PUBLIC CONSULTATION ISSUED BY THE INFO-COMMUNICATIONS MEDIA DEVELOPMENT AUTHORITY

ON

NEXT WAVE OF 5G GROWTH & DEPLOYMENT IN SINGAPORE: POLICY ISSUES & PROPOSED REGULATORY DESIGN FOR 2.1 GHZ BAND

26 JULY 2021

CHAPTER 1: INTRODUCTION

1. 5G plays a key role in the growth and development of Singapore's mobile market and economy as a whole. Beyond faster mobile broadband speeds, 5G is expected to enable a multiplicity of new and innovative use-cases which leverage on 5G technology and network capabilities, in areas such as smart estates, industry 4.0, urban mobility, maritime operations, amongst others.

2. IMDA had articulated its 5G policy objectives in IMDA's Decision on the *Policy for Fifth-Generation (5G) Mobile Networks and Services in Singapore* issued on 17 October 2019 (**5G Decision**), including the following:

   a. Maximise value of 5G for the economy and welfare for the consumers;

   b. Facilitate efficient allocation of scarce spectrum resources;

   c. Bring about 5G networks that are secure and resilient; and

   d. Support the growth of Singapore's telecommunications sector.

3. To achieve these policy objectives, IMDA's 5G Decision indicated that IMDA would facilitate 5G networks that were based on Standalone (**SA**) network architecture. Given the limited amount of spectrum in the 3.5 GHz band which was issued as part of IMDA's 5G Call for Proposal (**CFP**), IMDA had facilitated the deployment of two nationwide 5G SA networks for a start. Deployments of these two nationwide 5G SA networks, one by Singtel Mobile Singapore Pte Ltd (**Singtel**) and the other by a Joint-Venture Consortium formed by M1 Limited (**M1**) and StarHub Mobile Pte Ltd (**StarHub**), are ongoing and are making progress towards achieving at least 50% outdoor coverage by end-2022 and nationwide outdoor coverage (at least 95%) by end-2025.

4. In IMDA's 5G Decision, IMDA had also identified the next wave of 5G spectrum that would be suitable for 5G in Singapore. Among these bands, is the 2.1 GHz band that is currently supporting 3G services, and will be expiring on 31 December 2021[1].

5. The expiry of the 2.1 GHz band, if assessed to be suitable for 5G, affords IMDA the opportunity to support the next wave of 5G growth for all Mobile Network Operators (**MNOs**), including the opportunity for the deployment of additional nationwide SA networks, if there is market demand.

6. This document sets out IMDA's policy proposals on the allocation and use of the 2.1 GHz spectrum band upon the expiry of the existing spectrum rights. In developing the policy proposals, IMDA had sought early views from the four MNOs, namely M1, Singtel, StarHub and TPG Telecom Pte Ltd (**TPG**) and have taken their views into consideration.

[1] Besides frequency spectrum in the 2.1 GHz band, M1, Singtel and StarHub were also issued unpaired frequency spectrum in the 1.9 GHz Time Division Duplex (**TDD**) band (1904.9 MHz – 1920 MHz) in their respective spectrum rights which were issued in 2001. The allocation of spectrum in the 1.9 GHz TDD band will be reviewed separately from the 2.1 GHz band.

7. For the avoidance of doubt, all the information provided and views expressed in this consultation paper are for the purpose of discussion and consultation only. Nothing in this consultation paper represents or constitutes any decision made by IMDA. The consultation contemplated by this consultation paper is without prejudice to the exercise of the powers by IMDA under the Telecommunications Act (Cap. 323) or any subsidiary legislation thereunder.

CHAPTER 2: TECHNOLOGICAL & MARKET DEVELOPMENTS

8. In assessing the suitability of 2.1 GHz for 5G use in Singapore, IMDA considered whether the 2.1 GHz band could be used to support other services, including legacy 3G and 4G, as well as international trends and global ecosystem developments.

5G Networks & Services

International Trends – Increasing use of 2.1 GHz for 5G

9. The 2.1 GHz band is one of the sub-6 GHz bands with good propagation characteristics, which makes it beneficial for 5G coverage.

10. The 2.1 GHz band is increasingly being used for the deployment of 5G networks internationally, including in Germany, Hong Kong and United Kingdom. Since IMDA's Consultation on the *Proposed Policy Frameworks for the Allocation of 800 MHz, TDD 1900 MHz and FDD 2100 MHz Spectrum Bands* issued on 17 May 2019, several countries have auctioned the 2.1 GHz band for 5G use and others, like Australia and Norway, are conducting trials to assess its suitability for 5G.

11. The number of countries using the 2.1 GHz band for 5G networks is expected to increase as the demand for 5G picks up and as regulators around the world assess its suitability for 5G deployment.

Global Ecosystem Maturity

12. The 5G ecosystem for the 2.1 GHz band has also been growing. Today, the New Radio (**NR**) band "**n1**" (i.e., where the 2.1 GHz spectrum band lies) is supported by many network equipment vendors, chipset manufacturers and device vendors.

13. Overall, the device ecosystem for 5G in this band has matured at a faster pace than expected. Based on statistics from the Global mobile Suppliers Association Analyser for Mobile Broadband Data, as at end-June 2021, the number of 5G handsets operating on the 5G NR band n1 has grown more than ten-fold from 17 handsets in 2019 to more than 200 handsets in 2021. The growing availability of handsets means consumers would be able to choose from a wide variety of handset models and manufacturers.

14. The 5G ecosystem support for the 2.1 GHz band is expected to continue to grow, thus improving the commercial readiness of the band for 5G.

Minimising Interference with Use in Neighbouring Countries

15. For Singapore, due to our small geographical size and close proximity to our neighbouring countries, the possibility of cross-border interference is an important factor that IMDA will take into account when determining spectrum allocation. As Singapore and our neighbouring countries have deployed mobile cellular networks on the 2.1 GHz band in the Frequency Division Duplex mode,

any interference between the uplink and downlink of local and foreign networks is minimised.

4G Networks & Services

Domestically – 4G spectrum remains important to support continuing demands of users and deliver good service experience for 4G users

16. Singapore has achieved 4G nationwide coverage since early 2015. Today, more than 90% of Singapore's mobile subscribers are 4G subscribers and the number of 4G users continues to grow[2]. IMDA notes that consumers enjoy good quality 4G services today.

17. 4G is expected to remain the "anchor" mobile technology and service in Singapore for some years to come. As 4G services are well supported by multiple spectrum bands, IMDA has assessed that there is less need to allocate additional spectrum for 4G at this juncture. In this connection, IMDA does not intend to provide additional spectrum and repurpose the 2.1 GHz spectrum for the provision of 4G services.

3G Networks & Services

Domestically – spectrum still needed to support 3G user needs

18. The 2.1 GHz band is the main spectrum band supporting 3G services in Singapore today. IMDA notes the following:

    a. While the total number of 3G subscribers in Singapore today has declined, this number is not insignificant. There are approximately 700,000 3G subscriptions as at April 2021 (close to 8% of all mobile subscriptions) and more than 1.5 million handsets/devices still depend on 3G networks today. These handsets and devices may not support 4G voice calls, or are still using 3G SIM cards. Affected users include seniors, foreign workers, transport operators, and healthcare organisations; and

    b. Inbound roamers such as tourists and business travellers may still rely on 3G networks, for both data and voice applications.

    As such, 3G services remain relevant in Singapore in the short to medium term.

[2] http://www.imda.gov.sg/infocomm-media-landscape/research-and-statistics/telecommunications/statistics-on-telecom-services/statistic-on-telecom-service-for-2021-jan

CHAPTER 3: PROPOSAL TO ALLOCATE 2.1 GHZ FOR 5G SA IN SINGAPORE

19. As the national regulator for frequency spectrum in Singapore, IMDA has the duty to allocate and assign frequency spectrum, which is a scarce national resource, to meet national policy objectives and ensure the most efficient use of spectrum. IMDA also has the duty to ensure that Singapore's mobile/wireless deployments do not cause interference with our neighbours.

20. Bearing in mind the global technological and market developments discussed in the preceding section, as well as the state of our domestic mobile market, IMDA considers that the best and most efficient use of the 2.1 GHz band would be for the provision of 5G services. Therefore, IMDA proposes to refarm the 2.1 GHz band for 5G use after existing 3G spectrum rights in this band expire on 31 December 2021.

21. IMDA is mindful that there is some continued demand for 3G use, as described in paragraph 18 above. IMDA therefore proposes that a small amount of the 2.1 GHz band be used to support the continued provision of 3G services.

22. The proposed approach described in paragraphs 19 – 20 above would support the next wave of 5G growth for the MNOs, in line with IMDA's 5G policy outcomes of, amongst others, supporting the growth of Singapore's telecommunications sector. At the same time, it will ensure overall service continuity and minimise disruption to existing 3G subscribers.

IMDA's 5G Policy Outcomes

23. In refarming 2.1 GHz for 5G, the long-term policy outcomes in IMDA's 5G Decision must be achieved. In particular:

    a. IMDA seeks to facilitate deployment of 5G on SA network architecture. This is because only SA network standards will deliver the full capabilities and performance of 5G such as network virtualisation, intelligence at network edges, and dynamic provisioning or differentiated services for different use-cases. This is opposed to 5G Non-Standalone (**NSA**) networks, which can only deliver faster mobile broadband speeds;

    b. 5G SA networks must be secure and resilient; and

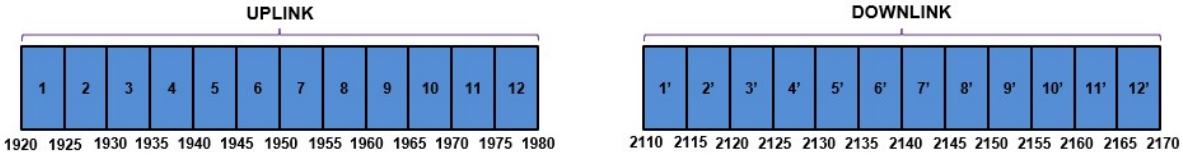
    c. IMDA will provide growth opportunities for Singapore's telecommunications sector.

Policy Issues for 2.1 GHz

Primary use of 2.1 GHz band – for 5G SA

24. IMDA plans to make available 2 x 60 MHz of spectrum in the 2.1 GHz band (i.e., the 1920 – 1980 MHz and 2110 – 2170 MHz bands) for 5G SA[3] network deployment. This represents a total of 12 paired lots with a lot size of 2 x 5 MHz each.

Figure 1: The 2.1 GHz spectrum band



Support Next Wave of 5G Growth for all MNOs & Service Enhancements

25. The 2.1 GHz band has good propagation characteristics when compared to other 5G bands currently in use in Singapore, such as the 3.5 GHz and mmWave bands.

26. Given that the 2.1 GHz band will be able to provide 5G coverage in Singapore, thus enhancing consumers' experience, IMDA is of the view that the most optimal uses for the 2.1 GHz band would be as follows:

    a. To complement existing 5G networks on 3.5 GHz, for coverage and capacity enhancements – this will allow Singapore to have enhanced nationwide 5G SA coverage and user service experience; and

    b. To provide an opportunity for 5G growth and expansion in Singapore, such as the deployment of additional nationwide 5G SA networks, should there be demand for it.

27. The 2.1 GHz band will also facilitate 5G SA deployment in buildings and road/MRT tunnels. This is because the existing infrastructure in these areas can be repurposed for 5G use.

28. Given the limited amount of spectrum available in the 2.1 GHz band, IMDA proposes to make available the opportunity to acquire spectrum in this band to existing MNOs only, namely, M1, Singtel, StarHub and TPG, if they are interested.

29. The deployment of all 5G SA nationwide networks must meet IMDA's requirements, in order to further IMDA's 5G policy outcomes:

    a. All 5G SA networks must meet the following baseline requirements:

[3] IMDA's approval will have to be sought for any 5G NSA deployment, in accordance with IMDA's *Regulatory Framework for Deployment of 5G Non-Standalone (NSA) Services in Singapore* issued on 29 March 2021.

i. Commitment to deploy 5G SA networks – in line with the long-term policy outcomes in IMDA's 5G Decision, MNOs must commit to SA deployments in 5G spectrum bands[4];

ii. Rollout and deployment milestones

I. For 5G CFP winners[5] : Existing coverage commitments (i.e., rollout milestones) arising from the CFP will continue to apply. In relation to their nationwide (at least 95%) outdoor coverage obligations, CFP winners can use both the 3.5 GHz and the 2.1 GHz bands in combination to meet such obligations.

II. For all other MNOs[6]: IMDA will require such MNOs to deploy a new 5G SA network using the 2.1 GHz band which meets the 5G SA outdoor coverage requirements described below:

A. At least 50% using the 2.1 GHz band within 2 years from commencement of the 2.1 GHz spectrum rights; and

B. Nationwide (at least 95%) within 5 years from commencement of 2.1 GHz spectrum rights. The MNOs can use the 2.1 GHz band and any of their other 5G spectrum bands[7] to meet the nationwide coverage obligation.

iii. Network design and resilience

The design of 5G networks should meet (I) key resilience and security requirements stipulated in the relevant IMDA Codes of Practice (or exceed such requirements where possible); and (II) IMDA's resilience and cybersecurity requirements specified based on the following principles, from the outset:

I. Defence-in-Depth[8]: Adopt security-by-design principles by implementing various defence mechanisms which are secure and scalable (e.g., capability to turn on encryption upon request);

[4] MNOs must first hold 5G spectrum rights for a 5G band and the accompanying licences for 5G SA deployment, and commit to nationwide 5G SA deployment using the said 5G band alone or in combination with other bands to which they hold 5G spectrum rights before IMDA will consider any commercial 5G NSA deployment in the same 5G band, per IMDA's Framework for NSA Deployment.

[5] The CFP winners are (1) Singtel and (2) the Joint-Venture Consortium formed by StarHub and M1 (**the Consortium**).

[6] This refers to TPG, and may include StarHub and M1 if they were to bid separately and would depend on the manner in which they use the 2.1 GHz spectrum to deploy their network.

[7] This includes the 3.5 GHz band.

[8] A series of defensive mechanisms that are multi-layered with redundancies to increase the security of a system and address different attack vectors.

II. Zero-trust Environment[9]: Ensure that the 5G network is always secure and trusted through the deployment of network security solutions (e.g., implementing a "demilitarised zone" and other relevant measures);

III. Network Element Assurance: Ensure that a risk assessment strategy and policy will be applied to the 5G infrastructure (e.g., through policy compliance with the Network Equipment Security Assurance Scheme currently being defined by 3rd Generation Partnership Project (**3GPP**) and Global System for Mobile Communications, and demonstrate how security assurance is achieved such as through the security testing of equipment);

IV. Resilience by Outcome: Demonstrate end-to-end network resilience to minimise outages and impact;

V. Minimise Dependency: Configure network, to the extent feasible, to minimise instances where a failure of the (a) fibre network used to provide broadband services, and/or (b) infrastructure used to provide other mobile services in a geographical area, could also affect 5G services in the same geographical area; and

VI. Adopt Technology: Use of advanced technologies for resilience purposes, e.g., the use of automation and machine learning to detect, respond and recover from service disruption expeditiously; and

iv. Provide 5G wholesale services on the 5G network deployed on the 2.1 GHz band to any requesting MNOs or Mobile Virtual Network Operators in accordance with IMDA's prescribed framework[10].

Continued Access to 3G Services for Existing 3G Subscribers

30. IMDA proposes to allocate a small amount of 2.1 GHz spectrum, on a First-Right-of-Refusal (**FROR**) basis (**FROR Lots**), to support the continued provision of 3G services by MNOs who have existing 3G networks on the 2.1 GHz band (i.e., M1, Singtel and StarHub, each a **3G MNO** and collectively the **3G MNOs**), given that 3G networks continue to be required in the short to medium term.

[9] An organisation should not trust anything inside or outside the perimeters of its networks and systems and must verify everything trying to connect to its networks and systems before granting access.

[10] https://www.imda.gov.sg/-/media/Imda/Files/Regulations-and-Licensing/Licensing/Telecommunication/Services-Based-Operations-Licence/Wholesale-Framework.pdf?la=en

31. IMDA has assessed that the FROR Lots are required for the following reasons:

    a. There is still a large number of active 3G subscriptions (approximately 700,000 3G subscriptions as at April 2021 (close to 8% of all mobile subscriptions) and more than 1.5 million handsets/devices still depend on 3G networks) today; and

    b. The 2.1 GHz band is the main 3G band that supports the 3G services described above. The 900 MHz band is used to supplement 3G coverage in 'hard to reach' areas such as buildings, given the propagation characteristics of the 900 MHz band.

32. The FROR Lots are therefore necessary to ensure that there is no service disruption to existing 3G subscribers. The FROR Lots will provide 3G MNOs with certainty that some spectrum can be obtained for the continued provision of 3G services on the 2.1 GHz band. This in turn ensures that there is no service disruption or degradation to existing 3G subscribers. IMDA would mention that an FROR process was similarly adopted for the allocation of spectrum for the 900 MHz band in 2016.

Number of FROR Lots to Support 3G services

33. Based on the current number of 3G subscribers and 3G equipment in circulation, IMDA has assessed that 5 MHz (paired) per 2.1 GHz 3G MNO together with 5 MHz (paired) from the 900 MHz band will be sufficient to support existing 3G services while providing adequate 3G coverage. Accordingly, IMDA proposes to set aside 5 MHz (paired) of spectrum in the 2.1 GHz band, for each 3G MNO, on an FROR basis.

Conditions of Use for FROR Lots

34. Should the 3G MNOs decide to apply for the FROR Lots, these lots must be used to provide 3G services and can only be repurposed for 5G after the 3G MNO shuts its entire 3G network (i.e., on both 2.1 GHz and 900 MHz bands). For the avoidance of doubt, the cessation of 3G networks is subject to IMDA's prior approval.

35. If 3G MNOs choose not to apply for the FROR Lots which are circumscribed with the conditions described above, these MNOs can choose to bid for non-FROR Lots, which can be used flexibly for both 3G and 5G services (details on the auction process are described in subsequent sections).

36. Some of the existing 3G MNOs are using the 2.1 GHz band in a limited and localised manner to support 4G services. Should these MNOs wish to continue their existing use of the 2.1 GHz spectrum to support 4G services with spectrum that they are allocated (whether through the exercise of the FROR option or the auction described at Chapter 4 of this document), IMDA is prepared to allow this. These MNOs must ensure that there is no degradation in the quality of 3G and 5G services (as the case may be) which they must deploy on the 2.1 GHz band. IMDA will not approve any further expansion of the existing 4G use on the 2.1 GHz band. Any decision by IMDA to allow the existing use for 4G

services to continue on the 2.1 GHz band should not be construed by the industry to give rise to any expectation that IMDA will adopt the same approach towards other spectrum bands in the future.

37. The above-mentioned FROR is an exceptional arrangement based on the facts of this case and shall not be construed to give rise to any expectation by the industry that IMDA will adopt the same or similar measures in the future.

CHAPTER 4: PROPOSED REGULATORY DESIGN FOR 2.1 GHZ

2.1 GHz Allocation Framework

38. IMDA had adopted a call for proposal approach in the allocation of the first tranche of 5G spectrum (i.e., 2 packages of 100 MHz of 3.5 GHz spectrum and 800 MHz of mmWave spectrum each) as it had determined that the CFP would be the more appropriate mechanism to achieve IMDA's policy outcome of securing two full-fledged nationwide, trusted and resilient 5G SA networks for Singapore from the outset.

39. IMDA has observed strong interest from the industry for the 2.1 GHz band. With certain 5G policy outcomes secured following the conclusion of the 5G CFP, IMDA has assessed that a market-based allocation approach, i.e., auction, would be the more appropriate allocation mechanism for the 2.1 GHz spectrum as it affords bidders flexibility to decide whether, and if so, how much, spectrum they wish to acquire and at what price.

40. While IMDA has considered other allocation methods (e.g., administrative assignment), an auction mechanism has been assessed to be most suitable, as it strikes a balance between meeting market demands and affording flexibility for MNOs who wish to obtain spectrum in this band.

41. To reiterate, due to the limited quantity of 2.1 GHz spectrum, IMDA will only allow existing MNOs to participate in the auction.

Proposed 5G Auction Format

42. IMDA proposes to conduct the auction in two steps: (a) the pre-auction; and (b) the auction proper. The lots that will be auctioned are the 12 lots mentioned in paragraph 24 above, less any FROR Lots (where the FROR option is exercised).

43. **Pre-auction**: Bidders must demonstrate compliance with the conditions of auction. These conditions of auction will include the regulatory requirements indicated in paragraph 29, amongst others. Bidders who are successful at this step may then proceed to participate in the auction proper.

44. **Auction**: A Clock Plus auction format will be adopted. This is the same format adopted in the 4G spectrum auction in 2013 as well as the general spectrum auction in 2017. The auction consists of three main stages.

    a. **Initial offer stage**: The MNOs to submit an Initial Offer with quantity of spectrum lots demanded (including any exercise of FROR Lots). If demand is greater than supply, the auction will proceed to the 'Quantity stage'. Where demand is equal or less than supply, MNOs will pay reserve price for the quantity they demanded and proceed to 'Assignment stage'.

    b. **Quantity stage**: Each round, the MNOs specify demand for quantities of lots and the price increases at every round at increments to be

determined by IMDA. Bidders will be required to place a price for lots they want when they reduce bids or exit the auction (i.e., expressly stating an “exit bid” will be mandatory). IMDA understands from MNOs’ feedback that one or two lots would not be cost-effective for 5G SA deployment. Therefore any MNO, who is allocated a single or two 2.1 lot(s) at the end of the Quantity Stage but has never submitted a bid for a single or two 2.1 lot(s) in its Initial Offer or at any Round of the Quantity Stage, may opt to reject the allocation of one or two lot(s) in its entirety. Successful qualified bidders of the rest of the lots then go on to the 'Assignment stage'.

c. **Assignment stage:** This stage involves the selection of specific spectrum lots after the conclusion of the Quantity stage. IMDA will allow the MNOs to discuss the assignment amongst themselves to find a common agreement. If MNOs are unable to agree, the process will move on to a one-time sealed bid. IMDA will prioritise contiguous selection of spectrum lots and reduce “movement” within the lots to minimise disruption to existing 3G services. For the avoidance of doubt, the FROR Lots will be prioritised to be allocated within the assignment of the existing 3G spectrum rights for the 2.1 GHz band.

Available Spectrum for Auction

45. There is a total of 60 MHz (paired) spectrum available in the 2.1 GHz band. In line with the channel bandwidths associated with the 2.1 GHz band for 5G under 3GPP specifications (e.g., 10 MHz, 15 MHz, 20 MHz, etc.), IMDA has decided to allocate spectrum in this band in 5 MHz lots (12 lots in total). All 12 lots will be available for auction, subject to FROR applications made by the 3G MNOs. In this connection, any FROR Lot that is not taken up by the 3G MNOs will be available for auction.

46. IMDA had considered specific requests to allocate the 3G FROR Lots through a separate allocation exercise, for the 3G MNOs only. IMDA’s policy intent is to allocate spectrum in the 2.1 GHz band for 5G use going forward. This being the case, conducting a separate allocation exercise for 3G would reduce the overall availability of 5G spectrum in the 2.1 GHz band and not be consistent with the aforementioned policy intent. Having a separate allocation exercise is also assessed to be sub-optimal as the take up of 3G services is likely to decline further, before the 3G MNOs shut their 3G networks. IMDA notes that different MNOs may have different plans and operating horizons for their 3G networks. It is therefore more consistent, policy wise, for IMDA to allocate the 2.1 GHz band for 5G (and set accompanying reserve prices for this purpose), while introducing mechanisms such as FROR to provide certainty and flexibility for 3G MNOs to manage their 3G networks, including supporting existing 3G users within the 5G allocation framework. MNOs can plan their network resources accordingly, for both enhancement and obsolescence purposes, noting that these FROR Lots are circumscribed with specific conditions, such as those described in paragraphs 34 - 37 above.

Spectrum Cap

47. In considering the appropriate spectrum cap, IMDA will take into account the reasonable amount of spectrum required for MNOs to provide mobile services, balanced with the need to prevent monopolisation of spectrum or spectrum hoarding.

48. **IMDA proposes a spectrum cap of 5 lots (paired) per MNO, which would also apply for the Consortium**. The 5-lot cap will include the FROR Lot. IMDA's view is that this cap will provide adequate flexibility and optionality to all MNOs on how they wish to deploy their networks, given each MNO's diverse requirements. While IMDA notes that 5 lots (i.e. 25 MHz channel bandwidth) in the 2.1 GHz band is commercially less common, it is nonetheless one of the available channel bandwidths supported by 3GPP. MNOs who obtain 5 lots also have the option to deploy the 2.1 GHz as two separate carriers. Overall, the 5-lot cap gives MNOs more flexibility to determine the required spectrum holdings to support their 5G deployment:

    a. IMDA has considered a 6-lot spectrum cap, but is of the view that it may be excessive for any single MNO, in view of the limited 2.1 GHz spectrum, which could result in the monopolisation of spectrum resources; and

    b. IMDA has considered a 4-lot spectrum cap, but is of the view that it may limit the flexibility of MNOs who may require slightly more spectrum to enhance their network capacity and performance.

49. Should MNOs decide to bid separately for 2.1 GHz spectrum and subsequently wish to pool/combine the spectrum together and jointly deploy them using the same RAN, IMDA's approval will have to be sought. IMDA will take into consideration all relevant factors at that juncture (including e.g., the existing 5G coverage obligations that the MNOs have and how this may be affected). Any approval provided by IMDA may be subject to conditions, including e.g., that spectrum that exceeds the 5-lot cap when aggregated be returned to IMDA without compensation of the sums paid. Depending on the technical architecture, IMDA may require compliance with the nationwide rollout obligation for separate bidders seeking to build new set(s) of RAN.

Reserve Price

50. IMDA considers that it is important to set reserve prices at levels that reasonably reflect the potential economic value of the spectrum, to better ensure that the auction mechanism can efficiently achieve its key objective of efficient allocation of scarce spectrum resources. Based on IMDA's assessment, IMDA proposes to set a fair value of S$10 – S$15 million per 5 MHz (paired) lot[11]. This takes into consideration the intrinsic value[12] of the 2.1 GHz band and where relevant, the international benchmarks of reserve and final bid prices for similar spectrum bands.

[11] FROR Lots will be allocated at the reserve price.

[12] Intrinsic value refers to the economic value of the spectrum arising from technical factors such as its propagation characteristics, applications and the harmonisation of the spectrum internationally, and commercial factors such as the expected market demand and market share for each qualified bidder.

Spectrum Right Duration

51. IMDA is proposing to adopt a spectrum right duration of 15 years for the 2.1 GHz band, with a commencement date of 1 January 2022.

52. Existing spectrum right holders must take the necessary measures for migration of services by no later than 3 months after the existing spectrum rights in this band expire on 31 December 2021 (the **Transition Period**), unless MNOs mutually agree to extend this Transition Period beyond the 3-months period. Given the large number of 3G subscribers that are served by the 2.1 GHz band, as well as the extensive deployment of 2.1 GHz network infrastructure in buildings and tunnels, IMDA considers it reasonable to provide for the abovementioned Transition Period, so as to reduce the occurrence of service disruptions, facilitate the transition and ensure the orderly migration of services.

53. Accordingly, MNOs may wish to take into account the Transition Period when bidding for 2.1GHz spectrum.

Detailed Auction Rules

54. IMDA will issue the detailed auction rules for the allocation of the 2.1 GHz band shortly. These auction rules will set out the specific auction design, as well as the process and mechanism for the conduct of the auction.

CHAPTER 5: INVITATION TO COMMENT

55. IMDA would like to seek views and comments from the industry and members of the public on the proposed policy design of the 2.1 GHz spectrum band, as set out in this document.

56. Respondents who submit their views or comments regarding the issues identified in this consultation document should organise their submission as follows: (a) cover page (including their personal/company particulars and contact information); (b) table of contents; (c) summary of major points; (d) statement of interest; (e) comments; and (f) conclusion. Supporting materials may be placed as an annex to the comments raised.

57. All views and comments should be submitted in soft copies (Microsoft Word and PDF Format), and should reach IMDA by **12 noon, 16 August 2021**. All views and comments should be addressed to:

Ms Aileen Chia
Director-General (Telecoms and Post)
Deputy CE (Competition Development & Regulation)
Infocomm Media Development Authority
10 Pasir Panjang Road
#03-01 Mapletree Business City
Singapore 117438

AND

Please submit your soft copies, with the email header "Public Consultation on 2.1 GHz Policy and Regulatory Design", via email to Consultation@imda.gov.sg.

58. IMDA reserves the right to make public all or parts of any written submission and to disclose the identity of the source. Respondents may request confidential treatment for any part of the submission that the respondent believes to be proprietary, confidential or commercially sensitive. Any such information should be clearly marked and placed in a separate annex. If IMDA grants confidential treatment, it will consider, but will not publicly disclose, the information. If IMDA rejects the request for confidential treatment, it will return the information to the party that submitted it and will not consider this information as part of its review. As far as possible, parties should limit any request for confidential treatment of information submitted. IMDA will not accept any submission that requests confidential treatment for all, or a substantial part, of the submission.