Arrangements for Assignment of the Spectrum in the 3.3 GHz and 4.9 GHz Bands for the Provision of Public Mobile Services and the Related Spectrum Utilisation Fee

Consultation Paper

28 August 2018

PURPOSE

This consultation paper is jointly issued by the Communications Authority ("CA") and the Secretary for Commerce and Economic Development ("SCED") to seek views and comments of the industry and interested parties on the arrangements for allocation and assignment of the spectrum in the 3.3 GHz band (3.3 – 3.4 GHz) and the 4.9 GHz band (4.83 – 4.93 GHz) for the provision of public mobile services and the related spectrum utilisation fee ("SUF").

BACKGROUND

Supply of Radio Spectrum for the Provision of Public Mobile Services

2. On 21 March 2017, the CA promulgated its work plan[1] for making available additional radio spectrum for public mobile services to meet the increasing aspirations of service users towards 2020 and beyond. The work plan has identified a number of frequency bands, including the 3.4 – 3.6 GHz band ("3.5 GHz band"), the 24.25 – 27.5 GHz band and the 27.5 – 28.35 GHz band ("26/28 GHz bands"), that can be made available for re-allocation to mobile services to prepare for the launch of fifth generation mobile ("5G") services. The CA has conducted separate public consultations regarding the arrangements for the assignment of the spectrum in these bands and is now considering the views and comments received from the industry and the general public[2].

[1] The relevant press release is available at: https://www.coms-auth.hk/en/media_focus/press_releases/index_id_1423.html.

[2] Further information on such consultations is available at: https://www.coms-auth.hk/en/policies_regulations/consultations/completed/index.html.

3. As made clear in the announcement of the work plan, the CA would continue to look for other suitable spectrum for timely release to the market to support the continuous development of the mobile industry. On 26 July 2018, the CA updated the Spectrum Release Plan ("SRP")[3] to inform the industry of the supply of additional radio spectrum below 6 GHz. In gist, 100 MHz of spectrum in the 4.9 GHz band (i.e. 4.83 – 4.93 GHz) which may be used in any locations of the territory, and another 100 MHz of spectrum in the 3.3 GHz band (i.e. 3.3 – 3.4 GHz), designated for indoor use only, will be made available for the provision of public mobile services (including 5G services) in 2019.

World Trend in the Use of the 3.3 GHz and 4.9 GHz Bands

4. The 3.3 GHz and 4.9 GHz bands have been identified by a number of economies in the Asia Pacific, Africa, and Latin America regions for the provision of International Mobile Telecommunication ("IMT") services. The Ministry of Industry and Information Technology ("MIIT") of the Mainland promulgated its decision in November 2017 to allocate spectrum in the range of 3.3 – 3.6 GHz and 4.8 – 5.0 GHz for the provision of 5G services, with the 3.3 GHz band being confined to indoor use only. India also launched a public consultation in August 2017 on auctioning spectrum in a number of frequency bands including the 3.3 GHz band for 5G services and is now making relevant preparations. Japan is actively considering to re-allocate part of the 4.9 GHz band for 5G services.

LEGAL AND REGULATORY FRAMEWORK

5. Under section 32G(1) of the Telecommunications Ordinance ("TO"), the CA has the statutory duty to promote the efficient allocation and use of the radio spectrum as a public resource of Hong Kong. Sections 32H(2) and 32I(1) of the TO empower the CA to assign radio frequencies and to designate which of them shall be subject to the payment of SUF following consultation with the telecommunications industry and other affected persons as required under section 32G(2) of the TO. Sections 32I(2) and 32I(4) of the TO empower the SCED to prescribe the method for determining the SUF and to specify the minimum level of the SUF (i.e. the auction reserve price). Having regard to section 32G(2) of the TO to the extent applicable to the CA, the CA and SCED hereby jointly initiate the present public consultation to

[3] The SRP is available at: https://www.coms-auth.hk/filemanager/en/content_613/spectrum_plan2018_en.pdf.

seek views on the arrangements for the allocation and assignment of the spectrum in the 3.3 GHz and 4.9 GHz bands, as well as the related SUF.

6. Section 4(4) of the Communications Authority Ordinance (Cap. 616) stipulates that the CA, in performing its functions, must have regard to the following matters which appear to the CA to be relevant in the circumstances: (a) the fostering of an environment that supports a vibrant communications sector to enhance Hong Kong's position as a communications hub in the region; (b) the encouragement of innovation and investment in the communications market; (c) the promotion of competition and adoption of best practices in the communications market for the benefit of the industry and consumers; and (d) acting in a manner consistent with the provisions of the Hong Kong Bill of Rights Ordinance (Cap. 383).

7. The Radio Spectrum Policy Framework [4] ("Framework") promulgated by the Government in April 2007 sets out the policy objectives and the guiding principle in spectrum management which the CA should take into account in discharging its spectrum management responsibilities under the TO. By a statement issued in April 2007, the former Telecommunications Authority ("TA") (now the CA) explained that, in exercising his statutory powers under the TO, he would, in addition to all relevant considerations as required by law, give due regard to the Framework to the extent that there would be no inconsistency with the objectives and provisions of the TO[5].

8. Pursuant to the Framework, the policy inclination is that a market-based approach will be adopted in spectrum management wherever the CA considers that there are likely to be competing demands from providers of non-Government services, unless there are overriding public policy reasons to do otherwise.

PROPOSED AMENDMENT TO THE HONG KONG TABLE OF FREQUENCY ALLOCATIONS FOR THE 3.3 GHz AND 4.9 GHz BANDS

9. Under the Hong Kong Table of Frequency Allocations, the 4.80 – 4.94 GHz band is at present allocated to fixed service only, whereas the 3.3 – 3.4 GHz band is allocated to radiolocation service only. To enable the use of

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[4] The Framework is available at: http://www.cedb.gov.hk/ccib/eng/legco/pdf/spectrum.pdf.

[5] The former TA statement on the Framework is available at: http://tel_archives.ofca.gov.hk/en/tas/others/ta20070424.pdf.

the 3.3 GHz and 4.9 GHz bands for the provision of public mobile services including 5G services, the CA proposes, pursuant to section 32H of the TO, to amend the Hong Kong Table of Frequency Allocations, with effect from 1 January 2019. Details are as follows –

(a) the 4.83 – 4.94 GHz band to be allocated to mobile service on a co-primary basis in addition to the existing allocation for fixed service, with 100 MHz of spectrum in the 4.83 – 4.93 GHz band to be used for the provision of public mobile services; and 10 MHz of spectrum in the 4.93 – 4.94 GHz band to be partitioned as a guard band to minimise potential mutual interference with the government services currently operating in the 4.94 – 4.99 GHz band; and

(b) 100 MHz of spectrum in the 3.3 – 3.4 GHz band to be allocated to mobile service on a co-primary basis in addition to the existing allocation for radiolocation. To avoid causing interference to or suffering interference from the territory-wide radiolocation service being operated outdoors, the prospective mobile service operating in the 3.3 GHz band will be restricted to indoor use only.

Question 1:	Do you have any views on the proposed amendment to the Hong Kong Table of Frequency Allocations as regards the allocation of the 3.3 – 3.4 GHz band and the 4.83 – 4.94 GHz band for mobile service on a co-primary basis in addition to the respective existing uses?

PROPOSED ARRANGEMENTS FOR ASSIGNMENT OF THE SPECTRUM IN THE 3.3 GHz AND 4.9 GHz BANDS

Demand for Spectrum in the 3.3 GHz and 4.9 GHz Bands

10. The 3.3 GHz and 4.9 GHz bands are adjacent to or near the 3.5 GHz band, the latter being one of the first frequency bands identified by many economies in the world for deployment of 5G services. The three frequency bands are below 6 GHz and hence have good radio propagation characteristics for providing wide area coverage if used for 5G services. Considering that the 3.3 GHz, 3.5 GHz, and 4.9 GHz bands have been identified by the MIIT for deployment of 5G services in the Mainland starting from 2020, it is expected that 5G network equipment and user terminals

operating in these frequency bands will gradually be made available to meet the demand of the market.

11. The 4.9 GHz band has the advantage of being able to support deployment of 5G services in any locations in Hong Kong.

12. To avoid mutual interference with the existing radiolocation service, the 3.3 GHz band will be deployed for providing 5G services to mobile terminals situated in indoor environments only[6]. Mobile network operators ("MNOs") assigned with spectrum in the 3.3 GHz band can make use of the spectrum for enhancement of 5G indoor coverage, in conjunction with spectrum in other frequency bands which they successfully acquired.

13. Taking into account the scarcity and limited bandwidth of radio spectrum in frequency bands below 6 GHz suitable for mobile use; the use of the 3.3 GHz and 4.9 GHz bands for deployment for 5G services; and the expected supply of 5G standard compliant equipment and devices supporting these two bands, the CA is of the view that there are likely to be competing demands when the spectrum is released. As such, pursuant to the guiding principle in spectrum management as set out in the Framework, the CA proposes that a market-based approach should be adopted for the assignment of the spectrum in these bands.

Assignment of Spectrum by Auction

14. Auction is regarded as the most appropriate market-based approach for the assignment of spectrum resources as it provides a fair, transparent, objective and economically efficient means to determine to whom the spectrum should be assigned. Therefore, the CA proposes to assign the spectrum in the 3.3 GHz and 4.9 GHz bands by way of auction.

15. Similar to previous spectrum auctions, the CA considers that there should only be minimal qualification requirements for registering bidders' interest and for demonstrating their capability to provide satisfactory service. The CA preliminarily proposes to impose the following qualification requirements on a bidder who is interested in participating in the respective auctions of the 3.3 GHz band and the 4.9 GHz band. In short, an eligible bidder should –

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[6] Base stations operating in the 3.3 GHz band will only be permitted to be installed, maintained and operated at indoor locations inside buildings and enclosed areas (such as tunnels) and they shall be configured in such a way that no service would be provided to mobile terminals situated in any outdoor environment and no harmful interference is caused to other lawful telecommunications services in Hong Kong and our neighbouring territories.

(a) lodge a specified amount of deposit which may be forfeited if the bidder violates the auction rules or fails to take up the licence after winning the auction; and

(b) demonstrate its technical and financial capability to provide service in fulfilment of the licensing obligations to the satisfaction of the CA and submit any other relevant supporting information which the CA may deem necessary.

Question 2:	Do you have any views on assigning the spectrum in the 3.3 GHz and 4.9 GHz bands by way of auction?

Band Plan

16. According to the technical specification adopted by the 3rd Generation Partnership Project ("3GPP") for 5G equipment and devices, the allowable channel bandwidths for the 4.9 GHz band include 40 MHz, 50 MHz, 60 MHz, 80 MHz and 100 MHz[7]. Given that future network equipment and user terminals would likely adopt the technical standards stipulated in the relevant 3GPP specifications, it is likely that any frequency blocks in the 4.9 GHz band with bandwidth smaller than 40 MHz would not be used for the purpose of deploying 5G standard compliant equipment. Having regard to the above technical considerations, the CA proposes that the bandwidth of each frequency block in the 4.9 GHz band spectrum should be up to 50 MHz.

17. For the 3.3 GHz band, the relevant 3GPP specification stipulates that the allowable channel bandwidths for the band are identical to those applicable for the 3.5 GHz band, i.e. ranging from 10 MHz to 100 MHz[8]. Taking into account the views of the industry in response to the CA's proposal regarding the band plan for the 3.5 GHz band[9], the CA proposes to divide the spectrum in the 3.3 GHz band into 10 frequency blocks, each with a

[7] The 3GPP technical specification TS 38.104 entitled "NR; Base Station (BS) radio transmission and reception" specifies the allowable channel bandwidths for the 4.9 GHz band. The technical specification is available at: https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3202.

[8] Please refer to the same 3GPP specification mentioned in footnote 7 above.

[9] Please refer to the CA's consultation paper entitled "Arrangements for Assignment of the Spectrum in the 3.4 – 3.6 GHz Band for the Provision of Public Mobile Services and the Related Spectrum Utilisation Fee", available at https://www.coms-auth.hk/filemanager/en/content_711/cp20180502.pdf.

bandwidth of 10 MHz, to cater for different amounts of spectrum that may be required by bidders for meeting their business needs.

Question 3:	Do you have any views on the proposal that the bandwidth of each frequency block in the 4.9 GHz band spectrum should be up to 50 MHz?

Question 4:	Do you have any views on the proposal to divide the spectrum in the 3.3 GHz band into 10 frequency blocks, each with a bandwidth of 10 MHz?

Spectrum Cap

18. To prevent over-concentration of spectrum holding by any individual operator and having regard to the different deployment characteristics of the 3.3 GHz and the 4.9 GHz bands, the CA proposes to impose separate spectrum caps for the amount of spectrum which may be acquired by a bidder in the respective frequency bands. For the 3.3 GHz band, the CA proposes to set a cap of 40 MHz which a bidder will be allowed to acquire. For the 4.9 GHz band, the CA proposes that a bidder would be allowed to acquire only one frequency block with a bandwidth of up to 50 MHz. These caps will be applied individually on any bidder in each auction to be conducted.

Question 5:	Do you have any views on the proposed spectrum cap of 40 MHz to be imposed on any bidder in the auction for the 3.3 GHz band?

Question 6:	Do you have any views on limiting any bidder to acquire only one frequency block with a bandwidth of up to 50 MHz of spectrum in the auction for the 4.9 GHz band?

Auction Format and Timing

19. For the 3.3 GHz band, in view of better technical efficiency for use of spectrum in contiguous blocks, the CA proposes to adopt the clock

auction format[10] for this band, similar to that proposed for the assignment of the 3.5 GHz band. Likewise, following the completion of the clock auction, there will be an assignment stage to determine the contiguous frequency blocks that may be assigned to bidders.

20. For the 4.9 GHz band, since each bidder would be eligible to bid for only one frequency block with a bandwidth of up to 50 MHz, the CA proposes to adopt the simultaneous multiple-round ascending auction format for auctioning the frequency blocks in the 4.9 GHz band. This auction format was used in auctions conducted before and is well known to the industry.

21. The CA will carefully consider the submissions received in this public consultation and is minded to make a decision on the relevant assignment arrangements of the spectrum in the 3.3 GHz and the 4.9 GHz bands around the end of 2018. Taking into account the time needed for making the relevant legislative amendments, the spectrum auctions for the 3.3 GHz and 4.9 GHz bands are planned to take place around mid-2019.

Question 7:	Do you have any views on the proposed format of and timing for the auctions of the 3.3 GHz band and the 4.9 GHz band?

LICENSING ARRANGEMENT

Licensing and Validity Period

22. The CA proposes to issue a new unified carrier licence ("UCL") to each successful bidder. In line with the term of a UCL, the radio spectrum in both the 3.3 GHz and 4.9 GHz bands will be assigned for a validity period of 15 years for the provision of public mobile services. For incumbent licensees who successfully acquire spectrum in the proposed auctions, they may apply to the CA for combining their existing UCLs with the new UCL to be issued.

[10] Under the clock auction format, all frequency blocks put to auction are generic. Bidders will bid for the number of frequency blocks they wish to acquire at a particular price rather than for the specific blocks in the frequency band. Bidding will take place over a number of rounds, with the round price increasing in each round in which the demand from bidders exceeds the available supply, until the total demand for frequency blocks from all bidders is equal to or less than the total supply.

Restriction on Frequency Swap

23. In order to realise the full market value of each individual frequency block in the auctions, the CA proposes that swapping of any frequency assignment in the 3.3 GHz and the 4.9 GHz bands within the first five years counting from the date of the frequency assignment will generally not be considered.

Technology Neutrality

24. For assignment of spectrum for public mobile services, the CA will in general adopt a technology neutral approach whereby the assignees are free to use whatever technology they choose based on widely recognised standards for service provision. There being no other overriding reasons, the CA will adhere to this technology neutral approach in assigning and licensing the spectrum concerned. Similar to most other spectrum assignment exercises conducted by the CA, the assignees will be free to use the spectrum for providing 5G or other generations of mobile services under their UCLs, so long as the technology to be used is a widely recognised standard and will not cause any harmful interference to other legitimate services.

Network and Service Rollout Obligations

25. In order to prevent spectrum hoarding and to ensure that the auctioned spectrum will be put into efficient use for the timely provision of advanced telecommunications services for the benefit of the general public, network and service rollout obligations are in general imposed on successful bidders of a spectrum auction.

26. Taking into account the time required by successful bidders to implement their 5G networks using the new spectrum in the 4.9 GHz band and having regard to the rollout requirements prescribed for successful bidders in other auctions, the CA proposes to require each successful bidder of the 4.9 GHz band to roll out its network and service for providing a minimum coverage of 50% of the population with regard to its mobile services provided using its assigned spectrum in the band within the first five years from the date of issue of the licence.

27. As for the 3.3 GHz band, since it can only be deployed indoors, the CA considers it necessary to impose a different network and service rollout obligation for each successful bidder. Drawing reference from the average number of indoor base stations currently established by the incumbent MNOs, the CA proposes to require each successful bidder of the 3.3 GHz

band to establish at least 500 indoor base stations operating at the band within the first five years from the date of issue of the licence.

28. The CA is inclined to mandate each successful bidder to lodge a performance bond for safeguarding its compliance with the rollout obligation. If the successful bidder is an incumbent licensee, it may make use of its existing network to fulfill the proposed network rollout requirement if it can demonstrate to the satisfaction of the CA that the newly acquired spectrum has been deployed in the network. The amount of the performance bond will be specified by the CA nearer the time of the auction.

Question 8:	Do you have any views on the proposed network and service rollout obligations, as well as the imposition of the associated performance bond on successful bidders for the 3.3 GHz and the 4.9 GHz bands?

SPECTRUM UTILISATION FEE

29. Under the Framework, SUF will in principle be applicable to all non-Government use of radio spectrum. Therefore, SUF should be paid by successful bidders for use of the spectrum in the 3.3 GHz and the 4.9 GHz bands.

30. While the exact amount of SUF will be determined by auction, each frequency block will be subject to a reserve price which will be set at a level that represents the minimum base value of the spectrum for the purpose of kick-starting the competitive bidding process. The auction reserve prices will be specified by SCED nearer the time of the auction.

31. Regarding the method of payment of SUF, SCED notes that the current assignment exercise involves a total of 200 MHz of spectrum. To afford greater flexibility to spectrum assignees to make financial arrangement for the payment of SUF, SCED proposes that spectrum assignees will be given a choice to pay the SUF either by –

(a) lump sum payment upfront, which is the lump sum amount determined in auction; or

(b) annual instalments, with the first instalment equivalent to the lump sum amount obtained in (a) above divided by 15 (i.e. the number of years of assignment), and subsequent instalments

increased every year by a pre-set fixed percentage which aims to reflect the time value of money to the Government.

Question 9:	Do you have any views on the proposal in relation to SUF above?

INVITATION OF COMMENTS

32. This consultation paper sets out preliminary views and proposals of the CA and SCED on the arrangements for allocation and assignment of the spectrum in the 3.3 GHz and 4.9 GHz bands for the provision of public mobile services, and the related SUF. For the avoidance of doubt, all the information given 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 the CA or SCED. The proposed arrangements set out in this consultation paper are without prejudice to the exercise of the powers by the CA and SCED under the TO or any subsidiary legislation thereunder.

33. The CA and SCED would like to seek views from the industry and any interested party on the issues discussed in this consultation paper. Views and comments should reach OFCA **on or before 26 September 2018**. **Late submissions would not be considered**.

34. Submissions received will be treated as public information and the CA and SCED may publish all or part of the views and comments received, and disclose the identity of the source in such manner as they see fit. Any part of the submissions considered commercially confidential should be clearly marked. The CA and SCED would take such markings into account in making the decision as to whether or not to disclose such information. Submissions should be sent to –

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29/F Wu Chung House
213 Queen's Road East
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(Attention: Principal Regulatory Affairs Manager (R22))

Fax: 2803 5112
Email: consult-3.3_4.9GHz@ofca.gov.hk

An electronic copy of the submission should be provided by email to the address indicated above.

Commerce and Economic Development Bureau
(Communications and Creative Industries Branch) and
Office of the Communications Authority
28 August 2018