefore imperative that any decision by Singapore to use the 3.4-3.6 GHz band for 5G mobile systems be accompanied by appropriate and enforceable protections against interference into co-frequency and/or adjacent band satellite operations above 3.6 GHz in neighbouring countries and any that remain in Singapore itself, as mentioned in the Consultation and as elaborated upon in the Satellite Associations' Comments.[3]

In the mmWave spectrum, globally, SES operates two (2) geostationary satellites in portions of the 26 GHz band, nine (9) geostationary satellites in portions of the 28 GHz band, and a constellation of twelve (12) O3b satellites in Medium Earth orbit ("MEO"). In addition, SES has three (3) geostationary HTS systems under construction that will use the 28 GHz band, of which one will be launched in 2018 to serve the Asia-Pacific region. SES's wholly owned subsidiary, O3b, will also launch eight (8) more O3b MEO satellites in 2018 that will use the 28 GHz band. Satellite investments in these bands should not be disturbed, especially when there is more than enough other mmWave spectrum being studied by the ITU for 5G/IMT-2020 to meet IMDA's estimated 5G requirements.[4] In addition, as the IMDA notes, mmWave spectrum in parts of the 26 GHz, 32 GHz, 66 GHz and 81 GHz bands are "most likely" to be internationally harmonized, since each of those bands is being studied by the ITU for possible future 5G/IMT-2020 use, while the 28 GHz band is not. There is simply no need to look beyond the spectrum bands being considered by the ITU under WRC-19 Agenda Item 1.13 in order to meet IMDA's estimated 5G requirements in the mmWave spectrum, and certainly no need to look in the heavily occupied 28 GHz band.

In the Q- and V-band spectrum, SES would note that quite a number of next-generation VHTS systems are being planned using this spectrum. For example, at least six companies – including Boeing, OneWeb, SpaceX, O3b (an SES affiliate), Telesat and Theia – filed applications with the U.S. Federal Communications Commission within the last year to use significant parts of these bands for large constellations of non-geostationary satellites. As the Satellite Associations' Comments make clear,[5] a careful review of the planned satellite use of these bands will need to be undertaken to see if future 5G mobile networks can also be accommodated. However, it may not be necessary to

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[3] *See* Satellite Associations' Comments at 7-8.
[4] It may be that IMDA's estimated 5G spectrum requirements may need to be revised downwards in light of international comparisons, as explained in the Satellite Associations' Comments at 15-16 (App.1, Responses to IMDA Q.13).
[5] Satellite Associations' Comments at 6.

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prioritise these bands for 5G mobile networks if there is enough other WRC-19 Agenda Item 1.13 spectrum to meet IMDA's estimated 5G requirements.[6]

SES thanks the IMDA for the opportunity to comment on the Consultation Paper. Please contact the undersigned if you have any questions regarding this letter.

Yours Sincerely,

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[6] Satellite Associations' Comments at 6-7.

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