AsiaSat
Reaching Further, Bringing You Closer

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Comment on the Consultation Paper Issued by Info-Communications Media Development Authority, Singapore–

Second Consultation on 5G Mobile Services and Networks

The IMDA is seeking views and comments on their second consultation on 5G mobile services and networks. This response is in particular focusing on the impact on the satellite services in overlapping frequency bands newly allocated to mobile and how to avoid the potential interference for co-existence between 5G and satellite services.

AsiaSat would like to provide its response to Question 3 and 5 v) regarding the frequency bands to be used by 5G in C and Ka-bands.

Question 1: IMDA would like to seek the industry's views on skills requirements and the potential job demands in the future of networks and next generation of application/use-cases with 5G technology.

Question 2: IMDA would like to seek views on:
i) The types of innovative use-cases that could capitalise and further enhance Singapore's competitive advantages, trigger new growth potential and/or strengthen Singapore's existing strategic pillars; and
ii) Areas of government support that the industry require in order to enable innovation and development in 5G.

Question 3: IMDA would like to seek views and comments on the suitable technical parameters, including the reasonable amount of guard band needed to reduce potential interference between IMT and FSS use in the 3.5 GHz band.

3.5 GHz band is allocated to fixed-satellite service (FSS) for downlink. It is noted that from the sharing study results, exclusion zones around earth stations are required if satellite services and 5G mobile networks are to co-exist in C-band. Calculated required separation distances to protect FSS receivers from 5G equipment are more than tens of kilometres for co-frequency operation, 0.5 to 5 kilometres for out-of-band spurious emissions and avoid overdrive of LNA/LNBs of earth stations.

AsiaSat notes the geographically very small territory of Singapore where one single 5G radio base station (RBS) can potentially seriously affect the co-frequency satellite C-band reception in Singapore and well into its neighboring countries like Malaysia and Indonesia. This is the case even if 5G mobile network is limited to only small-cell deployment.

Field trial studies were conducted in Hong Kong. Mitigation measures are required to avoid the harmful interference to FSS due to 5G deployment. These mitigation measures include but not limited to optimizing the radiation directions and transmitting power of RBS, introduction of a 5G rejection filter in FSS earth station receiving antennas etc.

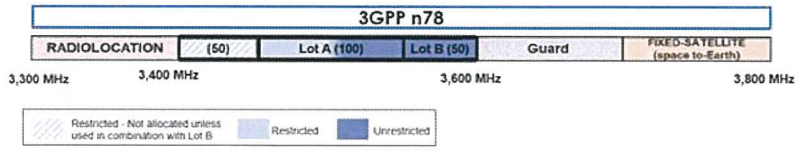
The introduction of a 5G rejection filter in earth station receiving antennas may reduce the separation distance required for protection of FSS receivers from 5G deployment.

Considering the need to protect FSS use and the performance of the filter, if one will be used in the earth station antennas to reduce the potential interference from 5G, AsiaSat suggests that a guard band around 100MHz could be implemented with consideration of imposing a separation distance between the 5G RBS and FSS antenna. It is observed that some Asian countries or areas have adopted a 100MHz guard band between the 5G and the FSS while this particular guard band is not used for any 5G transmission.

It is understood that the selection of guard band bandwidth is due to the 5G rejection filter available in the market. It would be necessary for the IMDA to conduct a survey to find out actual current available equipment in the market before making such a decision. One key note has to be taken, if the guard band is smaller than 100MHz, some type of tailor-made bandpass filter is required or special technology have to be used in the filter and this will drive up the cost of the filter. In addition to the roll-off of the filter characteristics, there are other parameters have to be carefully examined and noted, including rejection ratio in the 5G band, insertion loss in satellite receiving band. Moreover, there are also concerning on the wind loading and deformation of the receiving pattern due to weight and size of the filter.

Question 5: IMDA would like to seek views, comments and suggestions on:
i) Whether Singapore should have two nationwide networks as a start given the considerations and trade-offs;
ii) The proposed 3.5 GHz lot sizes and spectrum packages;

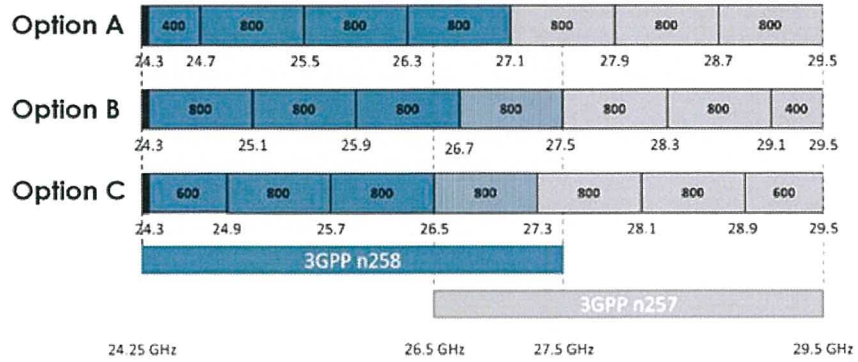
Figure 9: Proposed Band Plan Option for the 3.5 GHz Band



iii) Whether 5G equipment would be able to support 3.5 GHz bandwidths in multiples of 50 MHz;
iv) The value, if any, in assigning the remaining 50 MHz restricted 3.5 GHz spectrum in the same assignment exercise as the unrestricted lots;

v) The proposed mmWave lot sizes and preferred band plan option;

Figure 10: Proposed Band Plan Options for the mmWave Spectrum



The Importance of 26 GHz and 28 GHz bands to FSS

There are two bands of relevance in respect of satellite operation: 24.25-27.5 GHz and 28.5-29.5 GHz.

28GHz

The 28 GHz band is a part of the 27.5-31 GHz globally allocated FSS band. In ITU-R Region 3, the 27-31 GHz band is allocated to the fixed satellite services (FSS) (Earth-to-space) on a primary basis. In Europe, the European Communications Commission (ECC) has assigned the 28 GHz band for satellite uplinks and NOT 5G. Many satellites already use the band or parts of this band, and have had operational, licensed antennas, transmitting in this band.

Furthermore, it may be noted that due to the importance of the band for FSS worldwide, WRC-15 decided NOT to consider the 28 GHz band as a candidate band for IMT (5G) under WRC-19 Agenda Item 1.13. Quite on the contrary, WRC-15 created WRC-19 Agenda Item 1.5 to study use of Earth Station In Motion (ESIMs) operating in the 27.5-29.5 GHz uplink band (and the 17.7-19.7 GHz downlink band) to further expand the FSS applications for this band. Consequently, there will be no global trend to identify the 28 GHz band for 5G through the ITU allocation procedure.

To enable FSS to develop and evolve, AsiaSat would advise against deployment of 5G in the 28 GHz band. Any such deployment should only be on strict non-protected basis and appropriate limits should be applied to avoid interference to receiving space stations.

For the 27-27.5 GHz band, this band is allocated to FSS in ITU-R Regions 2 and 3. While this band is being considered for IMT (5G) by ITU, this band provides a most valuable opening for GSO gateways for High Throughput Satellite (HTS) networks in this region. With the current large interest for NGSO networks with several networks already deployed or in the process of being deployed and noting that one single NGSO system could block access for all GSO networks in the "NGSO bands" (28.6-29.5 / 18.8-19.7 GHz), use of the 27-27.5 GHz could prove essential in enabling sufficient uplink bandwidth for GSO HTS networks, in particular for gateway links. For this reason, AsiaSat would advise against identifying this band for 5G. Should the IMDA nevertheless consider this band for 5G, this would need to be in a manner that would not limit the ability to develop and deploy future transmitting gateway stations in the band, e.g. through 5G operating on a strictly non-protected basis, base stations which, if

encountering interference, should switch to alternative frequencies where interference from FSS is not an issue (e.g. 24.25-24.65 GHz or 25.25-27 GHz).

To provide the required protection of receiving space stations, 5G transmitters in the 27-27.5 GHz band also should adhere to ITU and other relevant standards and limits as may be established. To limit the interference area around transmitting earth stations, a reasonable minimum elevation angle, e.g. 20°, could be considered for earth stations in this band, reducing the emissions levels of earth stations towards the local horizon.

26GHz

The 26 GHz band is predominantly foreseen used for feederlinks for the broadcasting satellite service (BSS) and in particular for BSS in the 21.4-22 GHz band. Since this band was given definitive procedures for use only by WRC-12, noting the 15-20 year lifespan of a satellite, there has been little time to develop and deploy satellites using these bands. It is however known that there are plans in this region to make use of these bands in future satellites. Over time, one therefore should expect to see use of the 24.65-25.25 GHz band for FSS increasing.

While not totally rejecting the use of this band for 5G, AsiaSat is of the view that the ability to provide uplinks for BSS needs to be safeguarded. Any identification for 5G by IMDA in the 26 GHz band as a minimum would need to adhere to the limitations prescribed by WRC-19.

In summary, in considering terrestrial 5G in the 26 GHz and/or the 28 GHz band, it is important to recognize the need to safeguard the evolution and growth of also the satellite industry, including the satellite component of 5G, within this region as a part of the overall telecommunications infrastructure to serve its population, attracting investment by local, regional and international players, with the contributions to the economy.

AsiaSat note that it is unnecessary to select frequency bands which are overlapping with existing FSS allocations in 24.65-25.25 GHz and 27 -29.5GHz. Noting a wide bandwidth is under consideration, it is proposed to IDMA to select the bands which are not overlapping with FSS, 24.25-24.65 GHz and 25.25-27 GHz, two continuous blocks of 0.4GHz and 1.75GHz to give a total of the 2.15GHz frequency spectrum for new 5G deployment.

Thank you for your attention and consideration.

Yours sincerely,

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