

SINGTEL MOBILE SINGAPORE PTE LTD

**RESPONSE TO IDA CONSULTATION PAPER –
PROPOSED FRAMEWORK FOR THE REALLOCATION OF SPECTRUM FOR
FOURTH GENERATION (4G) TELECOMMUNICATION SYSTEMS AND
SERVICES**

1. INTRODUCTION

- 1.1. SingTel Mobile Singapore Pte Ltd (**SingTel Mobile**) refers to the Info-communications Development Authority of Singapore (**IDA**) consultation paper dated 10 April 2012 on the proposed framework for the reallocation of spectrum for fourth generation (**4G**) telecommunication systems and services (**Consultation Paper**).
- 1.2. SingTel Mobile is licensed to provide Public Cellular Mobile Telecommunications Services (**PCMTS**) in Singapore and has acquired 2G Spectrum Right(s) to provide 2G mobile services and 3G Spectrum Right(s) to provide 3G mobile services. SingTel Mobile also acquired Wireless Broadband Access (**WBA**) Spectrum Right(s) and is licensed to provide wireless broadband services.
- 1.3. SingTel Mobile is committed to the provision of state-of-the-art mobile telecommunication services and technologies in Singapore. As a leading provider of mobile telecommunication services over 2G, 3G and 4G networks, high speed data services through General Packet Radio Service (**GPRS**) and High-Speed Packet Access (**HSPA**) technology and wireless services on our WiFi platform, SingTel Mobile has a strong interest in the proposed framework for the re-allocation of 4G spectrum in the 700 MHz, 900 MHz, 1800 MHz, 2.3 GHz and 2.5 GHz frequency bands.
- 1.4. SingTel Mobile welcomes the opportunity to make this submission on the Consultation Paper and the various issues identified by the IDA.
- 1.5. This submission is structured as follows:

Section 1 – Introduction

Section 2 – Executive Summary

Section 3 – General Comments

Section 4 – Specific Comments

- 1.6. SingTel Mobile would be pleased to clarify any of the views and comments made in this document, as appropriate.

2. EXECUTIVE SUMMARY

2.1. [CONFIDENTIAL]

- 2.2. SingTel Mobile submits that IDA should give existing spectrum rights holders that are successful bidders in the re-allocation exercise, the first-right-of-refusal (**FROR**) in respect to their existing frequency spectrum lot(s).

- 2.3. SingTel Mobile strongly submits that the IDA should re-allocate the 900 MHz frequency spectrum at the same time as 1800 MHz, 2.3 GHz and 2.5 GHz frequency spectrum.

- 2.4. SingTel Mobile submits that the IDA should expedite regional co-ordination in relation to the 700 MHz frequency spectrum and make available in the re-allocation exercise as much frequency spectrum as possible across the 900 MHz, 1800 MHz, 2.3 GHz and 2.5 GHz frequency spectrum.

- 2.5. SingTel Mobile submits that no frequency spectrum should be reserved for a new entrant – all frequency spectrum should be made available to all interested bidders (new or otherwise), and all interested bidders should compete for the available frequency spectrum on a level playing ground and in a transparent manner.

- 2.6. SingTel Mobile submits that the IDA proposal to set-aside frequency spectrum for a new entrant will mean that 2 x 20 MHz of 2.5 GHz will not be used optimally for up to three (3) years while the other MTOs will face constraints in meeting the market's bandwidth requirements.

- 2.7. Without prejudice to the above, in the event that the IDA maintains its proposal to reserve frequency spectrum for a new entrant, the IDA should reserve frequency spectrum in the Time Division Duplex (**TDD**) frequency spectrum band instead.
- 2.8. SingTel Mobile also submits that frequency spectrum should not be offered to new entrants at different or preferential reserve prices. All interested bidders should be treated in a non-discriminatory manner. New entrants should be subject to the same terms and conditions.
- 2.9. SingTel Mobile submits that the IDA should not reserve frequency spectrum for new technology trials and/or future increases in capacity. The IDA should make available as much frequency spectrum as possible across the 900 MHz, 1800 MHz, 2.3 GHz and 2.5 GHz frequency spectrum.
- 2.10. SingTel Mobile supports an earlier start date for the full-band sharing arrangement on 2.5 GHz.
- 2.11. SingTel Mobile agrees that 10 MHz is an appropriate block size for Time Division Duplex (**TDD**) technology.
- 2.12. SingTel Mobile agrees that 5 MHz is an appropriate block size for Frequency Division Duplex (**FDD**) technology.
- 2.13. SingTel Mobile supports the proposal for MTOs to co-ordinate the guard bands between FDD and TDD technologies which MTOs currently do in relation to 2.1 GHz.
- 2.14. SingTel Mobile generally supports the proposed definition of 4G technologies; the proposal to take a technology neutral approach to what constitutes 4G technology; and the proposal to assess alternative technologies that may not meet the proposed definition of 4G technologies on a case-by-cases basis.
- 2.15. SingTel Mobile is concerned that the IDA has set deadlines for meeting nationwide rollout of 4G systems and service coverage in road and MRT tunnels without consulting all the relevant stakeholders, namely the MTOs, tunnel owners and Land

Transport Authority (**LTA**). Any deadline should only be set following consultation amongst all relevant stakeholders.

- 2.16. SingTel Mobile proposes to limit the coverage to up to 5km from the coastline of the island of Singapore to mitigate mutual interference with the neighbouring countries arising from full-band sharing.
- 2.17. SingTel Mobile submits that the rollout timeline should be the same for all frequency spectrum bands regardless of the amount of frequency spectrum allocated to a successful bidder.
- 2.18. SingTel Mobile suggests that a spectrum right duration of at least twenty (20) to twenty-five (25) years is more reasonable.
- 2.19. SingTel Mobile generally supports the “Clock Plus” format which allows bidding on generic frequency spectrum lots.
- 2.20. Should the IDA use the Simultaneous Multiple Round Action (**SMRA**) format, it should be amended to also use generic frequency spectrum lots to prevent fragmented or unwanted subsets of frequency spectrum lots.
- 2.21. SingTel Mobile does not support a sealed bid auction in the assignment stage should there be differences in frequency spectrum lot allocation preferences amongst the successful bidders.
- 2.22. SingTel Mobile proposes that the frequency spectrum fee be payable only when the frequency spectrum rights are available for use.
- 2.23. SingTel Mobile submits that operators with different amounts of frequency spectrum should not be benchmarked against the same quality of service standard(s).
- 2.24. SingTel Mobile supports the proposal to adopt ECC/REC/(11)05 Recommendation for cross-border co-ordination in the 2.5 GHz frequency spectrum band in Singapore.
- 2.25. SingTel Mobile submits that instead of specifying power emission and antenna tilts, the IDA should co-ordinate with the neighbouring countries to ensure that signal spillage does not exceed -110 dBm.

- 2.26. SingTel Mobile submits that the proposed guard band of 10 MHz between 2690 MHz and 2700 MHz is insufficient without fitting additional radio frequency (**RF**) filters on both radars and base stations.
- 2.27. SingTel Mobile submits that the IDA should allow the 2G MTOs to individually decide when to shut-down their respective 2G networks based on business and market considerations and without regulatory intervention.
- 2.28. SingTel Mobile submits that the IDA should use any available reserved frequency spectrum for national events instead of re-allocating spectrum that has already been assigned to the operator.
- 2.29. SingTel Mobile submits that the reserve price should be similar to the reserve price set in the 3G spectrum rights auction in 2010.

3. GENERAL COMMENTS

[CONFIDENTIAL]

3.1. [CONFIDENTIAL]

3.2. [CONFIDENTIAL]

3.3. [CONFIDENTIAL]

3.4. [CONFIDENTIAL]

3.5. [CONFIDENTIAL]

First-Right-of-Refusal (FROR)

- 3.6. SingTel Mobile submits that IDA should give existing spectrum rights holders that are successful bidders in the re-allocation exercise, the first-right-of-refusal (**FROR**) in respect to their existing frequency spectrum lot(s), i.e. where the existing spectrum rights holder(s) or MTO has already been allocated that frequency spectrum lot(s),

they should have the FROR for that frequency spectrum lot(s) in any re-allocation exercise.

- 3.7. SingTel Mobile believes this is reasonable as any spectrum allocation framework that involves the re-allocation of frequency spectrum that is already in use must provide for commercial and business certainty for the existing spectrum rights holder(s) or MTOs that are successful bidders.
- 3.8. As the IDA is aware, the MTOs have already deployed services in the 900 MHz, 1800 MHz, 2.3 GHz and 2.5 GHz frequency spectrum bands and there are existing customers subscribing to services in these frequency spectrum bands. In fact, most of the network equipment and components in use today to provide mobile coverage, for example, are designed for specific frequency spectrum bands especially for in-building deployment. Without an FROR mechanism, the existing spectrum rights holders or MTOs that are successful bidders may actually be allocated a different frequency spectrum lot(s).
- 3.9. If the existing spectrum rights holders or MTOs were to obtain a frequency spectrum lot(s) that differed from their existing frequency spectrum lot(s), they would have to implement a new frequency plan in their respective networks. This will cause service disruption to customers. Changing a frequency plan in a highly urbanised environment like Singapore is a significant and complex task, involving changes to cater for street level coverage and in-building coverage.
- 3.10. Second, any changes in the frequency plan will mean that significant co-ordination is required with the existing spectrum right holders or MTOs of the frequency spectrum bands to be able to achieve a changeover/migration. This includes time for frequency re-planning, cutover, optimisation, drive tests, etc. Concurrently, existing spectrum right holders or MTOs would need to work on the basis that the network adjustments and the degradation expected are not overly severe during the changeover/migration period. During such an exercise, customers will inevitably experience dropped calls, no dial tone, congestion (e.g. when one part of the network works on the new plan and another exists on the old plan) or a lack of coverage etc.
- 3.11. The change in frequency plan will mean that any existing MTO network infrastructure that has been designed based on the current frequency plan will need to be changed-

out (i.e. replaced by equipment that is designed to operate on the new frequency plan). The network equipment that has to be replaced includes, for example, antenna systems, filters, repeaters etc. Again, there is likely risk of service disruption. SingTel Mobile would also highlight that the cost of replacing network equipment will be significant and would ultimately be borne by customers.

- 3.12. The IDA had noted that FROR would provide certainty to the existing spectrum rights holders, and also mitigate disruption to customers in its consultation paper on the proposed framework for the reallocation of spectrum in the 900 MHz and 1800 MHz spectrum bands issued on 28 June 2007:

“The option of granting existing 2G operators the first right of refusal to some reserved spectrum would provide greater assurance and certainty to the existing operators, and mitigate the risks of disruption to existing end user services.”

- 3.13. The IDA subsequently accorded existing spectrum rights holders FROR in the information memorandum issued on 18 January 2008 (and updated on 6 February 2008) to minimise potential disruption should existing spectrum rights holders be assigned a different frequency spectrum lot(s):

“... to minimise unnecessary spectrum churning which may lead to service disruption, incumbent operators will be accorded first rights of refusal to retain the spectrum lots in their existing 2G spectrum rights...”

- 3.14. In light of the above, there is little or no objective reason for not adopting a FROR mechanism in this re-allocation exercise. In the event that an existing spectrum right holders or MTO successfully bid for frequency spectrum, SingTel Mobile proposes that the existing spectrum right holders or MTOs be allowed the FROR in respect to their existing frequency spectrum lot(s).

900 MHz

- 3.15. SingTel Mobile strongly submits that the IDA should re-allocate the 900 MHz frequency spectrum at the same time as 1800 MHz, 2.3 GHz and 2.5 GHz frequency spectrum. As the IDA is aware, the 900 MHz spectrum rights expire at the same time

as the 1800 MHz spectrum rights i.e. 31 March 2017. In the event that the IDA does not make 900 MHz frequency spectrum available, SingTel Mobile submits that the IDA should grant MTOs an extension of their existing 900 MHz spectrum rights to provide the required business and investment certainty.

- 3.16. MTOs, such as SingTel Mobile, have deployed their mobile networks across 900 MHz, 1800 MHz, 2.1 GHz and 2.5 GHz frequency spectrum. In terms of managing the network, network deployment, network expansion, network planning, capacity migration from 2G to 3G and from 3G to 4G, efficient spectrum utilisation etc. it is necessary for MTOs to be able to have certainty of spectrum availability and to plan bandwidth requirements to meet customer needs across all the frequency spectrum that they are currently utilising.
- 3.17. Given that MTOs' 900 MHz spectrum rights and 1800 MHz spectrum rights are both expiring at the same time on 31 March 2017, SingTel Mobile submits that the 900 MHz, 1800 MHz, 2.3 GHz and 2.5 GHz frequency spectrum available in the re-allocation exercise will reduce business uncertainty and facilitate MTOs in making plans for optimal investment(s) in 2G, 3G and new 4G technology with greater confidence.
- 3.18. Whilst the IDA appears to have focussed on 4G deployment, we note that the IDA has taken a technology neutral approach. The 900 MHz frequency spectrum could be used for 3G deployment and/or 4G deployment. Re-allocating the 900 MHz frequency spectrum available at this juncture would enable the MTOs to make business and network decisions about how they wish to develop and evolve their networks with greater certainty.
- 3.19. Without prejudice to the above, in the event that the IDA does not make 900 MHz frequency spectrum available in this re-allocation exercise, SingTel Mobile submits that the IDA should grant MTOs an extension of their existing 900 MHz spectrum rights to provide the required business and investment certainty.
- 3.20. In light of the above, SingTel Mobile strongly submits that the IDA should re-allocate the 900 MHz frequency spectrum at the same time as the 1800 MHz, 2.3 GHz and 2.5 GHz. In the event that the 900 MHz frequency spectrum is not made available, the

IDA should grant MTOs an extension in relation to their existing 900 MHz spectrum rights.

700 MHz

- 3.21. As early 2010, SingTel Mobile had highlighted that there is a strong case for deploying 4G in the 700 MHz frequency spectrum due to the relative ease of upgrading from the current 3G to 4G, compared to the significant infrastructure build-out that WiMAX (i.e. deployments in the 2.3 GHz or 2.5 GHz) requires. Fewer cell sites have to be built and penetration into buildings is better with 700 MHz. 4G is considered by many to be the natural evolution of 3G, in part because it upgrades 3G networks to provide significantly faster data rates for both uploading and downloading.
- 3.22. Whilst SingTel Mobile appreciates the need for regional co-ordination, SingTel Mobile would request that the IDA expedite efforts for regional co-ordination of the 700 MHz frequency spectrum, particularly given that many other jurisdictions have already deployed or are planning to deploy 4G over the 700 MHz frequency spectrum band. The US has already deployed a 4G network on the 700 MHz frequency spectrum¹. Australia is planning to deploy 4G in the 700 MHz “digital dividend spectrum band” [and is expected to commence an auction to reallocate the 700 MHz and 2.5 GHz by end-2012]²; Optus has recently concluded a trial of 4G over 700 MHz which it found offered better throughputs compared to 4G over 1800 MHz³. India is expected to auction the 700 MHz for 4G purposes in 2014⁴. UK is also considering deploying 4G on 700 MHz⁵.
- 3.23. In relation to the IDA’s assessment and forecasts, we note that the mobile broadband traffic forecast for the period 2007 to 2010 in ITU report M.2072 was significantly lower than the actual traffic generated [which was approximately five (5) times higher

¹ Australian Communications and Media Authority, *Spectrum reallocation in the 700 MHz digital dividend band*

² Ibid

³ TeleGeography, *Optus concludes Bendigo 700 MHz LTE trials*,
<http://www.telegeography.com/products/commsupdate/articles/2012/03/16/optus-concludes-bendigo-700mhz-lte-trials/>

⁴ Telecom Regulatory Authority of India, *Recommendations on Auction of Spectrum*

⁵ Ofcom, *Securing long term benefits from scarce spectrum resources: A strategy for UHF bands IV and V*

than initially estimated⁶]. ITU-R report M.2243 also indicates that mobile broadband traffic today already exceeds the M.2072 projection for 2020, and has in fact, exceeded mobile voice traffic since 2009⁷. Therefore, as indicated above, SingTel Mobile submits that the IDA should make as much frequency spectrum available as quickly as possible in order to meet the exponential data growth and to meet the frequency spectrum requirements for the deployment of 4G-Advanced [which features a peak throughput of 100Mbps].

- 3.24. In light of the above, SingTel Mobile submits that the IDA should expedite regional co-ordination in relation to the 700 MHz frequency spectrum and make available in the re-allocation exercise as much frequency spectrum as possible across the 900 MHz, 1800 MHz, 2.3 GHz and 2.5 GHz frequency spectrum.

Reservation of Spectrum & Different Reserve Price

- 3.25. The IDA has stated that it intends to make available the following amounts of frequency spectrum for auction:

	Paired	Unpaired	Reserved
1800 MHz	2 x 70 MHz	-	2 x 5 MHz
2.5 GHz	2 x 60 MHz	30 MHz	2 x 10 MHz paired and 20 MHz unpaired
2.3 GHz	30 MHz (TDD)		20 MHz

- 3.26. Out of the 2 x 60 MHz of paired spectrum in the 2.5 GHz frequency spectrum, the IDA is reserving 2 x 20 MHz of paired spectrum for a new entrant. SingTel Mobile submits that no frequency spectrum should be reserved for a new entrant – all frequency spectrum should be made available to all interested bidders (new or otherwise), and all interested bidders should compete for the available frequency spectrum on a level playing field and in a transparent manner. In fact, the IDA has held nine (9) spectrum auctions since 2001 for a range of spectrum to provide mobile telecommunications services including PCMTS, 2G and 3G, and there has never been

⁶ ITU-R M.2243, *Assessment of the global mobile broadband deployments and forecasts for International Mobile Telecommunications*

⁷ Ibid

a fourth entrant bid. As such, SingTel Mobile sees little or no merit in reserving frequency spectrum for a new entrant.

- 3.27. By reserving frequency spectrum, the IDA simply:
- reduces or limits the amount of frequency spectrum an MTO can use to deploy its 4G services; and consequently
 - limits the size and scale of any 4G network rollout, including the quality of the services that can be delivered.
- 3.28. SingTel Mobile submits that it is not necessary to reserve any frequency spectrum for a new entrant – all frequency spectrum should be made available to all interested bidders (new or otherwise). All interested bidders should undergo the same bidding process and be subject to the same rollout timeline. This ensures that all interested bidders are treated equally and have an equal opportunity to obtain frequency spectrum.
- 3.29. Limiting the available frequency spectrum may also prevent MTOs from expanding their 4G networks to meet the capacity requirements in the mobile market as indicated in paragraph 4 of the Consultation Paper. Therefore, it is critical for the IDA to make available as much 900 MHz, 1800 MHz, 2.3 GHz and 2.5 GHz spectrum as possible in the re-allocation exercise instead of reserving the frequency spectrum for potential/future uses.
- 3.30. Without prejudice to the above, in the event that the IDA maintains its proposal to reserve frequency spectrum for a new entrant, the IDA should reserve frequency spectrum in the Time Division Duplex (**TDD**) frequency spectrum band instead. SingTel Mobile notes that there are fewer services deployed in the TDD band which also has the lowest customer usage. Therefore any ensuing impact to customers as a result of a migration to another frequency spectrum band will be minimal compared to the potential impact to services and customers in the Frequency Division Duplex (**FDD**) frequency spectrum band.
- 3.31. SingTel Mobile also submits that frequency spectrum should not be offered to new entrants at different or preferential reserve prices. All interested bidders should be treated in a non-discriminatory manner. New entrants should be subject to the same

terms and conditions. This ensures that all interested bidders are subject to the same terms and conditions and will therefore have the same considerations when planning their business case. Offering a different or preferential reserve price is likely to distort the market.

Insufficient Spectrum for Rollout

3.32. In determining the amount of frequency spectrum to make available for the 4G re-allocation exercise, the IDA has made the assumption that frequency spectrum blocks of 2 x 20 MHz of FDD would be sufficient to support a nationwide 4G deployment. SingTel Mobile submits that this assumption is incorrect and fails to take appropriate account of the following:

- First, future 4G-Advanced deployment will require contiguous blocks of at least 2 x 20 MHz each in the 1800 MHz and 2.5 GHz frequency spectrum bands to allow for inter-frequency aggregation and to achieve an optimal throughput as close to the peak 4G-Advanced throughput as possible. It does not make commercial sense to evolve the network to a 4G-Advanced network [as required under the definition of 4G services in the Consultation Paper] if there is insufficient frequency spectrum to support a reasonable quality of service to customers.
- Second, the IDA further assumes that only 4G and/or WiMAX technologies will use the 1800 MHz and 2.5 GHz FDD frequency spectrum therefore 2 x 20 MHz is sufficient to provide nationwide coverage. However, there may be other technologies developed in future that cannot use both frequency spectrum bands inter-changeably (i.e. technologies which can only use either 1800 MHz or 2.5 GHz but not both) which will severely limit the available frequency spectrum for this technology.

3.33. With the exponential growth in mobile traffic [as indicated in the ITU reports and the IDA's own study of mobile traffic growth in Singapore], MTOs will need more than 2 x 20 MHz FDD to support increasing customer data consumption as well as maintain a reasonable quality of service.

- 3.34. The IDA proposal in effect leaves only 2 x 40 MHz paired frequency spectrum in 2.5 GHz for allocation to existing MTOs who would have to also manage with limits in 1800 MHz to make-up the required frequency spectrum in the FDD technology range. This is clearly insufficient.
- 3.35. For these reasons, SingTel Mobile submits that the IDA proposal to set-aside frequency spectrum for a new entrant will mean that 2 x 20 MHz in the 2.5 GHz frequency spectrum band will not be used optimally for up to three (3) years while the other MTOs will face constraints in meeting the market's bandwidth needs.
- 3.36. In addition, SingTel Mobile also does not support the IDA proposal to reserve frequency spectrum for new technology trials and/or future increases in capacity. As indicated above, SingTel Mobile submits that there should be no limits set on what an MTO can obtain during the allocation exercise, i.e. there should not be any spectrum reserved for a new entrant or new technology trials/future capacity increases. All available frequency spectrum 900 MHz, 1800 MHz, 2.3 GHz and 2.5 GHz should be made available in the re-allocation exercise.

4. SPECIFIC COMMENTS

Question 1

IDA seeks views on the proposed allocation of the 1800 MHz, 2.3 GHz and 2.5 GHz spectrum bands.

- 4.1. We refer to our comments in section 3.

Question 2

IDA seeks views on the amount of spectrum to be made available for allocation in the 1800 MHz, 2.3 GHz and 2.5 GHz bands.

- 4.2. We refer to our comments in section 3.

1800 MHz

- 4.3. SingTel Mobile requests that all frequency spectrum in the 1800 MHz be made available for re-allocation so that each MTO can have the opportunity (if successful) to obtain an equal amount of frequency spectrum of up to 25 MHz each.
- 4.4. Without prejudice to the above, should the IDA maintain its view that 2 x 5 MHz of 1800 MHz be reserved, SingTel Mobile agrees with the IDA proposal to reserve spectrum lot 1710 MHz – 1715 MHz / 1805 MHz – 1810 MHz.

2.3 GHz

- 4.5. As indicated above in the Section 2, SingTel Mobile submits that no frequency spectrum should be reserved. All frequency spectrum should be made available and the IDA should allow the market to determine the frequency spectrum required.

2.5 GHz

- 4.6. SingTel Mobile requests that all frequency spectrum in 2.5 GHz be made available for re-allocation so that each MTO can obtain contiguous frequency spectrum of at least 20 MHz [in preparation for 4G-Advanced].

Question 3

IDA seeks views on the benefits of an earlier start date for the full-band sharing arrangement, and what an appropriate start date may be.

- 4.7. SingTel Mobile supports an earlier start date for the full-band sharing arrangement on 2.5 GHz. Ideally, it should be implemented prior to the re-allocation exercise. The full-band sharing arrangement will have an impact on how the frequency spectrum is valued and knowing the long-term arrangement for 2.5 GHz will allow operators to make informed decisions during the re-allocation exercise.

Question 4

IDA seeks views of the proposed block size per spectrum lot, the number of spectrum lots, and the arrangement of the spectrum lots to be made available for reallocation.

- 4.8. SingTel Mobile agrees that 10 MHz is an appropriate block size for TDD technology.
- 4.9. SingTel Mobile agrees that 5 MHz is an appropriate block size for FDD technology.

Question 5

IDA seeks views on its proposal for operators to co-ordinate the use of different services and not to set aside guard bands at the frequency boundaries between FDD and TDD technologies in the 2.5 GHz band.

- 4.10. SingTel Mobile supports the proposal for MTOs to co-ordinate the guard bands between FDD and TDD technologies which the MTOs currently do in relation to 2.1 GHz.
- 4.11. SingTel Mobile recommends that the IDA co-ordinate with neighbouring countries to set-aside a guard band of at least 5 MHz between FDD and TDD technologies to be allocated from the available frequency spectrum on the TDD band. From an economical and technical point of view, the two (2) 5 MHz channel blocks at 2570 – 2575 MHz and 2615 – 2620 MHz are regarded as the minimum feasible guard bands or restricted channels to safeguard the TDD operations in the 2575 – 2615 MHz band and the operations in the 2500 – 2570 MHz band paired with the 2620 – 2690 MHz band. These 5 MHz guard bands reduce the interference between operations to an acceptable level. Notably, even with guard bands in place, special measures for co-existence may still be required between the paired and unpaired operations. For an acceptable level of quality for mobile broadband end-users, a guard band of 5 MHz is the minimum requirement although there will still be both technical and economical impact in terms of site co-ordination and additional filtering. The experiences from Europe suggest that a guard band provides better clarity for the bidders for the frequency spectrum, over a restricted channel approach.

Question 6

IDA seeks views on its proposed definition of 4G technologies and the proposal to assess on a case-by-case basis alternative technologies to be deployed in the 4G spectrum bands.

- 4.12. SingTel Mobile generally supports of the proposed definition of 4G technologies; the proposal to take a technology neutral approach to what constitutes 4G technology; and

the proposal to assess alternative technologies that may not meet the proposed definition of 4G technologies on a case-by-cases basis.

- 4.13. However, we note that the proposed definition intends for the 4G mobile communications systems to eventually support 4G-Advanced and reiterate that as a pre-condition for the deployment of 4G-Advanced technology, each MTO will require contiguous blocks of at least 2 x 20 MHz each in the 1800 MHz and 2.5 GHz bands.
- 4.14. We also seek the IDA's confirmation that the frequency spectrum assigned in the re-allocation exercise can also be used to support 2G services.

Question 7

IDA seeks views on its proposal that successful bidders of 4G spectrum should meet nationwide 4G systems and service coverage requirements by the dates specified.

- 4.15. SingTel Mobile is concerned that the IDA has set deadlines for meeting nationwide rollout of 4G systems and service coverage in road and MRT tunnels without consulting all the relevant stakeholders, namely the MTOs, tunnel owners and Land Transport Authority (LTA).
- 4.16. As the IDA is aware, the provision of 4G [or any form of mobile] coverage in the tunnels is subject to various constraints including access to the stations/ tunnels, and resource availability. Previous experience in providing 3G mobile coverage in the MRT and road tunnels indicates that the timeline is subject to discussions with the LTA and respective tunnel owners particularly in light of possible improvement/ maintenance works to be carried out on the MRT lines following the recent service disruptions and the MRT inquiry. Any deadline should only be set following consultation amongst all relevant stakeholders.
- 4.17. In addition, the definition of "nationwide" encompasses "... offshore islands and territorial waters of up to 15km from the coast line of the island of Singapore". Providing such extensive 4G coverage up to 15km from the coast line will require coastal and/or offshore island sites. We already face difficulties today in acquiring suitable sites for our equipment or [where we have a site in place] lack a right of access to our equipment site as it is not mandatory for the site owner to allow us to access the site. SingTel Mobile therefore proposes to limit the coverage to up to 5km

from the coast line of the island of Singapore to mitigate mutual interference with the neighbouring countries arising from full-band sharing. 4G coverage can then be extended to cover specific offshore islands/ areas beyond the 5km as necessary.

- 4.18. SingTel Mobile further submits that the nationwide [up to 5km from the coast line of the island of Singapore] rollout timeline should be the same for all frequency spectrum bands regardless of the amount of frequency spectrum allocated to a winning bidder.
- 4.19. SingTel Mobile also seeks the IDA's clarification if winning bidders are required to deploy FDD/ TDD technology nationwide.

Question 8

IDA would like to seek the industry's views on the proposed auction parameters for the 4G spectrum rights.

Duration of spectrum right

- 4.20. SingTel Mobile submits that a spectrum right duration of thirteen (13) years and fifteen (15) years [up to 30 June 2030] for the 1800 MHz, and 2.3 GHz and 2.5 GHz respectively is too short. The spectrum right duration must allow sufficient time for the MTO to deploy the 4G network and recover costs. SingTel Mobile suggests that a spectrum right duration of at least twenty (20) to twenty-five (25) years is more reasonable.

Auction format

- 4.21. SingTel Mobile generally supports the "Clock Plus" format which allows bidding on generic frequency spectrum lots. Should the IDA use the Simultaneous Multiple Round Action (**SMRA**) format, it should be amended to also use generic frequency spectrum lots to prevent fragmented or unwanted subsets of frequency spectrum lots. SingTel Mobile submits that this is important, i.e. the IDA should ensure that there is no unnecessary fragmentation of frequency spectrum lots as spectrum is a precious resource. An allocation framework that fragments the frequency spectrum lots instead of providing maximum opportunity for an MTO to obtain contiguous lots will actually work contrary to the interests of customers. This is because the MTOs are unable to

fully exploit the benefits of 4G systems deployment with fragmented frequency spectrum lots.

- 4.22. SingTel Mobile does not support a sealed bid auction in the assignment stage should there be differences in frequency spectrum lot allocation preferences amongst the successful bidders. We refer to our comments in Section 3 (FROR).
- 4.23. SingTel Mobile proposes that the frequency spectrum fee be payable only when the frequency spectrum rights are available for use.

Spectrum lot size

- 4.24. We refer to our comments on question 4.

Spectrum caps

- 4.25. We refer to our comments in Section 3 (Insufficient Spectrum for Rollout).
- 4.26. We note that the IDA expects at least three (3) operators to obtain at least 2 x 20 MHz of FDD frequency spectrum, however, there are four (4) operators who currently hold frequency spectrum rights in the available FDD frequency spectrum meaning one (1) operator may obtain less than 1 x 20 MHz of FDD frequency spectrum. This contradicts the IDA's consideration in paragraph 24 of the Consultation Paper that operators "*would typically require spectrum blocks of about 2 x 20 MHz ... for nationwide network deployment*". An operator cannot be expected to deploy a nationwide network if it is unable to obtain at least 2 x 20 MHz of FDD.
- 4.27. The amount of frequency spectrum available to an operator will have an impact to the quality of service. An operator with less frequency spectrum cannot provide the same level of quality of service as an operator with more frequency spectrum. SingTel Mobile submits that operators with different amounts of frequency spectrum should not be benchmarked against the same quality of service standard(s).

Question 9

IDA would like to solicit interest from potential new entrants in the market. In addition, IDA seeks views on the proposed spectrum set-aside and nationwide 4G systems and service coverage obligations for the new entrant.

Interested parties may submit their comments on the “new entrant” rules in a confidential annex if required.

IDA would also like to seek the industry’s views on whether the reserve price for the spectrum set aside for a new entrant should differ from the spectrum to be auctioned to non-new entrants.

- 4.28. We refer to our comments in Section 3 (Reservation of Spectrum & Different Reserve Price).

Question 10

IDA invites views and comments on the adoption of the ECC/REC/(11)05 Recommendation for cross border coordination in the 2.5 GHz band in Singapore.

- 4.29. SingTel Mobile supports the proposal to adopt ECC/REC/(11)05 Recommendation for cross-border co-ordination in the 2.5 GHz frequency spectrum band in Singapore. This approach could also ensure that the 2.5 GHz frequency spectrum band is used in a harmonised manner along the geographic boundaries, and that each MTO’s network/ system will be carefully assessed against the other networks/ systems with a view towards harmonised co-existence.

Question 11

IDA invites views and comments on the practical measures for the deployment of 4G base stations at the border areas for the harmonised co-existence with the BSS in Indonesia.

- 4.30. SingTel Mobile submits that instead of specifying power emission and antenna tilts, the IDA should coordinate with the neighbouring countries to ensure that signal spillage does not exceed -110 dBm. These measures will be more effective in achieving a harmonised co-existence with the Broadcast Satellite Services (BSS) in Indonesia.

Question 12

IDA invites views and comments on the possible practical measures that the operators would implement to allow coexistence of mobile services and radar services in the adjacent band.

IDA also invites views and comments on the required mitigation parameters indicated in the ECC Report 174 and the regulatory limit proposed by IDA for the co-existence between mobile services in 2.5 GHz with S-band radars.

- 4.31. The necessary guard band needed and the strengthening of the spurious limit depends on the expected minimum distance between base stations/ terminals and radar stations, the types of radars used, the propagation in the area, etc. Without specific details, it is not possible to propose the regulatory limit. However, SingTel Mobile submits that the proposed guard band of 10 MHz between 2690 MHz and 2700 MHz is insufficient without fitting additional radio frequency (**RF**) filters on both radars and base stations. Further, it is necessary to have a guard band of more than 10 MHz for these filters to be efficient. SingTel Mobile suggests that the IDA do a further study of the necessary guard band to allow coexistence of mobile and radar services.
- 4.32. ECC Report 174 cites several possible mitigation techniques and the corresponding results of these techniques. The most suitable solution(s) depends largely on the circumstances in each country or the area of relevance in the affected countries. For example, the type of radar system used will have a significant impact on the co-existence conditions.
- 4.33. RF filters on radars and base stations are essential [together with the mitigation techniques in ECC Report 174] towards resolving any cross-border interference. The best results are obtained when using the RF filters and mitigation techniques concurrently.
- 4.34. Another important aspect is to allocate radars above the 2700 MHz frequency to provide an additional guard band between the mobile broadband use and possible radar use. With these measures in place, the geographical separation distance between mobile broadband and radar uses would be manageable.

- 4.35. Notably, the 2700 MHz band may be one of potential candidate bands for International Mobile Telecommunications (IMT) in the next World Radio-communication Conference (i.e. ITU WRC-15). Therefore the long-term coexistence with S-band radars may no longer be an issue in the future if the S-band radars are phased out.

Question 13

IDA would like to seek the industry's views on whether IDA should: (1) allow the 2G service providers to individually decide on when to shut down their 2G networks; or (2) intervene or assist to facilitate in any aspect of a possible winding down of 2G services in Singapore in order to manage the efficient use of spectrum. Such intervention could include the possibility of IDA centrally managing the 2G spectrum made available, e.g., by specifying spectrum, to be used by the 2G service providers on a shared basis for a shared 2G network.

- 4.36. SingTel Mobile submits that the IDA should allow the 2G MTOs to individually decide when to shut-down their respective 2G networks based on business and market considerations and without regulatory intervention.
- 4.37. SingTel Mobile does not foresee the closing of 2G services in the near future for the following [non-exhaustive] reasons:
- (a) inbound 2G roamers;
 - (b) the 2G service is an essential fallback for 3G services [and even 4G services];
and
 - (c) the 2G service is used for essential government services
- 4.38. Further, whether the 2G service is eventually offered on a shared network should be a commercial decision amongst the MTOs. All the MTOs have deployed equipment from different vendors on their networks therefore it is not technically feasible to share a network at this time.

Others

Spectrum Co-ordination during National Events

- 4.39. SingTel Mobile notes the requirement for spectrum co-ordination during National Events. Without prejudice to our comments above, SingTel Mobile submits that the IDA should use any available reserved frequency spectrum for such events instead of re-allocating frequency spectrum that has already been assigned to the operator. Aside from disruptions to the operator's services, the reallocation is likely to result in interference with the neighbouring countries and more importantly, have a severe impact on the quality of service to end-users especially in high traffic locations such as City Hall where the F1 [and occasionally the National Day Parade] is held or in Orchard Road where Chingay is held.
- 4.40. SingTel Mobile submits that the IDA should refrain from re-allocating assigned frequency spectrum for national [or any other] events in view of the substantial impact to the operator's customers.

Proposed pricing

- 4.41. SingTel Mobile submits that the reserve price should be similar to the reserve price set in the 3G spectrum rights auction in 2010.