Submission to the Info-communications Media Development Authority (IMDA):

Comments on Consultation Paper on "Second consultation on 5G mobile services and networks"

JUNE 19TH , 2019

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1. Executive Summary

Samsung Electronics Co., Ltd (hereinafter Samsung[1]) is very pleased to take this opportunity to submit these comments to the IMDA in response to the second consultation on 5G mobile services and networks[2]. Samsung is grateful for the opportunity to work with the IMDA and the industry on 5G spectrum matters and to help Singapore be a global wireless leader and realize the economic and social benefits of 5G. In addition, Samsung would like to express a hearty welcome that the IMDA considers the planning of the 3.5 GHz, 26 GHz and 28 GHz bands to allocate mobile service on a primary basis for Singapore 5G service.

In section 2, Samsung provides views and comments on the issue for questions on 5G. Samsung fully supports the IMDA taking into account both the 3.5 GHz band and 26/28 GHz bands for 5G in order to drive an early 5G market in 2020 and to realize the full potential of 5G.

Finally Samsung thanks the IMDA for the opportunity to comment on the public consultation, and looks forward to working closely with the IMDA in order to realize commercial 5G in Singapore before 2020.

2. Views and Comments

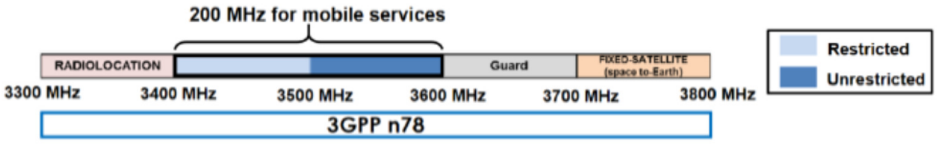
In this section, Samsung provides views and comments for each question.

Chapter 3: Proposed Regulatory Policy and Framework for 5G Deployment in Singapore

Q3. 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.

From the consultation paper, Samsung recognizes that the IMDA considers approximately 100 MHz bandwidth as guard band between 5G/IMT and FSS.

Figure 1: Available spectrum in the 3.5 GHz band in Singapore



However, we are of the view that 100 MHz guard band on 3.6 GHz to 3.7 GHz will be wasteful. Other countries using also satellite services such as the USA, the Republic of Korea, Australia, etc. have already allocated up to 3.7 GHz band for their mobile service. And Japan has allocated up to 4.1 GHz band for their 5G service on April 10th, 2019. Even though there are geographical clusters in Singapore with dense deployment of FSS services using the 3.5 GHz band, Singapore could use the

[1] Further information on 5G is available at https://www.samsung.com/global/business/networks/insights/?news

2 Available at https://www2.imda.gov.sg/regulations-and-licensing/Regulations/consultations/Consultation-Papers/2019/Second-Public-Consultation-on-5G-Mobile-Services-and-Networks

band for the mobile service taking into account other countries' experiences. ***Therefore, Samsung recommends that IMDA consider less guard band than 100 MHz. And Samsung also recommend the IMDA to consider the entire 3.6-3.7 GHz band for 5G/mobile service usage in the near future.***

Q5. IMDA would like to seek views, comments and suggestions on:

iii) Whether 5G equipment would be able to support 3.5 GHz bandwidths in multiples of 50 MHz;

In order to support 5G service, 3GPP has defined the detailed technical specifications for 5G NR in June 2018. From the technical specifications, the Frequency Range 1 (FR1) covering bands from 450 MHz to 7 125 MHz can support a variety of channel bandwidth from 5 MHz to 100 MHz. In addition, the technical specifications can be achievable up to 16 carrier aggregation.

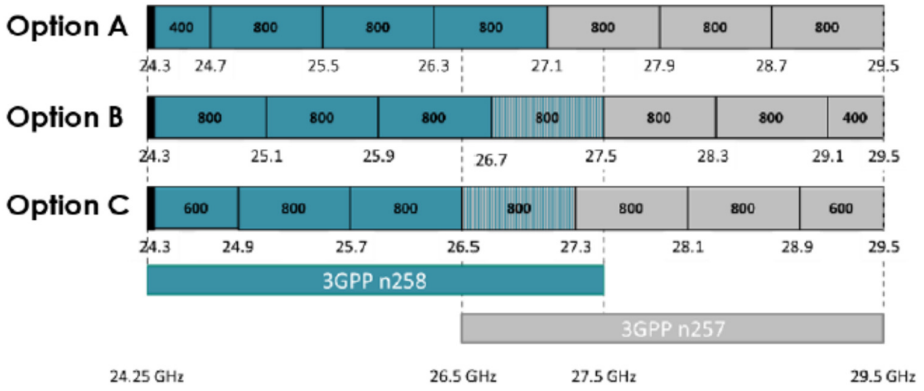
Moreover, in April 2019, mobile operators in Korea have started their 5G commercial service using the 3.42-3.7 GHz band. Among three mobile operators, KT and SKT are using 100 MHz bandwidth and LG Uplus is using 80 MHz bandwidth. ***Therefore, we are of the view that 5G equipment is able to support 3.5 GHz bandwidths in multiples of 50 MHz.***

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

As indicated the clause 74 in the consultation paper, also in conjunction with WRC-19 matter, Samsung fully supports that IMDA will put in place operational regulations within the licensing condition such as the minimum distance away from shore for maritime ESIM (60 to 120 km) and altitude limit (6 km) for aeronautical ESIM[3] to mitigate interference issues from satellite service in order to protect mobile service using the 28 GHz band.

With regard to mmWave bands band plan, Samsung has also similar view with the IMDA. Among three options, option B and C aligned with 3GPP NR n257, 258 and n261 could be considered as appropriate band plans. Meanwhile, some blocks in the 26 GHz band defined as 3GPP n257 NR band should be taken into account WRC-19 outcomes. Therefore, Samsung is of the view that core-blocks, e.g. 25.1 GHz to 28.3 GHz in option B and 24.9/25.7 GHz to 28.1/28.9 GHz in option C, could be considered as the first early initial 5G spectrum bands in Singapore.

Figure 2: Proposed band plan options for the mmWave spectrum by IMDA



[3] Available at the final CPM report in preparation for WRC-19

Q6. IMDA would like to seek views, comments and suggestions on:

Samsung supports for IMDA to consider 5G NR based on SA network architecture. Samsung would like to point out that 3GPP Rel-15 can support 5G NR SA. To meet time frame facilitating early deployment of 5G starting from 2020 based on SA network architecture, therefore, Samsung recommends that IMDA consider 3GPP Rel-15 technology supporting NR SA as the starting point.

Q10. IMDA would like to seek views and comments on following:

i) The interest from industry players to leverage 5G spectrum or other mobile spectrum bands for fixed-wireless services that support mobile connectivity; and

ii) The policies (e.g., spectrum allocation, numbering) that should be considered to facilitate such use-cases.

FWA services, as one of the 5G services, ensuring QoS in last one mile would also require mmWave bands, so that mmWave bands is worth to realize 5G era. And we would like to emphasize that commercial 5G FWA[4] service using mmWave band has already been introduced in October 2018. Therefore, spectrum allocation for FWA service as one of the 5G services is also suggested.

3. Acronyms and Abbreviation

3GPP	3rd Generation Partnership Project
CPM	Conference Preparatory Meeting
ESIM	Earth Station in Motion
FSS	Fixed Satellite Service
FWA	Fixed Wireless Access
IMT	International Mobile Telecommunications
NR	New Radio
QoS	Quality of Service
SA	Standalone
WRC	World Radiocommunication Conferences

4. Contacts

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[4] Available at http://telecoms.com/492549/5g-becomes-real-as-verizon-launches-fwa-offering-in-four-cities/