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Attention: Principal Regulatory Affairs Manager (R22)
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Dear Mr. Madam/Sir,

AsiaSat Comment on the CA Consultation Paper:
Arrangements for Assignment of the Spectrum in the 3.3 GHz and 4.9 GHz Bands for the Provision of Public Mobile Services and the Related Spectrum Utilisation Fee

1. Introduction

The CA consultation paper published on 28 August 2018 is seeking views on "Arrangements for Assignment of the Spectrum in the 3.3 GHz and 4.9 GHz Bands for the Provision of Public Mobile Services and the Related Spectrum Utilisation Fee". This document provides AsiaSat's views and comments on the proposed arrangement for the spectrum assignment.

2. AsiaSat views and comments to the questions raised in the consultation paper

Question 1: Do you have any views on the proposed amendment to the Hong Kong Table of Frequency Allocations as regards the allocation of the 3.3-3.4 GHz band and the 4.83-4.94 GHz band for mobile service on a co-primary basis in addition to the respective existing uses?

The 3.3 GHz (i.e. 3.3-3.4 GHz) and 4.9 GHz (i.e. 4.83-4.93 GHz) bands are currently not allocated to the fixed-satellite service (FSS) in Hong Kong, but they are adjacent to satellite bands in the 3.4-4.2 GHz and 4.5-4.8 GHz. OFCA, ITU and APT studies as well as practical experience all show that mobile services (i.e. 5G) and FSS reception in the same area is not only infeasible within the same frequency range, it is also infeasible in adjacent frequency bands. The issues of co-existence between

5G in the 3.3 GHz and 4.9 GHz bands with FSS should be very similar to the adjacent band issues related to 5G deployment in 3.4-3.6 GHz and FSS in 3.7-4.2 GHz.

1) Unwanted out-of-band emissions of 5G transmitters

Due to the very low power level of the incoming FSS signals, unwanted emissions generated by 5G base stations or user terminals operating in an adjacent frequency band, can create interference to FSS receivers.

Depending on the type of 5G deployment considered, studies have shown that the separation distances required to offer adequate protection to FSS receivers in respect of out-of-band emissions of 5G transmitters, assuming no guardband between the satellite and 5G signals, are in the range of hundreds of meters to about 1 kilometre for 5G small-cell indoor deployment to tens of kilometres for 5G macro-cell outdoor deployment. With increasing frequency separation between the two signals, it is possible to reduce this required separation distance.

2) FSS receiver LNA/LNB overdrive

Typically, to achieve a low noise figure to allow reception of the very low incoming satellite signals, low-noise amplifiers (LNAs) and low-noise block down-converters (LNBs) are wideband devices with a flat frequency response over the wanted frequency range. Figure 1 shows the typical filtering characteristics of a commercially available LNB where it can be seen that the 3.3 GHz band is in the passband of the LNB. As a result, 5G emissions in the 3.3-3.4 GHz band will have the capability to overdrive the LNA/LNB operating in the 3.4-4.2 GHz band.

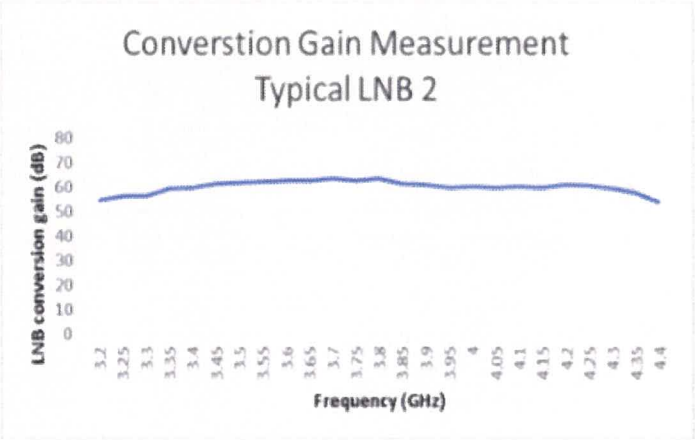

Figure 1 Typical filtering characteristics of a commercially available LNB

Depending on the type of 5G deployment considered, studies have shown that the separation distances required to offer adequate protection to FSS receivers in respect of LNA/LNB overdrive are about a kilometre in respect of 5G small-cell deployment and around 9 kilometres in respect of 5G macro-cell deployment. It is worth noting that this required separation distance does not reduce with increasing frequency separation between the signals.

The CA is proposing to allocate the 3.3 GHz band to 5G, designated for indoor use only.

In previous consultations, AsiaSat has objected to 5G allocations in the 3.4-3.6 GHz band due to the demonstrated detrimental impact on FSS reception in the 3.4-3.6 GHz band and in the 3.6-4.2 GHz and the ability of Hong Kong to retain its position as a regional telecommunications hub, also noting that important functions like control of satellites are conducted from the earth stations located within Hong Kong. AsiaSat however, understands that despite the advice from AsiaSat and the satellite industry, OFCA has decided to identify the 3.4-3.6 GHz band for 5G and even enable outdoor deployment of base stations outside the restriction zones defined in Tai Po and Stanley earth stations. Indoor deployment of 5G in the 3.3-3.4 GHz band would pose less of a problem to FSS reception than outdoor deployment of 5G in 3.4-3.6 GHz, but would still be a source of interference to satellite reception. Moreover, 5G in 3.3-3.4 GHz together with 5G in 3.4-3.6 GHz would lead to a higher aggregated interference level at the FSS receiving antennas.

Importantly, in doing so, OFCA has acknowledged the need to safeguard the critical operation of the signals for control of the satellites from the Tai Po and Stanley earth stations in the 3.4-3.6 GHz and 3.6-4.2 GHz bands and has established restriction zones around the earth stations to this effect. 5G in the 3.3-3.4 GHz also would have the potential to interfere with reception of the satellite control signals and for this reason, there would be a need to ensure this protection also when considering conditions for 5G operation in 3.3 GHz band. For this reason, appropriate requirements in respect of power levels and unwanted emissions of 5G equipment together with restriction zones around the earth stations, albeit possibly smaller than those required for 5G operation in the 3.5 GHz band, would be required for 5G also in the 3.3 GHz band.

The proposed allocation in the 4.83-4.93 GHz band is adjacent to the planned FSS band in the 4.5-4.8 GHz. With the 3.4-3.6 GHz in the C-band taken away by 5G and the detrimental impact on FSS reception in the entire 3.4-4.2 GHz band, this planned band is the only C-band FSS band left where services can be offered with high availability. This band therefore becomes more important for future development of C-band satellite services than before. With a guardband of only 30 MHz, it will be very tough, if not impossible, for FSS to achieve a rejection good enough to avoid the impact from

the power of 5G transmitters operating in the 4.83-4.93 GHz band and the powers from 5G transmitted unwanted emissions falling in the 4.5-4.8 GHz band. Therefore CA's proposal to allocate 4.83-4.93 GHz to mobile services would hinder the operation of FSS in the 4.5-4.8 GHz band, both for general reception within Hong Kong and for reception at the Hong Kong earth stations.

3. Conclusion

For Hong Kong to be able to retain its role as a telecommunications hub and to safeguard the satellite services, it is vital that C-band reception is protected now and also in the future. Currently, 5G has been able to get access to the 3.4-3.6 GHz in the C-band in Hong Kong, causing many difficulties to the existing FSS operation in the C-band. To protect the existing FSS in the C-band and to support the future development of FSS in the planned C-band, AsiaSat strongly advices against allocating the 4.9 GHz band for the mobile services and identifying it for 5G. Furthermore, AsiaSat advices that in considering 5G in the 3.3-3.4 GHz band, required separation distances from 5G base stations to FSS reception earth stations are established and 5G in-band and unwanted emission limits are established which ensures the required for protection of FSS in the 3.4-4.2 GHz band.

Yours sincerely,

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