

# **Arrangements for the Frequency Spectrum in the 1.9 – 2.2 GHz Band upon Expiry of the Existing Frequency Assignments for 3G Mobile Services**

**– Consultation Paper –**

**30 March 2012**

## **Foreword**

This paper seeks views and comments on possible options as to how the frequency spectrum in the 1.9 – 2.2 GHz band should be assigned when the existing 3G frequency assignments expire in October 2016. For the avoidance of doubt, all the 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 the Secretary for Commerce and Economic Development (“SCED”) or the Telecommunications Authority (“TA”). The consultation contemplated by this consultation paper is without prejudice to the exercise of the powers by the SCED or the TA under the Telecommunications Ordinance (the “Ordinance”) or any subsidiary legislation.

Any person wishing to submit to the SCED and the TA<sup>1</sup> views and comments on this consultation paper should do so on or before 15 June 2012. We may publish all or any part of the views and comments received, and disclose the identity of the source in such manner as we see fit. Any part of the submissions considered commercially confidential should be clearly marked. We would take such markings into account in making the decision as to whether or not to disclose such information. Submissions should be addressed to:

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<sup>1</sup> Pursuant to the Communications Authority Ordinance (Cap 616) which will come into operation on 1 April 2012, all functions conferred on the Telecommunications Authority (“TA”) under, amongst others, the Telecommunications Ordinance (Cap 106) will be conferred on the Communications Authority (“CA”). The CA will be supported by its executive arm - the Office of the Communications Authority (“OFCA”). Unless the context otherwise requires, all references to TA and OFTA in this document shall be construed as CA and OFCA respectively with effect from 1 April 2012.

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## **Introduction**

Hong Kong has one of the most competitive mobile telecommunications markets in the world, with five mobile network operators (“MNOs”) serving a population of 7 million using frequency spectrum in the 800/900 MHz, 1700 – 1900 MHz, 1.9 – 2.2 GHz and 2.5/2.6 GHz bands.

2. A total of 2 x 60 MHz of paired spectrum in the 1.9 – 2.2 GHz band is being deployed for the provision of the third generation (“3G”) mobile services. It was assigned through auction to four MNOs in October 2001, namely CSL Limited, Sunday 3G (HK) Limited (now Hong Kong Telecommunications (HKT) Limited), Hutchison Telephone Company Limited and SmarTone Mobile Communications Limited, for a tenure of 15 years each. Through the same auction exercise, each of these MNOs was also assigned 5 MHz of unpaired spectrum within the same frequency band, though this spectrum has so far remained idle. All these frequency assignments will expire on 21 October 2016. In this consultation paper, these four MNOs will be collectively referred to as the “incumbent 3G operators”. The fifth MNO, China Mobile Hong Kong Company Limited, operates only a 2G network at the time when this consultation paper is published, although it also provides 3G service in its capacity as a mobile virtual network operator.

## **Spectrum Policy**

### Spectrum Rights

3. According to the Spectrum Policy Framework (“Framework”) promulgated by the Government in April 2007<sup>2</sup>, there is no legitimate expectation on the part of the licensees that there will be any right of renewal or right of first refusal of any licence or frequency assignment upon the expiry of a licence or frequency assignment under the Ordinance. The decision whether a new frequency assignment, with the same or varied frequencies, should be given to the frequency assignee would be made and notified to the frequency assignee within a reasonable time before the expiry of its frequency assignment or after receipt of its application by TA as it is applicable in the circumstances, after taking into account the policy objectives set out in the

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<sup>2</sup> <http://www.cedb.gov.hk/ctb/eng/legco/pdf/spectrum.pdf>

Framework as well as all other relevant factors, including but not limited to any other public interest considerations.

#### Notification to be Given

4. The Framework also provides that if a frequency assignment is to be renewed with different frequencies assigned, or not renewed upon the expiry of an assignment, notification would be given. If the circumstances permit, the minimum notice periods to be stated by TA would apply in relation to these changes or non-renewal.

5. According to the Statement issued by the TA in January 2008<sup>3</sup>, insofar as it is practicable in the circumstances, a notice period of not less than three years should be given for frequency assignment involving connection between the network and the customers. Therefore, if the TA is minded to renew the 3G frequency assignment with different frequencies assigned, or not to renew the 3G frequency assignment upon its expiry, he has to give notification to the incumbent 3G operators by **October 2013** at the latest.

6. Sections 32G(2), 32H(2) and 32I(1) of the Ordinance stipulate that before the TA exercises his power to allocate the radio frequency and to designate the frequency bands for the payment of spectrum utilisation fee (“SUF”) by the users of the spectrum, he has to carry out consultation with the industry and other interested parties. The TA therefore initiates the present consultation to solicit the views of the industry and other interested parties on the arrangements for the 1.9 – 2.2 GHz spectrum post October 2016.

#### Market-Based Approach

7. The Framework provides that whenever the TA considers that there are likely to be competing demands for the spectrum from providers of non-Government services, a market-based approach in spectrum management will be used, unless there are overriding public policy reasons to do otherwise. If the market-based approach for managing spectrum with competing demands from providers of non-Government services will not be used, the relevant

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<sup>3</sup> The TA Statement on minimum notice periods for variation or withdrawal of spectrum assignments upon and before their expiry, January 2008  
[http://tel\\_archives.ofca.gov.hk/en/tas/others/ta20080131.pdf](http://tel_archives.ofca.gov.hk/en/tas/others/ta20080131.pdf)

public policy reasons will be published.

8. The volume of mobile data traffic has been growing by leaps and bounds in recent years. The volume of mobile data usage per month grew from 9 terabytes at end-2006 to 4 134 terabytes at end 2011, representing a surge of over 450 times over the five-year period. Total usage expanded by 124% in 2011 alone, with usage per customer rising by 72% year-on-year to 509 megabytes per month at the end of the year. Smartphones and the ever growing interest in mobile data services and applications, such as video streaming, social networking, location services, and online purchases, are expected to continue to fuel the growth in mobile data traffic.

9. The extent to which this robust traffic expansion is translated into the demand for additional spectrum will depend on the level of capital investment to be put into the networks by MNOs, the growth in spectral efficiency and other technological improvements, as well as users' practices or habits in using mobile data services, for instance how often do they offload the mobile data to Wi-Fi service or the emerging femtocell service. It is however certain that demand for spectrum will remain strong in the years ahead.

10. Notwithstanding the apparently insatiable market demand for ever more spectrum for mobile service, the reality is spectrum remains a scarce public resource. Currently, 442 MHz<sup>4</sup> of paired spectrum and 110 MHz<sup>5</sup> of unpaired spectrum have been assigned for the provision of public mobile telecommunications services. The charts in Annex 1 depict the distribution of spectrum in different frequency bands among the five incumbent MNOs.

11. In December 2011, the TA initiated a public consultation exercise on the planned release of 50 MHz of paired spectrum in the 2.5/2.6 GHz band<sup>6</sup>, and he indicated that the related auction should be held some time in the first quarter of 2013. Even taking into account this 50 MHz of spectrum, the amount of 3G spectrum under review in this consultation exercise accounts for

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<sup>4</sup> The 442 MHz of paired spectrum (2 x 221 MHz) consists of radio frequencies in the 800 MHz (for CDMA 2000), 850 MHz, 900 MHz, 1700 – 1900 MHz, 1.9 – 2.2 GHz, and 2.5/2.6 GHz bands.

<sup>5</sup> The 110 MHz of unpaired spectrum includes the 20 MHz spectrum in the 2 GHz band held by the four incumbent 3G operators and the newly auctioned 90 MHz spectrum in the 2.3 GHz band.

<sup>6</sup> The consultation paper is available at [http://tel\\_archives.ofca.gov.hk/en/report-paper-guide/paper/consultation/cp20111229.pdf](http://tel_archives.ofca.gov.hk/en/report-paper-guide/paper/consultation/cp20111229.pdf)

as much as about one-quarter of the total spectrum currently assigned for the provision of public mobile services. Furthermore, there will be no supply of new spectrum suitable for the provision of mobile services until the analogue TV service is switched off, which is targeted to be at end 2015.

12. In the course of drawing up this consultation paper, the TA has sought the views of his advisory committees, viz. the Regulatory Affairs Advisory Committee and the Telecommunications Users and Consumers Advisory Committee. He has also sounded out the industry players individually. Other than the four incumbent 3G operators, other parties have expressed strong interest in the relevant spectrum. There is clear indication that the spectrum under review is much sought after by the five incumbent MNOs (including the incumbent 3G operators) and other aspiring parties. The TA has therefore come to the view that there will be competing demand for the 1.9 – 2.2 GHz spectrum under review. Following the Framework, a market-based approach will be adopted for the assignment of the said spectrum after the current frequency assignments expire in October 2016, unless the TA comes to the view that there are good public policy reasons for not following such an approach.

## **Way Forward**

13. In view of the complexities of the subject, we plan to conduct two rounds of consultation on way forward. In this consultation paper, three options for the reassignment of the 3G spectrum are proposed for views and comments. Taking into account the submissions received, we would put forward a more concrete and detailed proposal in a second consultation paper for further views from the industry and interested parties. Our aim is to issue the second consultation paper by end 2012 or early 2013, make a decision on the way forward before October 2013 and give the necessary notification to the incumbent 3G operators by October 2013.

## **Options on How the Spectrum May be Reassigned**

14. As stated in paragraph 2 above, while the paired spectrum is fully deployed by the four incumbent 3G operators for the provision of 3G mobile services, the unpaired spectrum has been left idle since its assignment in 2001. The focus of this consultation exercise will therefore be on the paired spectrum. The unpaired spectrum will be dealt with briefly in paragraph 59 below.

15. The paired spectrum involves a total of 120 MHz of spectrum in the 1920 – 1980 MHz band paired with the 2110 – 2170 MHz band. The TA has identified the following three options for reassignment of this spectrum:

- Option 1: Right of first refusal to be offered to the incumbent 3G operators;
- Option 2: Re-auction all the spectrum; and
- Option 3: A hybrid option – right of first refusal to the incumbent 3G operators cum spectrum re-auction

16. In analysing the pros and cons of each of the three options, SCED and the TA will have regard to the following mission of the Commerce and Economic Development Bureau i.e.

- We will foster a business-friendly environment and attract investment to Hong Kong.
- We will position Hong Kong as the premier digital city and telecommunications hub of Asia.
- We will promote high value-added, creative and high technology activities in Hong Kong, leveraging on the very strong services and manufacturing sectors in Hong Kong and in the Pearl River Delta respectively.

To fulfil the mission, SCED and the TA need to choose an option that will best meet the multiple objectives of ensuring customer service continuity, efficient spectrum utilisation, promotion of effective competition, and encouragement of investment and promotion of innovative services.

## **Option 1: Offering the Right of First Refusal to the Incumbent 3G Operators**

17. Under this option, incumbent 3G operators will be offered the right of first refusal to acquire the originally assigned 2 x 15 MHz frequency slot in the 1.9 – 2.2 GHz band upon the expiry of the current term of assignment, subject to their payment of the SUF to be specified by SCED and agreement to the licence conditions to be imposed by the TA. If they choose to exercise the right, they will be granted new frequency assignments upon the expiry of the existing 3G frequency assignments in October 2016. If an incumbent 3G operator chooses not to exercise the right (e.g. because it does not agree to the specified SUF or the imposed licence conditions), the concerned spectrum will be put to auction. However, this incumbent 3G operator may still take part in the subsequent auction to compete with other bidders, either for the frequency assignment which it has given up or other 3G spectrum which may be put out for bidding in the auction. In terms of overseas experience, Australia has recently adopted this approach in renewing its cellular licences.

### Pros and Cons Analysis

#### *Efficient Spectrum Utilisation, Encouragement of Investment and Promotion of Innovative Services*

18. In a keenly competitive market for mobile telecommunications services, it is incumbent upon MNOs to utilise their spectrum efficiently in order to stay competitive and maximise their return on investment. To cater for the rapid growth in mobile data service market, MNOs need to upgrade the capacity and performance of their networks.

19. This option will provide the incumbent 3G operators with a stable environment for operation and investment. Subject to their payment of the specified SUF and agreement to the licence conditions, they will be reassigned the same amount of spectrum in the same frequency band upon expiry of current term of assignment. With this certainty in the spectrum assignment for another 15 years, there is little reason for them to hold back on their investment in the 1.9 – 2.2 GHz frequency band. In addition, this option will maximise the flexibility of the operators in spectrum planning along with spectrum in the other frequency bands. Thus Option 1 is expected to contribute to efficient



spectrum utilisation through continuous capital investment and more certain spectrum planning.

20. That said, the TA is not certain whether the existing assignment of the 120 MHz of 1.9 – 2.2 GHz spectrum among the four incumbent 3G operators has already delivered the optimal consumer benefit, given the spectrum was assigned through auction more than a decade ago and the technical and application aspects of the spectrum and the mobile market have undergone phenomenal developments during this period.

21. In addition, the amount and profile of spectrum holding is highly asymmetric among the five MNOs, as depicted by the charts in Annex 1. The number and mix of their customers are also different. Concrete indicators for measuring the robustness of each MNO in their utilisation of the 1.9 – 2.2 GHz spectrum are not readily available. It may be possible to attain higher spectral efficiency for the industry as a whole by varying the distribution of the spectrum among incumbent 3G operators or by recruiting new players to the 3G mobile service market. But Option 1 rules out such a possibility.

#### *Promotion of Effective Competition*

22. The state of market competition is unlikely to change much under Option 1, if the incumbent 3G operators all exercise the right of first refusal.

23. Admittedly, Hong Kong already has one of the most competitive mobile markets in the world, with a mobile penetration rate exceeding 200% and mobile charges among the lowest in the world. In particular, competition in every aspect (price and non-price) has been keen among the four incumbent 3G operators. This notwithstanding, the TA cannot ignore the possibility that potential new players may be at the forefront of service innovations or working on new business paradigms, thereby inducing even keener competition particularly in the market for mobile broadband services. By offering the right of first refusal to the incumbent 3G operators, Option 1 will preclude the entry of new players which may be more efficient than the incumbent 3G operators in terms of service choice, quality and price.

### *Customer Service Continuity*

24. A key advantage of this option, which will yield effectively a status quo position, is that it would ensure continuity of services to customers as all the concerned spectrum has already been deployed for the provision of public mobile services. If the incumbent 3G operators all exercise the right of first refusal to retain their original frequency assignments after October 2016, service continuity will be assured.

### Setting of SUF for Spectrum Assigned Administratively

25. In offering the right of first refusal to the incumbent 3G operators, the TA has to set the SUF that would reflect as far as possible the full market value of the spectrum, i.e. a level of SUF as if it would have been determined through market means although the market does not actually exist on this occasion.

26. Option 1 effectively implies that all the 3G spectrum will be administratively reassigned by the TA to the incumbent 3G operators. The subject of how SUF for spectrum assigned administratively should be set has been comprehensively examined previously in two official documents – the Framework and the Joint Statement on SUF issued by SCED and the TA in September 2011<sup>7</sup>.

27. The Framework stipulates that for spectrum not released through auction or other market mechanisms prescribed by SCED, the SUF may be set to reflect the opportunity costs of the spectrum. Where a frequency band is assigned to a frequency assignee wholly or significantly to support public interest purposes agreed by or at the request of the Government, SUF may be adjusted at the sole discretion of SCED to reflect the nature of such use.

### *Directly-Calculated Approach – the Least Cost Alternative Method*

28. In the September 2011 Joint Statement, SCED has decided that the least cost alternative (“LCA”) method will be used to set the SUF for spectrum in certain frequency bands that is assigned administratively. As pointed out by the consultant which the TA has commissioned in the Study on Radio

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<sup>7</sup> [http://tel\\_archives.ofca.gov.hk/en/tas/spectrum/ta20110923.pdf](http://tel_archives.ofca.gov.hk/en/tas/spectrum/ta20110923.pdf)

Spectrum Pricing System<sup>8</sup>, both the UK and New Zealand have adopted the LCA approach to derive the values for spectrum used by their cellular operators. The method has also been used lately by Australia to set the SUF for its mobile voice and data and wireless broadband spectrum.

29. The LCA method measures the additional cost that a MNO would have to incur in enhancing its network if a small block of the spectrum it currently uses is taken away such that the quality and quantity of the services produced will be the same. It thus reflects the opportunity costs of the MNO in utilising the spectrum and provides the incentive for it to use the spectrum efficiently. This method normally generates a range of SUFs depending on the assumptions about technologies and traffic growth in the future.

#### *Market Benchmark Approach*

30. Another approach is to make use of market benchmarks. In this regard, it would be useful to make reference to what SCED and the TA have said in the joint consultation paper on SUF for Spectrum Assigned Administratively issued in November 2010<sup>9</sup>. Paragraph 24 of this joint consultation paper says the following:

*“The “market benchmarks” approach refers to the finding of a reference point in the market to reflect the value of the spectrum. Under this approach, market information such as spectrum prices in auctions or trades, sales price of capacity and market value of companies may be used to estimate the full market value of the spectrum. Such “market benchmarks” approach has its appeal because of its simplicity, objectivity and transparency. Despite the apparent appeal of the “market-benchmarks” approach, however, implementation difficulties severely limit the actual applicability of such an approach. One example is the difficulty involved in making like-for-like comparisons between frequency bands and between market values obtained in different economies and at different points in time.”*

31. As far as the current consultation exercise is concerned, the auction

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<sup>8</sup> See for example the executive summary of the study report at

[http://tel\\_archives.ofca.gov.hk/en/report-paper-guide/report/rp20101126\\_ex.pdf](http://tel_archives.ofca.gov.hk/en/report-paper-guide/report/rp20101126_ex.pdf)

<sup>9</sup> [http://tel\\_archives.ofca.gov.hk/en/report-paper-guide/paper/consultation/cp20101126.pdf](http://tel_archives.ofca.gov.hk/en/report-paper-guide/paper/consultation/cp20101126.pdf)

which is mentioned in paragraph 11 above and which is expected to be held in the first quarter of 2013 will provide a useful reference for the determination of the SUF that SCED should impose on the assignment of 3G spectrum post October 2016. The observation made in the preceding paragraph however remains applicable. Specifically, there are marked differences between the two groups of spectrum, including the technical characteristics of the spectrum, the technological maturity of the spectrum, the amount of spectrum under concern and the business value.

#### *Other Alternative Approach*

32. One innovative approach is to inject some market elements under Option 1 by conducting an auction to determine the SUF. The auction will be open to both the incumbent 3G operators and other interested parties. The incumbent 3G operators are allowed to exercise their right of first refusal after the completion of the auction by paying the SUF as determined by the auction and acquire the spectrum. That means the successful bidder who has placed the highest bid for a particular block of spectrum in the auction may not be able to acquire the spectrum upon the exercise of the right of first refusal by the relevant incumbent 3G operator. In case the incumbent 3G operator decides not to exercise its right of first refusal, it will forfeit its deposit and the highest bidder will be assigned the relevant block of spectrum by paying the SUF determined by the auction. To conclude, it would not be a straightforward task to set an appropriate level of SUF associated with the right of first refusal to be offered to the incumbent 3G operators under Option 1. Where necessary, consideration may be given to generate a range of SUFs using a combination of different methods.

*Question 1: Given there is clear indication of competing demand for the 3G spectrum, are there good public policy reasons for the TA to adopt Option 1, instead of the market-based approach as stipulated in the Framework, when the current 3G frequency assignments expire in October 2016?*

*Question 2: In offering the right of first refusal to the incumbent 3G operators to acquire the 1.9 – 2.2 GHz spectrum under Option 1, what would be the preferred method for setting the SUF so that it may reflect the full market value of the spectrum?*

## **Option 2: Re-auction All the Spectrum**

33. This option represents the other extreme to Option 1, as the entire spectrum under concern is to be reassigned by auction prior to the expiry of the current frequency assignment in October 2016. Whether the incumbent 3G operators may regain their original slot of spectrum or obtain a new slot through bidding in the auction depends on the outcome of the auction. Likewise those who would like to enter the mobile market or are interested in the 1.9 – 2.2 GHz frequency band can compete for the spectrum by participating in the auction. As to overseas experience, the Netherlands has decided to adopt this approach. No right of first refusal will be offered to the incumbent operators, and all its 900 MHz and 1800 MHz spectrum will be re-auctioned in 2012.

### Pros and Cons Analysis

#### *Efficient Spectrum Utilisation, Encouragement of Investment and Promotion of Innovative Services*

34. By re-auctioning all the 120 MHz of spectrum, the incumbent 3G operators, the fifth MNO and other interested parties can all compete on a level playing field for the spectrum. The market mechanism will ensure that the successful bidders which value the spectrum the most will obtain the spectrum by paying the highest SUF, and as a result they will put the spectrum to the most productive uses.

35. Through the re-auctioning process and depending on the auction design, some incumbent 3G operators may lose a portion or all of their frequency assignments. But it is equally conceivable that some of them may be able to acquire more spectrum than what they currently have.

36. A key concern for adopting Option 2 would be the disruptive impact the re-auction has on the incumbent 3G operators and their customers. The incumbent 3G operators may be able to get back the same, lesser or greater amount of spectrum through bidding in the auction. There is therefore great uncertainty on the level of spectrum holding each incumbent 3G operator may end up with between the time when the decision to adopt this option is made

and the completion of the actual auction. From the investment perspective, the period of uncertainty may start as early as now with the kick off of this consultation exercise, as it is unclear as to which option the Government will eventually adopt. Such an uncertain environment could well dampen the commercial incentive of the incumbent 3G operators to make new investment in their 3G networks and hinder the development of mobile data service. With capital investment being held up, technology upgrade in the concerned frequency band would be restrained.

*Question 3: How would the prospect to re-auction the entire 120 MHz of spectrum in the 1.9 – 2.2 GHz band impact on the investment plan and network planning of the incumbent 3G operators, and how would that further impact on their mobile network capacity?*

#### *Promotion of Effective Competition*

37. As discussed in paragraph 23 above, the Hong Kong mobile market is already one of the most competitive in the world. However, it is possible that new players may bring about even keener competition by introducing innovative services or new business paradigms. Option 2 will provide the maximum opportunity for new players which believe that they can perform better and more efficient than the incumbent 3G operators. The new player may be the fifth MNO which currently does not operate 3G network, or it may be a completely newcomer to the mobile market.

*Question 4: The number of players in the mobile telecommunications market may or may not remain unchanged after the auction. Would competition in the mobile market be enhanced if the entire 120 MHz of spectrum in the 1.9 – 2.2 GHz band is to be re-auctioned under Option 2?*

#### *Customer Service Continuity*

38. Option 2 will lead to a disruptive process if one or more incumbent 3G operators cannot get hold of the necessary spectrum in the auction, as this is still the primary spectrum supporting the provision of 3G mobile services. In the extreme case, one or more of them may even lose all their 3G spectrum. While some of them have already deployed the 900 MHz spectrum for 3G mobile services, the spectrum in the 1.9 – 2.2 GHz band continues to carry the

bulk of the 3G mobile traffic, and this is expected to be so in the next few years.

39. Even if the incumbent 3G operators can eventually get hold of the original amount of spectrum (2 x 15 MHz) through auction, the newly required spectrum may be located in different sub-bands. In this case, the incumbent 3G operators will need to invest in new capital equipment or to reconfigure their networks in order to deploy the newly acquired spectrum. The incumbent 3G operators and new players which are successful in the auction will also have to co-ordinate and co-operate among themselves to switch off and switch on the relevant sub-bands upon expiry of the current term of frequency assignments. However complicated the process may sound, it can be argued that such a concern is exactly what the market-based approach is supposed to deal with. As explained earlier in paragraph 29, the LCA method enables an incumbent 3G operator to estimate the opportunity costs that it would have to incur in enhancing its network if a small block of the spectrum it currently uses is taken away such that the quality and quantity of the services produced will be the same. During the auction, the incumbent 3G operator can therefore make informed commercial decisions of whether it should bid for its preferred sub-bands at a certain price, or whether it should put its money to better use by investing in the network.

*Question 5: What would be the transitional plans for an incumbent 3G operator if under Option 2 (a) it cannot retain any of its original frequency assignment; (b) it can retain only part of its original frequency assignment; and (c) it gets spectrum in a different sub-frequency band?*

*Question 6: What are the estimated costs and the areas of investment for implementing the transitional plans for tackling the three scenarios mentioned in Question 5?*

40. The prospects of service disruption under Option 2 may not be so gloomy. By the time the current 3G frequency assignments expire in October 2016, all five incumbent MNOs will have rolled out their 4G LTE networks either using the 2.5/2.6 GHz band or the 1800 MHz band, and a sizeable number of 3G mobile customers will have migrated to 4G mobile services. MNOs which possess spectrum in the 800/900 MHz frequency band will have deployed most of the spectrum for 3G services. They may also offload some of

the traffic from their networks by using Wi-Fi, femtocells and other technologies.

*Question 7: If an incumbent 3G operator is unable to obtain any of the 3G spectrum or if it manages to obtain less spectrum than what it currently has, to what extent the spectrum that it currently holds in other frequency bands could act as effective substitute for the spectrum foregone?*

*Question 8: How effective would be the application of alternative technologies (e.g. Wi-Fi, femtocell, etc.) help economise on the use of radio spectrum through offloading the mobile data traffic?*

#### Setting of SUF

41. The determination of SUF under Option 2 is straightforward. The TA will set the reserve prices for each block of spectrum to be put to auction, and the actual amount of SUF payable will be determined by auction.

#### **Option 3: A Hybrid Option – Right of First Refusal to the Incumbent 3G Operators cum Spectrum Re-auction**

42. Option 3 is a hybrid of Options 1 and 2, where each incumbent 3G operator will be offered the right of first refusal to acquire a subset of the original spectrum it holds. The rest of the spectrum will be pooled together for reassignment through auction. Similar to the arrangements proposed for Option 1, the incumbent 3G operators will need to decide whether to exercise the right to take up the new frequency assignments by paying the SUF and agreeing to the licence conditions, but this will be for a smaller spectrum holding. If any incumbent 3G operator decides not to exercise the right, the spectrum that it gives up will be put in the general pool of spectrum for the subsequent auction. As in Option 1, this incumbent 3G operator can take part in the auction together with other bidders.

43. Under Option 3, it is necessary to determine (a) the amount of spectrum that will be assigned through offering right of first refusal to the incumbent 3G operators (“Spectrum RFR”) and the amount that will be withdrawn and put to the market through the auction (“Spectrum



Re-auctioned”), and (b) which slots of the spectrum should be allocated for Spectrum RFR and which slots should be allocated for Spectrum Re-auctioned.

44. Regarding the first issue, the arrangement is constrained technically by the minimum amount of bandwidth required for the application of the 3G technology, which is a 5 MHz spectrum pair. There are therefore only two alternatives - the amount of Spectrum RFR can only be 2 x 5 MHz or 2 x 10 MHz. Due to the explosive growth of the mobile data market, MNOs have implemented different solutions to meet the booming demand. At present, MNOs have implemented where feasible the DC-HSPA+ technology, which aggregates two continuous 5MHz spectrum pairs to offer peak downlink data rate up to 42 Mbps. By setting Spectrum RFR to a contiguous band of 10 MHz spectrum pair, the incumbent 3G operators will be able to maintain the current dual carrier design and optimise the utilisation of their frequency assignments. Given this technical consideration, the TA is of the preliminary view that the amount of Spectrum RFR should be 2 x 10 MHz i.e. each of the incumbent 3G operators will be offered the right of first refusal to a frequency assignment of 2 x 10 MHz of 3G spectrum post October 2016.

*Question 9: Do you have any comment on the preliminary proposal of the TA to offer each of the incumbent 3G operators the right of first refusal to a frequency assignment of 2 x 10 MHz of 3G spectrum post October 2016 under Option 3?*

*Question 10: Similar to Question 1, given there is clear indication of competing demand for the 3G spectrum, are there good public policy reasons for the TA to offer Spectrum RFR to the incumbent 3G operators, instead of assigning it through the market-based approach as stipulated in the Framework, when the current 3G frequency assignments expire in October 2016?*

45. Given the scarcity nature of the spectrum and the technical consideration discussed in paragraph 44 above, the TA is of the preliminary view that if Option 3 is adopted, he should devise an arrangement such that both the incumbent 3G operators and new players will have the opportunity to get hold of at least a contiguous band of 2 x 10 MHz of paired 3G spectrum.

*Question 11: Do you have any comment on the preliminary proposal of the TA under Option 3 to devise an arrangement so that all interested parties will have*

*the opportunity to get hold of at least a contiguous band of 2 x 10 MHz of paired 3G spectrum?*

46. As for the second issue raised in paragraph 43 (i.e. which frequency slots should be allocated for Spectrum RFR and which slots should be allocated for Spectrum Re-auctioned), at first sight the options would appear to include (a) voluntary submission by each incumbent 3G operator; (b) a random pick by the TA from each of the incumbent 3G operators' portfolio; or (c) the TA to draw up a band plan within the 1.9 – 2.2 GHz band delineating where Spectrum RFR and Spectrum Re-auctioned would exactly lie. Bearing in mind the need for frequency assignments of a contiguous band of 2 x 10 MHz of paired spectrum, it appears that only the last option can address such a need.

*Question 12: Taking into account the merits of having contiguous spectrum of 2 x 10 MHz paired spectrum and the investment in capital equipment that the incumbent operators have already put in the 3G spectrum, should the TA draw up the band plan as described in paragraph 46?*

#### Pros and Cons Analysis

##### *Efficient Spectrum Utilisation, Encouragement of Investment and Promotion of Innovative Services*

47. Discussion in paragraphs 20 to 21 shows that there are no readily available concrete indicators to assess the efficiency of the incumbent 3G operators in utilising the spectrum. Under the circumstances, the TA is of the view that keen competition in the mobile market would encourage MNOs to strive for the best. It is conceivable that if one or more of the incumbent 3G operators are assigned more 3G spectrum under Option 3, they can put it to better and more efficient use. For example, if an incumbent 3G operator can obtain one contiguous 2 x 10 MHz spectrum pair more in the auction in addition to the Spectrum RFR, its network will be able to support the operation of two dual-carriers. Alternatively, if some of the spectrum ends up in the hands of new players, they may make better use of the spectrum through application of the latest technologies, provision of innovative services or development of new business paradigms. Therefore, Option 3 will enable the assignment of the Spectrum Re-auctioned to higher-valued uses. In contrast, Option 1 forecloses completely such a scenario.

48. Similar to the discussion under Option 2, the incumbent 3G operators will face uncertainty under Option 3. This would impact on the efficiency in spectrum utilization, at least in the short term, as investment would be held up until the situation becomes clear. However, the uncertainty facing the incumbent 3G operators will be much lower under Option 3 as they would be assigned with certainty the Spectrum RFR without having to face any competition, subject to their payment of the SUF and agreement to the licence conditions.

#### *Promotion of Effective Competition*

49. It has been said time and again in this consultation paper that the Hong Kong mobile telecommunications market is already keenly competitive. The idea underlying both Options 2 and 3 is to explore the possibility of facilitating even more effective competition, by assigning through auction the spectrum to the more efficient market players. The amount of spectrum that may change hand with the resulting impact on the competition scenario will of course be smaller under Option 3.

#### *Customer Service Continuity*

50. As discussed in paragraphs 38 - 39, re-auctioning the entire 120 MHz of 3G spectrum under Option 2 can be disruptive. Option 3 is less drastic in this aspect as the incumbent 3G operators would be offered the right of first refusal to acquire the Spectrum RFR. In addition, they will have the chance to retain the Spectrum Re-auctioned that has been carved out from their original frequency assignments in the subsequent auction. Depending on the auction design, the incumbent 3G operators may even obtain more spectrum in the auction. Any disruption to customer services under Option 3 will be more manageable as compared to Option 2.

#### Arrangement for the Auction vis-a-vis the Offer of Right of First Refusal, and the Setting of SUF

51. Under Option 3, the 3G spectrum will be divided into two pools, Spectrum RFR and Spectrum Re-auctioned. The setting of SUF for the pool of Spectrum Re-auctioned is straightforward, as it will be determined by the auction.

52. The Spectrum RFR will be assigned administratively to the incumbent 3G operators if they exercise their right of first refusal, and the right has to be exercised before the auction takes place. In case any 3G incumbent operator decides not to exercise its right of first refusal, the concerned spectrum would be put in the pool of Spectrum Re-auctioned and put to auction. This proposed arrangement has two implications. First, the auction result would not be known to both the TA and the whole industry when the TA offers the right of first refusal to the incumbent 3G operators. SCED does not therefore have the benefit of relying on the auction result to determine the SUF for the Spectrum RFR.

53. The second implication is that the industry will have a clear idea of the exact amount of Spectrum Re-auctioned that will be available, after all incumbent 3G operators have decided whether or not to exercise their rights of first refusal. Assuming that the general response to the point raised by the TA in Question 9 above is positive, the minimum amount of Spectrum Re-auctioned available will be 2 x 20 MHz. More spectrum will be available in the auction if one or more incumbent 3G operators do not exercise their rights of first refusal.

54. As Spectrum RFR is to be assigned administratively to the incumbent 3G operators, the discussion on how SCED should set the SUF under Option 1 in paragraphs 25 to 32 will apply here. SCED is of the preliminary view that he should determine and publicly announce the reserve price for the Spectrum Re-auctioned when the offer of the right of first refusal to Spectrum RFR is made. In anticipation of the keen competition for the Spectrum Re-auctioned, and to be fair to the taxpayers and all industry players concerned, SCED is of the preliminary view that he should set the reserve price for Spectrum Re-auctioned at a level that is lower than the SUF for Spectrum RFR. The incumbent 3G operators will then have to make their commercial decision of whether or not they should exercise their right of first refusal by paying the SUF administratively set by SCED. Alternatively, they may relinquish their frequency assignments (which will put back to the pool of Spectrum Re-auctioned) and compete with other bidders in the auction in the hope that they can win in the bidding exercise and pay a lower SUF for the same frequency assignments.

*Question 13: What are your views and comments on the proposed arrangement discussed in paragraph 54?*

55. A variation of the arrangement described in paragraphs 52 – 54 above is to benchmark the SUF of the Spectrum RFR with the SUF of Spectrum Re-auctioned as determined by the auction. This has the merit of ensuring that the SUF to be paid by the incumbent 3G operators exercising the right of first refusal will reflect the full market value of the spectrum. Under this arrangement, the incumbent 3G operators will have to decide whether they will exercise the right of first refusal to retain part of the spectrum they originally hold (i.e. Spectrum RFR) before the auction takes place, without any idea on the eventual amount of SUF payable.

56. If any of the incumbent 3G operators finds the risk of making such a commitment unacceptable, it can choose to give up the right of first refusal. The Spectrum RFR relinquished will then be put back to the pool of Spectrum Re-auctioned. The incumbent 3G operator which has relinquished the right of first refusal can take part in the auction along with other bidders if they wish to acquire the spectrum through competitive bidding. The SUF of the Spectrum Re-auctioned will reflect the full market value of the spectrum.

57. If the incumbent 3G operators choose to exercise the first right of refusal, then they will be required to commit to paying the SUF of the Spectrum RFR that will be set as equivalent to the average SUF of Spectrum Re-auctioned as determined by the auction.

58. The setting of SUF under Option 3 could be an even more complicated task than that under Option 1, as there are two categories of spectrum – Spectrum RFR and Spectrum Re-auctioned – to be taken care of. Our objective is to devise a method such that the SUF to be set for both categories of spectrum will reflect to the maximum extent possible the full market value of the 1.9 – 2.2 GHz spectrum as a scarce public resource, and at the same time ensuring fairness to both the incumbent 3G operators exercising the right of first refusal and those who are seeking to acquire the spectrum through auction. We are aware that this hybrid option appears to be an innovative arrangement for the reassignment of spectrum that has been fully deployed for service provisioning, as overseas jurisdictions usually adopt Option 1 or Option 2. We are nevertheless of the view that the hybrid option

could also deliver the benefits to the consumers and the industry as a whole. In this context, we would welcome the proposals of any other innovative arrangements for setting the SUF under Option 3.

*Question 14: What are your views and comments on the proposal to benchmark the SUF of Spectrum RFR with the Spectrum Re-auctioned as proposed in paragraphs 55 – 58 above?*

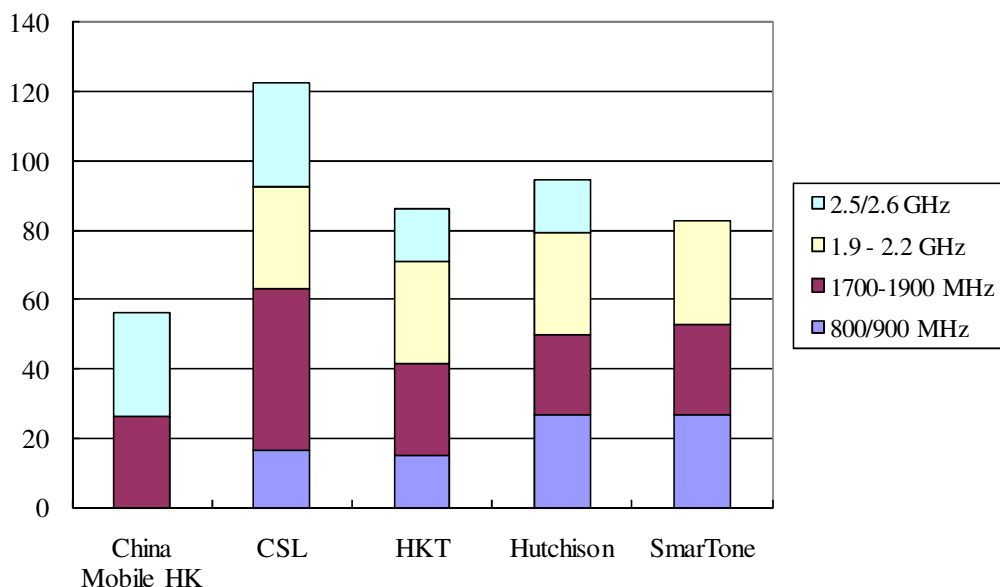
### **Proposals for the Unpaired Spectrum**

59. As explained in paragraph 14, each of the incumbent 3G operators has been assigned with 5 MHz of unpaired spectrum in the 1905 - 1920 MHz and 2020 - 2025 MHz bands. However, the 20 MHz spectrum has been left idle since its assignment. Subject to any views and comments of the respondents to this consultation exercise, the TA intends to put the concerned spectrum back to reserve. He will monitor the market and technology development before releasing it to the market in accordance with the Framework.

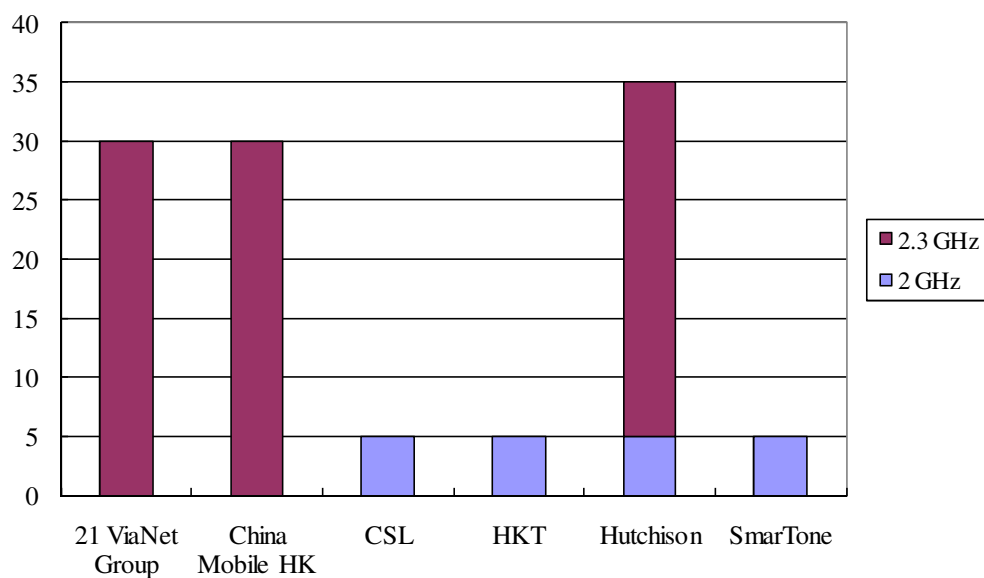
*Question 15: What are your views on the proposal to put the unpaired 3G spectrum to reserve?*

**Commerce and Economic Development Bureau  
(Communications and Technology Branch) and  
Office of the Telecommunications Authority  
30 March 2012**

### Distribution of Paired Spectrum among Mobile Network Operators



### Distribution of Unpaired Spectrum among Mobile Network Operators



Note: All the categories of spectrum were assigned under the technology neutral policy, except the 2 x 7.5 MHz spectrum in the 800 MHz band held by HKT, which was designated for the provision of public mobile telecommunications services using the CDMA 2000 technology.