

**Proposed Allocation of the 26 GHz and 28 GHz Bands
to Mobile Service and the Associated Arrangements for
Spectrum Assignment and Spectrum Utilisation Fee**

Consultation Paper

26 July 2018

FOREWORD

This paper seeks views and comments of the telecommunications industry and other affected persons on the proposal to allocate spectrum in the 26 GHz band (24.25 – 27.5 GHz) and 28 GHz band (27.5 – 28.35 GHz) (collectively referred to as the “26/28 GHz bands”) to mobile service; proposed arrangements for spectrum assignment and the related spectrum utilisation fee (“SUF”).

Spectrum at high frequencies, with very large bandwidths supporting ultra-high capacity, is integral to the fifth generation mobile (“5G”) frequency bands. In Hong Kong, a total of 4 100 MHz of spectrum in the 26/28 GHz bands will be made available for the provision of 5G services. The Communications Authority (“CA”) and the Secretary for Commerce and Economic Development (“SCED”) plan to make their respective decisions on frequency allocation and assignment and the related SUF by the end of 2018 after taking into account views and comments received in response to this consultation.

For the avoidance of doubt, all the information provided and views expressed in this consultation paper are for the purpose of discussion and consultation only. Nothing in this consultation paper represents or constitutes any decision made by the CA or SCED. The consultation contemplated by this consultation paper is without prejudice to the exercise of the powers by the CA and SCED under the Telecommunications Ordinance (Cap. 106) (“TO”) or any subsidiary legislation thereunder.

Any person wishing to respond to the public consultation should do so on or before **22 August 2018**. **Late submissions would not be considered.** 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 –

Office of the Communications Authority
29/F., Wu Chung House
213 Queen's Road East
Wan Chai
Hong Kong
(Attention: Head, Regulatory 3)

Fax: 2803 5112

E-mail: consult-26-28GHz@ofca.gov.hk

An electronic copy of the submission should be provided by e-mail to the e-mail address indicated above.

INTRODUCTION

To prepare for the launch of 5G services in Hong Kong, the CA announced its work plan in March 2017 to make available additional spectrum for the provision of public mobile services¹. In December 2017, the CA issued an invitation for expressions of interest (“EOI Invitation”) to gauge the views of the local industry and other interested parties on using the 4 100 MHz of spectrum in the 26/28 GHz bands for the provision of 5G services². Submissions were received from 11 respondents, including those from mobile network operators (“MNOs”), satellite operators, an equipment vendor, a social media company, and a number of industry organisations.

2. Frequency spectrum within the range of 24.25 – 86 GHz has been identified by the International Telecommunication Union (“ITU”) for global allocation to International Mobile Telecommunications (“IMT”) services for 2020 and beyond (i.e. 5G services), and the matter will be deliberated at the World Radiocommunication Conference (“WRC”) to be held in November 2019 (“WRC-19”). Such high frequency spectrum above 24 GHz is commonly known as the millimetre wave or mmWave spectrum.

3. The 26 GHz band within the frequency range of 24.25 – 27.5 GHz, which is the lowest band to be deliberated at WRC-19, is being actively considered by major economies around the world for 5G deployment. In Hong Kong, the 26 GHz band is currently allocated primarily to fixed service, with a small part of it assigned to two network operators. In order to vacate the spectrum concerned for allocation to mobile service for the provision of 5G services, notices of withdrawal have been served on the two network operators to withdraw the assignments from 1 April 2019. Part of the spectrum within the 26 GHz band has also been allocated to radionavigation service and fixed satellite service (Earth-to-space) (“FSS”), which has not, however, been occupied for the purposes.

¹ The work plan of the CA for making available additional spectrum for public mobile services to meet the increasing aspirations of service users towards 2020 and beyond is available at: https://www.coms-auth.hk/en/media_focus/press_releases/index_id_1423.html.

² The paper on invitation for expression of interest in using the 26/28 GHz bands for the provision of 5G services is available at: https://www.coms-auth.hk/filemanager/en/content_1082/EOI_on_26_28_GHz_bands.pdf.

4. Although the 28 GHz band within the frequency range of 27.5 – 28.35 GHz is not one of the candidate bands identified by ITU for 5G deployment, it has been designated by some advanced economies such as the United States (“US”), South Korea and Japan for the provision of 5G services, with equipment and devices also being developed to support this band. In Hong Kong, the 28 GHz band is currently allocated to both fixed service and FSS as primary services, but it has not been occupied for either purpose.

5. Against the above background, the CA intends to allocate the 26/28 GHz bands to mobile service and assign the spectrum for the provision of public mobile services. While the proposed assignment will be on a technology-neutral basis, since the two frequency bands are being targeted in many economies as the priority high frequency bands for the provision of 5G services, they are expected to be deployed for the provision of 5G services in Hong Kong. The CA sets out for consultation in this paper the proposed arrangements for allocating the 26/28 GHz bands to mobile service and the assignment of such frequency bands to potential 5G network operators. SCED also sets out in this consultation paper his proposal for the arrangement of the SUF for the use of the spectrum concerned.

LEGISLATIVE AND POLICY FRAMEWORK

6. Under section 32G(1) of the 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 allocate and 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. Section 32I(2) of the TO empowers SCED to prescribe the level of SUF or the method for determining the SUF. Before exercising the respective statutory powers conferred on them by the TO, the CA and SCED jointly initiate the present public consultation.

7. 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).

8. The Radio Spectrum Policy Framework ("Spectrum Policy Framework") promulgated by the Government in April 2007 identifies the policy objectives and the guiding principle in radio spectrum management which the CA should take into account in discharging its spectrum management responsibilities under the TO³. By his Statement issued in April 2007, the former Telecommunications Authority ("TA") 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 Spectrum Policy Framework to the extent that there would be no inconsistency with the objectives and provisions of the TO⁴.

9. According to the Spectrum Policy Framework, the policy inclination is that a market-based approach will be used 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. This policy does not apply where the CA considers that there are unlikely to be competing demands for the spectrum from providers of non-Government services.

10. In addition, the Spectrum Policy Framework makes clear that there is no legitimate expectation that there will be any right of renewal or right of first refusal upon the expiry of a spectrum assignment under the TO. A decision on whether to grant a new spectrum assignment, with the same or varied radio frequencies, would be made and notified to the spectrum assignee within a reasonable time before the expiry of its spectrum assignment.

³ The Spectrum Policy Framework is available at:
<https://www.cedb.gov.hk/ccib/eng/legco/pdf/spectrum.pdf>.

⁴ The TA Statement on radio spectrum policy framework is available at:
http://tel_archives.ofca.gov.hk/en/tas/others/ta20070424.pdf.

11. As regards SUF, the Spectrum Policy Framework provides that SUF should be applicable to all non-government use of spectrum. It further stipulates that for spectrum not released through auction or other market mechanisms, the SUF may be set to reflect the opportunity costs of the spectrum.

HIGHLIGHTS OF VIEWS FROM THE EOI INVITATION

12. The CA has carefully considered the views expressed in the submissions in response to the EOI Invitation. Regarding the demand for the spectrum in 26/28 GHz bands, the aggregate demand indicated by the respondents is less than the total supply of 4 100 MHz of spectrum in the bands. Regarding the spectrum assignment, one respondent prefers a mix of assignment in both the 26 GHz and 28 GHz bands, while others consider that a mix of assignment in the two frequency bands is not advisable. Some respondents who are MNOs raise concerns about possible difficulties associated with the shared use of these two frequency bands among MNOs for territory-wide coverage. The setting of a cap for the assignment of spectrum in the 26/28 GHz bands has the support of most of the respondents who indicate demand for the spectrum, and a cap in the range of 25% to 40% of the overall spectrum holding is proposed. Besides, they consider that the traditional network coverage requirement would not be suitable for spectrum in the 26/28 GHz bands.

13. Respondents who are satellite operators and representatives of organisations in the satellite industry comment that the 28 GHz band has been allocated to FSS as a part of the 27 – 31 GHz uplink band. Therefore, protection of the 27 – 28.35 GHz band and the 24.75 – 25.25 GHz band is important for the satellite industry to develop.

14. On the proposal to allocate the 26/28 GHz bands to mobile service, there are views from the EOI Invitation that studies on the co-existence of FSS and 5G services in Hong Kong should be conducted. In this regard, following the WRC of the ITU held in 2015 (“WRC-15”) which identified 11 candidate

bands within the frequency range of 24.25 – 86 GHz for IMT services⁵, ITU has tasked its working group to conduct the sharing and compatibility studies between IMT services and the existing primary services allocated in or adjacent to the 26 GHz band. Preliminary study results show that subject to certain deployment constraints, IMT services are compatible with the existing services in the 26 GHz band. It is considered that the study results are highly relevant to the co-existence of FSS and 5G services in the 28 GHz band as well, in view of the similar radio environment of the two frequency bands. The ITU study results confirm the feasibility of introducing mobile service on top of the existing services in the two frequency bands.

PROPOSED ALLOCATION OF THE 26/28 GHZ BANDS TO MOBILE SERVICE

15. The 26 GHz band is the lowest band amongst the 11 candidate bands identified by ITU for IMT services, and is expected to gain wide support from different economies for development of IMT services. As for the 28 GHz band, some advanced economies such as the US, South Korea and Japan have openly promulgated their plan to use this band for 5G services. Furthermore, both the 26 GHz and 28 GHz bands have been adopted by the 3rd Generation Partnership Project (“3GPP”)⁶ as part of the 5G operating bands in the 3GPP technical specifications for global implementation of 5G network equipment and customer devices by vendors in the mobile industry.

Proposed Allocation to Mobile Service

16. The CA proposes to allocate the 26 GHz and 28 GHz bands to mobile service on a primary basis, and the sub-band of 24.25 – 24.45 GHz to fixed service (remaining part of the 26/28 GHz bands already allocated to fixed service) on a primary basis in Hong Kong, as shown in Figure 1 below. Under

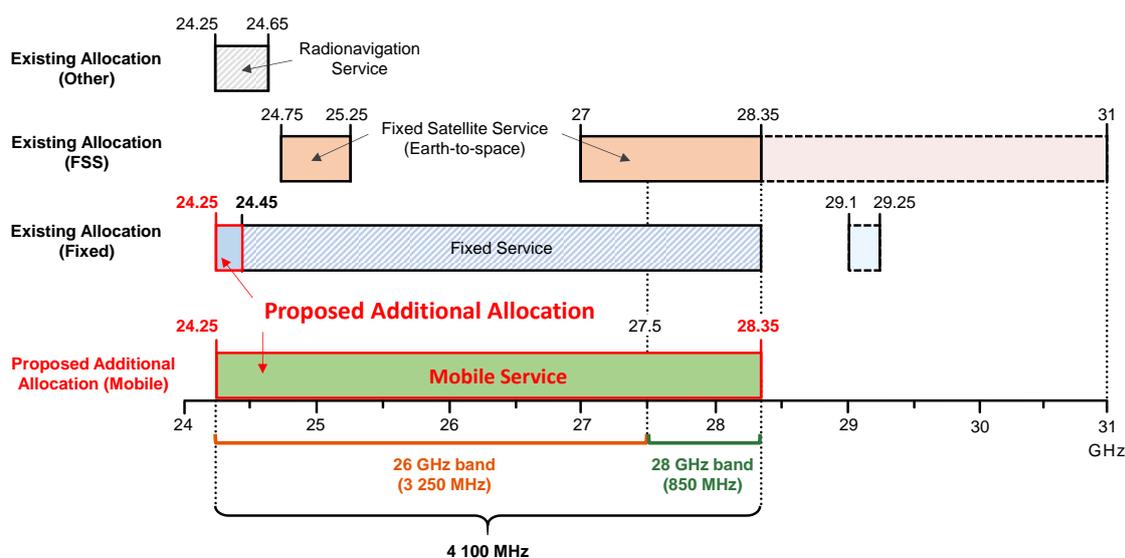
⁵ According to Resolution 238 of WRC-15, the 11 candidate bands identified include those in the frequency ranges of 24.25 – 27.5 GHz, 31.8 – 33.4 GHz, 37 – 40.5 GHz, 40.5 – 42.5 GHz, 42.5 – 43.5 GHz, 45.5 – 47 GHz, 47 – 47.2 GHz, 47.2 – 50.2 GHz, 50.4 – 52.6 GHz, 66 – 76 GHz, and 81 – 86 GHz, with a total bandwidth of 33.25 GHz. The ITU Resolution is available at: https://www.itu.int/dms_pub/itu-r/oth/0c/0a/ROC0A00000C0014PDFE.pdf.

⁶ 3GPP is an internationally recognised telecommunications standard development organisation that specialises in the formulation and implementation of standards for global 3G, 4G and 5G mobile communication systems. Members include standard associations of Europe, Japan, China, Korea and North America.

this arrangement, in future, both 5G services operating in the 26/28 GHz bands (whether in the form of mobile or wireless fixed application) and FSS (current allocation in 24.75 – 25.25 GHz and 27 – 28.35 GHz) will be primary services i.e. on a co-primary basis. A new base station of a co-primary service must refrain from causing harmful interference to, and will not be entitled to protection from harmful interference caused by, stations of other co-primary users already in existence. In gist, the radio stations of co-primary users will be protected on a first-come-first-served basis.

17. Further, the use of the 26/28 GHz bands for public mobile services in Hong Kong would need to observe the relevant resolutions or other co-existence rules to be promulgated by ITU in the future, where applicable.

Figure 1: Proposed Frequency Allocation for the 26/28 GHz Bands



Question 1: What are your views on the proposed allocation of the 26/28 GHz bands to mobile service and of the sub-band of 24.25 – 24.45 GHz to fixed service, both on a primary basis? What are your views on the protection of radio stations of co-primary users on a first-come-first-served basis?

Access of High Altitude Platform Stations (“HAPS”)⁷ to the 26/28 GHz Bands

18. There is a proposal raised in the responses to EOI Invitation that HAPS should be allowed to operate in the 26/28 GHz bands. In this regard, according to the Radio Regulations (“RR”) issued by ITU, China (including Hong Kong) is not among the countries that allow the use of HAPS operating in the 28 GHz band⁸. Although WRC-19 will discuss the use of 26 GHz band for HAPS, it would be limited to ITU Region 2⁹ only, not covering China (including Hong Kong). In view of the above, the proposed operation of HAPS in the 26/28 GHz bands in Hong Kong is not in compliance with the RR of ITU and hence will not be allowed.

ASSIGNMENT OF SPECTRUM IN THE 26/28 GHZ BANDS: ADMINISTRATIVE APPROACH

19. Taking into account the ample supply of spectrum in the 26/28 GHz bands; technical characteristics of these higher frequency bands (including the potential for use by different operators on a shared basis); the use of this spectrum in other economies in the world; potential supply of equipment operating in the two frequency bands; and the feedback from the local industry including the responses to the EOI Invitation, the CA considers that there are unlikely to be competing demands for spectrum in the 26/28 GHz bands from providers of non-Government services.

20. In accordance with the Spectrum Policy Framework, where no competing demand is considered likely, the CA may decide whether to assign the spectrum concerned based on a market-based approach or any other approaches. In the current case, having regard to the precedent of the CA in assigning spectrum administratively in frequency bands where no competing demand was established and the need for timely release of radio spectrum to

⁷ HAPS is, according to Article 1.66A of ITU’s RR, defined as “a station on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth”.

⁸ Countries that allow the use of HAPS operating in the 28 GHz band include Bhutan, Cameroon, Korea (Rep. of), the Russian Federation, India, Indonesia, Iran (Islamic Republic of), Iraq, Japan, Kazakhstan, Malaysia, Maldives, Mongolia, Myanmar, Uzbekistan, Pakistan, the Philippines, Kyrgyzstan, the Dem. People’s Rep. of Korea, Sudan, Sri Lanka, Thailand and Viet Nam.

⁹ ITU Region 2 covers mainly the Americas.

facilitate the launch of 5G services, the CA considers it appropriate to adopt an administrative approach for assignment of spectrum in the 26/28 GHz bands. Subject to views and comments to be received in the public consultation, under an administrative approach of assignment, the CA expects to be able to invite applications for administrative assignment of the spectrum in the 26/28 GHz bands by the end of 2018, such that the mmWave spectrum in the 26/28 GHz bands can be used for providing 5G services starting from April 2019.

Question 2: Do you have any views on adopting an administrative assignment approach for the release of spectrum in the 26/28 GHz bands?

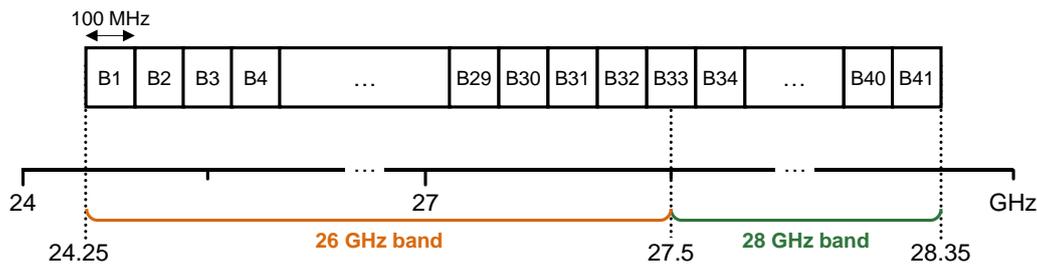
SPECTRUM ASSIGNMENT ARRANGEMENTS

Band Plan

21. The 26/28 GHz bands have a wide bandwidth and are particularly suitable for supporting usages with high traffic demand and high user density. Taking into account the technical specifications of 5G technology being developed by the 3GPP and the views of the respondents on channel planning in their submissions to the EOI Invitation, the Time Division Duplex (“TDD”) mode, with spectrum dividing into unpaired frequency slots will be adopted for the 26/28 GHz bands.

22. Information from equipment vendors indicates that the 5G equipment supports channel bandwidths of 50, 100, 200 and 400 MHz, with aggregated bandwidth up to 800 MHz. The CA proposes to adopt a channel bandwidth of 100 MHz for the 4 100 MHz of spectrum in the 26/28 GHz bands, making a total of 41 frequency slots available for assignment, as shown in [Figure 2](#) below. It provides the flexibility required to cater for different numbers of applicants and for meeting the requirements of different 5G use cases. In addition, this also enables efficient aggregation of the assigned spectrum into larger bandwidths for the provision of very high speed mobile broadband services.

Figure 2: Proposed Band Plan for the 26/28 GHz Bands



Question 3: Do you have any views on the proposed band plan with frequency slots of 100 MHz each?

23. Recognising that the new 5G technology will support development of a new telecommunications infrastructure which allows different scale and configuration of deployment to cater for a variety of innovative services and applications, the CA will consider assigning the spectrum for the provision of both large scale public 5G services in any locations of the territory (“large scale public 5G services”) as well as smaller scale localised services in specified locations with use of the spectrum on a shared basis (“specified location services”). Among the 4 100 MHz of spectrum available in the two bands, the CA proposes to assign 3 300 MHz to 3 700 MHz of spectrum in the 26/28 GHz bands for the provision of large scale public 5G services.

24. The remaining 400 MHz to 800 MHz of spectrum in the two frequency bands is proposed for assignment to entities interested in providing specified location services on a shared basis (“Shared Spectrum”), in order to widen the scope of 5G services and the choice of service suppliers in the 5G era. Entities other than those providing large scale public 5G services may apply to use the Shared Spectrum in specified locations such as university campus, industrial estates, airport, technology parks, etc. Such geographical sharing is made possible by using the mmWave spectrum given that small cells with limited coverage are expected to be deployed for 5G services. The exact amount of spectrum to be assigned for large scale public 5G services and for specified location services respectively will be determined by the CA after taking into account the applications received for use of the spectrum in the 26/28 GHz bands. More details on the proposed arrangement for assignment of the spectrum in the bands are set out in the ensuing paragraphs.

Question 4: Do you have any views on the proposal of assigning (a) 3 300 MHz to 3 700 MHz of spectrum in the 26/28 GHz bands for the provision of large scale public 5G services; and (b) the remaining 400 MHz to 800 MHz of spectrum in the two frequency bands to other entities for the provision of 5G services in specified locations on a shared basis?

Spectrum Cap

25. In their responses to the EOI Invitation, some respondents consider it necessary to set a cap for the assignment of spectrum in the 26/28 GHz bands. The CA shares the same view, given the limited initial supply of mmWave spectrum suitable for the provision of 5G services and the consideration of preventing overconcentration of spectrum in individual market players so as to promote effective competition in the supply of 5G services.

26. The cap for the holding of spectrum in the 26/28 GHz bands is proposed to be set independent of assignees' holdings of spectrum in the other frequency bands. This is in view of the different technical characteristics and usage of the mmWave spectrum and spectrum in the low frequency bands in the deployment of 5G services.

27. In regard to the size of the spectrum cap, apart from competition related concern and the indicative spectrum demand from individual respondents, consideration has to be given also to the bandwidths required for the provision of enhanced mobile broadband connectivity using the 5G New Radio technology. Major equipment vendors are working to provide devices which support a maximum bandwidth of 800 MHz in the 26/28 GHz bands using the carrier aggregation technology to provide very high speed transmission. To facilitate MNOs to realise the full potential of the technology to achieve the peak downlink speed of 20 Gbps according to the ITU's target for 5G implementation, the cap for the assignment of spectrum designated for the provision of large scale public 5G services is proposed to be set at 800 MHz for each assignee. For other applicants who intend to provide specified location services, a cap of 400 MHz of the Shared Spectrum is proposed.

Question 5: Do you have any views on the proposed caps of (a) 800 MHz of spectrum in the 26/28 GHz bands for spectrum designated for the provision of large scale public 5G services; and (b) 400 MHz of the Shared Spectrum designated for the provision of specified location services?

Spectrum Assignment Methods

Assignment of Spectrum for Provision of Large Scale Public 5G Services

28. For the spectrum to be assigned for the provision of large scale public 5G services, the assignment period is proposed to be 15 years from 1 April 2019 to 31 March 2034. Applications for spectrum assignment will be open to all incumbent MNOs and any new entrants during an application period to be specified by the CA. For each application received, a pre-qualification exercise will be conducted to determine whether an applicant is qualified for participation in the application. The CA preliminarily considers that the following qualification requirements should be adopted –

- (a) applicants will be required to put in a deposit in the form of cash or a letter of credit issued by a qualifying bank based on the amount of spectrum it applies for; and
- (b) applicants should indicate the types of services they plan to provide, and demonstrate their technical, organisational and financial capabilities to provide the services in fulfilment of the licensing obligations to the satisfaction of the CA and submit any other relevant supporting information that the CA may consider necessary.

29. Subject to the relevant spectrum cap, each applicant should indicate the amount of spectrum it seeks for assignment. The CA will consider the applications and the total amount of spectrum applied for in deciding how much of the spectrum within the 26/28 GHz bands will be assigned for the provision of large scale public 5G services. If the demands of all qualified applicants taken together are equal to or smaller than the amount of spectrum available in the two frequency bands for assignment for the provision of large scale public 5G services, each applicant will be assigned the amount of

spectrum it applies for. If the total amount of spectrum applied for exceeds the amount of spectrum available for the purpose, the CA will employ the two-stage distribution mechanism as proposed in paragraphs 30 – 31 below for spectrum assignment.

Proposed Two-Stage Approach If the Total Amount of Spectrum Applied for Exceeds the Amount Available

30. In the first stage of distribution, the available slots (i.e. 33 to 37 slots, to be determined following assessment of the applications received) will be distributed among the qualified applicants based on the principles that (a) the amount of spectrum to be provided to an applicant shall be no more than what it demands; and (b) equal sharing of available spectrum among qualified applicants. The mechanism can be depicted as follows –

- Each applicant will be provided with one frequency slot by turn for each round of distribution (i.e. x frequency slots will be distributed for x number of applicants in a single round);
- The above process will repeat and the applicant whose demand is fully satisfied in a round of distribution will be excluded from the next round of distribution; and
- The distribution process will stop when the number of frequency slots available for distribution in the next round is less than the number of remaining applicants. There will then be a second stage distribution.

31. In the second stage of distribution, the remaining frequency slots designated for the purpose of providing large scale public 5G services are proposed to be distributed by drawing lots among the remaining applicants.

32. After completing the above stages of distribution, the exact amount of spectrum to be assigned to each of the individual applicants will be determined. The CA will then decide the exact positions of the frequency slots to be assigned to each applicant by drawing lots; and notify the result of spectrum assignment to the qualified applicants.

Question 6: What are your views on the proposed method of assigning spectrum in the 26/28 GHz band to qualified applicants for the provision of large scale public 5G services?

Question 7: Do you have any preference on the assignment of spectrum in either the 26 GHz or 28 GHz band?

Assignment of Spectrum for Provision of Specified Location Services

33. A total of 400 MHz to 800 MHz of spectrum in the 26/28 GHz bands is proposed to be assigned on a shared basis for the provision of 5G services in specified locations. To encourage the introduction of innovative services as technologies evolve and demands arise, applicants may apply for the assignment of the Shared Spectrum during and at any time after the period to be specified by the CA for application for assignment of spectrum designated for large scale operation, and the assignments will be made on a first-come-first-served basis. For the avoidance of doubt, assignees of spectrum in the 26/28 GHz bands designated for the provision of large scale public 5G services as well as their connected companies¹⁰ will not be eligible for assignment of the Shared Spectrum, to ensure sufficient spectrum will be made available to support a wider scope of 5G services and choice of service suppliers. For efficient spectrum management and administration, the assignments of the Shared Spectrum in the 26/28 GHz bands for use in specified locations will, subject to the validity period of the appropriate licence to be issued to the assignee, terminate on or before 31 March 2034 when the assignments for the provision of large scale public 5G services will expire.

34. The CA will consider applications for use of the Shared Spectrum and determine the exact amount and position of frequency slots to be assigned to the successful applicants, subject to the cap of 400 MHz of spectrum as set out in paragraph 27 above. To enable effective use of the Shared Spectrum by different parties, the aggregate network coverage by each assignee is proposed to be limited to no more than 50 square kilometres. The proposed restriction on

¹⁰ For the purpose of the current spectrum assignment exercise, a company (Company A) is a connected company of another company (Company B) if, amongst other things, Company A holds a material interest in Company B (which includes Company A holding or possessing, directly or indirectly, more than 25% of the issued share capital or voting power in respect of more than 25% of the issued share capital of Company B).

aggregate coverage for deployment of any Shared Spectrum assigned to an applicant will be applied to its connected companies¹¹ on an aggregate basis. The spectrum will be assigned to a successful applicant under an appropriate licence such as the Public Radiocommunications Service Licence. The restriction on geographical coverage in using the Shared Spectrum assigned will be specified in the licence.

Question 8: What are your views on the proposed assignment method for the Shared Spectrum?

Network and Service Rollout Obligations

35. In order to encourage early rollout of the 5G network using the mmWave spectrum to provide mobile services with very high transmission speed and capacity, network and service rollout obligations are proposed to be imposed on the assignment of spectrum in the 26/28 GHz bands designated for the provision of large scale public 5G services. Taking into account the timing for general availability of 5G compliant equipment and to ensure efficient use of the spectrum in the 26/28 GHz bands assigned administratively to each assignee, it is proposed that a minimum of 5 000 radio base stations should be established and put into use within the first five years following the spectrum assignment. The base stations can be installed in five stages: with 500 base stations to be installed by the end of the first year; an annual addition of 1 000 base stations by the end of each of the following three years; and an annual addition of 1 500 base stations by the end of the fifth year.

36. Network and service rollout obligations are however not proposed to be imposed for deployment of the Shared Spectrum. As it will be assigned on a geographically shared basis for use in specified locations, underutilisation of the spectrum by assignees should not be a major concern. Applicants for the Shared Spectrum shall submit the network and service rollout plan in their proposals. Upon successful application, the plan will be included as a schedule to their respective licences.

¹¹ Please see Footnote 10 for the definition of “connected companies”.

Question 9: What are your views on the network and service rollout obligations proposed to be imposed on the use of spectrum assigned for the provision of large scale public 5G services?

Performance Bond

37. Each spectrum assignee assigned with the spectrum for the provision of large scale public 5G services will be required to submit a performance bond to guarantee its rollout of 5G network and services. The size of the performance bond is proposed to be set at \$1 million per MHz of spectrum assigned. For example, a spectrum assignee will need to submit a bond of \$400 million if it is assigned with 400 MHz of spectrum. The bond will be released to the assignees in five phases on equal portions and in accordance with their fulfilment of the milestone set for each of the five years following assignment of the relevant spectrum. If the assignee cannot fulfil any of the milestones as required, the relevant part of the bond will be forfeited.

38. As assignments of the Shared Spectrum in the 26/28 GHz bands are not proposed to be subject to network and service rollout requirements, no performance bond will be required.

Question 10: What are your views on the proposed performance bond for guaranteeing compliance with the proposed network and service rollout obligations for using spectrum assigned for the provision of large scale public 5G services?

SPECTRUM UTILISATION FEE

39. As a matter of principle, as frequency spectrum is a scarce public resource, it is incumbent upon the Government to ensure that the SUF of spectrum is set to reflect as close as possible its full market value so that spectrum assignees, which run their commercial operations in a fully liberalised market, would put the spectrum so acquired to its most efficient use.

40. For spectrum where the CA considers that there are not likely to be competing demands when it is made available for assignment, such spectrum

will be assigned to licensees administratively. The Spectrum Policy Framework provides that for this type of spectrum not released through auction or other market mechanisms, the SUF may be set to reflect the opportunity costs of the spectrum. Imposing an SUF would help encourage spectrum users to put the spectrum assigned to them to efficient use and/or to return unused or under-utilised spectrum to the CA for assignment to other users. Charging an SUF is justified for frequency bands that are congested (i.e. 75% or more occupied) and anticipated to be more so in future.

SUF Charging Scheme for Spectrum Assigned Administratively

41. In view of the role of SUF in promoting spectrum efficiency, SCED and the former TA decided in 2011 to introduce a SUF charging scheme for spectrum assigned administratively (“SUF Charging Scheme”)¹², under which SUF should be applicable to the use of administratively assigned spectrum in frequency bands that are congested (i.e. 75% or more occupied) and the demand for using the frequency bands associated with its current use is expected to grow in the next three to five years, or a high potential demand for the frequency bands for alternative use(s) is expected.

42. As regards the levels of SUF, it was decided that the least cost alternative (“LCA”) approach should be adopted in deriving the opportunity cost for spectrum assigned administratively. This methodology is based on the lower cost a user will necessarily incur in using an alternative means to provide the same service assuming that the spectrum it currently utilises would be taken away. SUF is set at the cost difference between a spectrum user’s current operation and its least cost alternative. When there is no matching or viable alternative for a spectrum user to provide the same service, its occupation of a band might deny the use by another user and thus still carry an opportunity cost¹³.

¹² The Joint Statement of SCED and the former TA on SUF for spectrum administratively assigned is available at:
<http://tel.archives.ofca.gov.hk/en/tas/spectrum/ta20110923.pdf>.

¹³ For example, for spectrum that may be allocated for both fixed service and FSS on a co-primary basis, using the spectrum for satellite uplink application (which some operators consider that there is no viable service provision alternative) would deny the use of the same spectrum for fixed link application. The opportunity cost for granting the spectrum for the satellite uplink application would be calculated on the basis of the LCA for the displaced fixed link user.

43. The SUF Charging Scheme took effect from 1 January 2018, with a transitional period of five years before the charging scheme is fully in force, i.e. no SUF is levied in the first two years from 1 January 2018 to 31 December 2019, 30% of the SUF payable for the third year in 2020, 70% payable for the fourth year in 2021, and the full amount payable for the fifth year in 2022 and beyond.

44. Given that the technological landscape is evolving continuously in the telecommunications industry, it was decided that the designation of congested bands and the levels of SUF imposed on the designated frequency bands should be reviewed every five years¹⁴.

Proposal for SUF of the 26/28 GHz bands

45. In view that the CA considers it appropriate to administratively assign spectrum in the 26/28 GHz bands (see paragraph 20 above), SCED proposes –

- not to charge any SUF if less than 75% of the spectrum in these frequency bands will be assigned or occupied; or
- to charge an SUF if the frequency bands become congested (i.e. 75% or more occupied) and are anticipated to become more congested in the future¹⁵.

46. Whether spectrum users in the 26/28 GHz bands will be subject to the payment of SUF will be ascertained after the CA has received and assessed their applications.

47. If the 75% threshold is reached, SCED proposes to adopt the LCA approach in determining the level of SUF. While there is no matching or viable alternative for a spectrum user to provide public mobile services, the 26/28 GHz bands are also allocated for fixed service and FSS on a co-primary basis. As such, using the spectrum for public mobile services would deny the

¹⁴ The next review will take place in around 2022 – 2023, i.e., five years' time from the taking of effect of the SUF Charging Scheme on 1 January 2018.

¹⁵ In assessing whether the 26/28 GHz bands are congested, SCED will treat the 26/28 GHz bands as one frequency band and take into account the aggregate utilisation rate of the two bands

use of the same spectrum for fixed service and FSS. SCED therefore considers that the level of SUF for the provision of public mobile services should make reference to the LCA calculated for fixed links and satellite uplinks under the SUF Charging Scheme.

48. For spectrum to be assigned for provision of large scale public 5G services (see paragraph 23 above), SCED proposes that the level of SUF be set at \$21,600 per MHz per annum, which is the SUF levied on carrier licensees for use of fixed links or satellite uplinks under the SUF Charging Scheme; whereas for the Shared Spectrum (see paragraph 24 above), SCED proposes that the level of SUF be set at \$1,080 per MHz per annum per geographical coverage of 50 square kilometres.

49. In view of the substantial upfront investments required for MNOs and non-MNOs to roll-out their 5G network infrastructure, and to facilitate them to launch public 5G services as early as possible, SCED proposes to follow the payment timetable set out in set out in paragraph 43 above if payment of an SUF is required, i.e. no SUF will be charged for 2019, 30% payable for 2020, 70% payable for 2021, and the full amount payable for 2022 and beyond.

50. To ensure that the levels of SUF will keep reflecting the opportunity cost of the spectrum, such that spectrum assignees will be incentivised to use the spectrum in a more efficient manner, SCED proposes that the review on the designation of frequency bands and levels of SUF under the SUF Charging Scheme conducted every five years will cover the 26/28 GHz bands, irrespective of whether the 26/28 GHz bands are regarded as congested at the initial stage.

51. If the 75% threshold is reached and payment of an SUF is required, the CA will, pursuant to section 32I(1) of the TO, by order designate the frequency bands as ones in which the use of spectrum is subject to the payment of SUF by the users of the spectrum, and SCED will, pursuant to section 32I(2) of the TO, by regulation prescribe the levels of SUF.

Question 11: Do you have any views on the proposal for SUF as set out in paragraphs 45 to 50 above?

WAY FORWARD

52. The CA and SCED will carefully consider the views and comments received in response to this consultation before promulgating their respective decisions on the allocation of the 26/28 GHz bands and the associated arrangements for spectrum assignment, and on the related SUF by the end of the year. The target is to invite applications for assignment of spectrum in the 26/28 GHz bands by the end of 2018, such that the spectrum can be deployed for the provision of 5G services from April 2019 onwards.

**Commerce and Economic Development Bureau
(Communications and Creative Industries Branch) and
Office of the Communications Authority
26 July 2018**