

MEASAT's Comments towards IMDA's 2nd Consultation on 5G Mobile Services and Networks

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

5G will drive creation of jobs - ranging from designing, deploying and maintaining the networks as well as beneficiary industries. These jobs enhance expertise (and quality) of the workforce as well as require transformation in skills. Among others, skill requirements for (i) telecommunication engineers with knowledge in MIMO, mmWave, network slicing, (ii) programmer with skills to write programme for Artificial Intelligence (AI), robotics; and (iii) system management for smart cities, autonomous vehicles, industrial machines. These new job opportunities will emerge and transform the economy from low-skilled labour to high-skilled labour.

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 requires in order to enable innovation and development in 5G.*

No comments.

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.*

Taking into account the study conducted in other parts of the world, an appropriate guard band would be necessary but may not be a sufficient measure to protect continuous operation of fixed satellite service (FSS) in the C-band. To avoid interference from IMT signals to FSS operation above the guard band, the FSS receivers will still need to be retrofitted with filters.

At the same time, to protect the FSS in the standard C-band within Singapore, a 100 MHz guard band is optimal in order to warrant sufficient signal suppression of the relatively strong mobile signals by the band-pass filter. In particular, leveraging on the 100 MHz guard band, the recommended band-pass filter that operates in the 3.7 – 4.2 GHz range shall suppress unwanted mobile signals at frequencies below 3.6 GHz by at least 55 dB.

Additionally, IMDA needs to consider the implementation by neighboring countries in addressing the amount of guard band required to ensure harmonization and minimize interference issues. Explicitly, in accordance with ITU-R Radio Regulation No 5.432B, the use for IMT is subject to agreement obtained under No. 9.21 with other administrations. Hence, for neighbouring countries like Malaysia and Indonesia, it is critical to ensure that the power flux density (pfd) limit at the border of the territory of these countries are met.

Question 4: IMDA would like to seek views and comments on the following:

- i) Whether the industry agrees with the timelines on the expected availability of the next wave of 5G spectrum; and
- ii) Whether current deployments in the 2.5 GHz FDD spectrum band (based on 3GPP Band 7) and in the 2.5 GHz TDD spectrum band (based on 3GPP Band 38), should be refarmed to 3GPP Band 41 for future 5G services in Singapore, and the views on the associated cost and challenges.

Any re-allocation exercise by IMDA in the 3.5 GHz band will also affect MEASAT as one of the regional satellite operators. MEASAT currently operates MEASAT-3, MEASAT-3a, Africasat-1a which will have a lifetime in orbit up to years ranging from 2023 to 2028. MEASAT also has plans to continue utilizing the entire 3.4–4.2 GHz for MEASAT-3d that is scheduled to be launched in 2H'2021 to replace MEASAT-3. This satellite will also carry the 28 GHz band. Therefore, MEASAT seeks IMDA to consider activities by all regional satellite operators and their long-term investments prior to making available the 3.5 GHz, 26 GHz and 28 GHz bands for 5G.

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;
- 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; and
- vi) The rank order preference of the 3.5 GHz spectrum package and mmWave lot combinations.

MEASAT believes that allocation to (minimum) two operators will make the 5G infrastructure and services more competitive. However, the increased in number of operators should not correspond to demand for additional (proposed) 50 MHz block. These operators should work efficiently to utilize the spectrum i.e. ensure that the network speed, performance and need is fully satisfied.

At the same time, MEASAT urges IMDA to remove consideration of the 28 GHz band as a terrestrial 5G band, for reasons discussed in Question 4 above.

Question 6: IMDA would like to seek views, comments and suggestions on:

- i) The proposed network rollout and performance obligations to be imposed on the spectrum right holders;
- ii) The methodology and measurement criteria for the coverage obligation;
- iii) The network design and resilience challenges of 5G (in particular, enabling technologies, such as SDN, NFV and Cloud Computing that may fundamentally change how the network would be designed and deployed) and possible measures to address them, and whether there are other aspects that should be considered to enable trusted and resilient 5G network; and
- iv) The framework for the provision of 5G wholesale services.

MEASAT critically believes that the proposed network rollout should consider incumbent users and services and streamline arrangements to ensure that there is no/minimal impact. In particular, spurious emissions from 5G network equipment into the adjacent frequency bands should be controlled stringently.

Question 7: IMDA would like to seek views, comments and suggestions on the spectrum assignment framework, including:

- i) The proposed assignment approach;*
- ii) The spectrum right duration of the 3.5 GHz package and mmWave lots;*
- iii) The evaluation criteria, sub-criteria and weights to assess the proposals;*
- iv) The assessment methodology, including evidence (documentary or otherwise) to evaluate the proposals; and*
- v) The enforcement and/or audit mechanisms to ensure that applicants are able to deliver on their proposals.*

No comments.

Question 8: IMDA would like to seek views and comments on the trade-offs (particularly on resilience, 5G capabilities) and technical feasibility of the various levels of infrastructure sharing.

No comments.

Question 9: IMDA would like to seek views and comments on the following:

- i) The synchronisation approach for 5G TDD networks in a multi-operator environment for the 3.5 GHz and mmWave bands, specifically for the following:
 - a. Synchronised networks: the required frame alignment, compatible frame structures and BEM specifications for AAS and non-AAS base stations; and*
 - b. Unsynchronised networks: the amount of guard band, geographical separation and BEM specifications for AAS and non-AAS base stations;**
- ii) The adoption of other suitable mitigation measures to mitigate interference between unsynchronised networks; and*
- iii) The need for IMDA to mandate a regulatory requirement for synchronisation across the 5G TDD networks or leave it to operators to co-ordinate their network deployment and parameters in order to reduce interference between networks.*

No comments.

Question 10: IMDA would like to seek views and comments on the 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.*

No comments.
