Joint Statement of the Communications Authority and the Secretary for Commerce and Economic Development

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

13 December 2018

PURPOSE

This Statement promulgates the decision of the Communications Authority ("CA") on the allocation of 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 and the associated arrangements for spectrum assignment. This Statement also announces the decision of the Secretary for Commerce and Economic Development ("SCED") on arrangements for the related spectrum utilisation fee ("SUF").

INTRODUCTION

2. The CA announced its work plan in March 2017 to make available additional spectrum in multiple frequency bands for the provision of public mobile services[1]. Among others, spectrum in the 26/28 GHz bands will be the first batch of spectrum to be made available for the provision of the fifth generation ("5G") mobile services in Hong Kong. With a contiguous bandwidth of 4 100 MHz, the 26/28 GHz bands are well placed to support enhanced mobile broadband services ("eMBB") likely to be implemented in the initial phase of 5G deployment to provide extremely high-speed and high-capacity data transmissions to end users.

3. The 26/28 GHz bands are currently allocated primarily to fixed service, with part of the spectrum within the 26 GHz band assigned. In order to vacate the spectrum concerned for allocation to mobile service, notices of

[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.

withdrawal have been served on the relevant spectrum assignees to withdraw their assignments from 1 April 2019. On the other hand, part of the spectrum within the 26 GHz band and the entire 28 GHz band has also been allocated to fixed satellite service (Earth-to-space) ("FSS") though there is no actual use for the time being.

4. To prepare for the launch of 5G services in Hong Kong, the CA issued an invitation for expression of interest in December 2017 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 services[2]. Having analysed the submissions received, the CA and SCED jointly issued a public consultation paper on 26 July 2018 ("Consultation Paper") to seek views and comments on the proposal to allocate the 26/28 GHz bands to mobile service, and on the proposed associated arrangements for spectrum assignment and charging of SUF[3].

5. Upon the close of the public consultation on 22 August 2018, 20 submissions were received, including those from the four mobile network operators ("MNOs"), a fixed network operator, four satellite operators, some equipment vendors, industry associations, as well as members of the public[4]. Having carefully considered the views and comments received, the CA and SCED promulgate in this Statement their respective decisions on allocation and assignment of spectrum in the 26/28 GHz bands, and on matters in relation to the related SUF.

LEGISLATIVE AND POLICY FRAMEWORK

6. Under section 32G(1) of the Telecommunications Ordinance (Cap. 106) ("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

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[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.

[3] The Consultation Paper is available at: https://www.coms-auth.hk/filemanager/en/content_711/cp20180726_e.pdf.

[4] Submissions to the public consultation are available at: https://www.coms-auth.hk/en/policies_regulations/consultations/completed/index_id_467.html.

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.

7. Section 4(4) of the Communications Authority Ordinance (Cap. 616) ("CAO") 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 principles in radio spectrum management which the CA should take into account in discharging its spectrum management responsibilities under the TO[5]. 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 TO[6].

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.

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[5] The Spectrum Policy Framework is available at: https://www.cedb.gov.hk/ccib/eng/legco/pdf/spectrum.pdf.

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

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.

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.

PROPOSALS IN THE CONSULTATION PAPER

12. The 26 GHz band is the lowest band among the 11 candidate bands within the frequency range of 24.25 – 86 GHz identified by the International Telecommunication Union ("ITU") for global allocation to International Mobile Telecommunications ("IMT") services for 2020 and beyond (i.e. 5G services). Such high frequency spectrum above 24 GHz is commonly referred to as the millimetre wave spectrum or mmWave spectrum. While Mainland China and Europe have adopted the 26 GHz band as the priority band for the provision of 5G services, other major economies including the United States, South Korea and Japan focus on using the 28 GHz band. Both the 26 GHz and 28 GHz bands have been adopted by the 3rd Generation Partnership Project ("3GPP") [7] 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.

13. Against the above background, the CA proposed to allocate the 26 GHz and 28 GHz bands to mobile service on a co-primary basis with FSS, with base stations of co-primary users to be protected on a first-come-first-served basis. According to the expressions of interest received, it is unlikely that the total demand for spectrum in the 26/28 GHz bands from providers of

[7] 3GPP is an internationally recognised telecommunications standard development organisation that specialises in the formulation and implementation of standards for global third generation ("3G"), fourth generation ("4G") and 5G mobile communication systems. Members include standard associations of Europe, Japan, China, Korea and North America.

non-Government services will exceed the total supply of 4 100 MHz. The CA therefore proposed to adopt an administrative approach for spectrum assignment.

14. In gist, the proposal for the assignment of the 4 100 MHz of spectrum in the 26/28 GHz bands was to assign 3 300 MHz to 3 700 MHz of it ("Non-shared Spectrum") to the incumbent MNOs and any new entrants for providing large scale public 5G services, with the remaining 400 MHz to 800 MHz of spectrum to be assigned to other entities on a geographical sharing basis ("Shared Spectrum") for providing services in specified locations. Spectrum caps of 800 MHz and 400 MHz would be imposed on any person acquiring the Non-shared Spectrum and the Shared Spectrum respectively. Each assignee of the Shared Spectrum would be subject to a further restriction on geographical network coverage. Network and service rollout obligations were proposed to be imposed only on the Non-shared Spectrum assigned.

15. With regard to SUF, SCED proposed to charge SUF only if 75% or more of the spectrum within the 26/28 GHz bands is occupied. In that case, for the Non-shared Spectrum, the SUF would be set at $21,600 per MHz per annum. For the Shared Spectrum, the SUF would be set at $1,080 per MHz per annum per geographical coverage of 50 square kilometres.

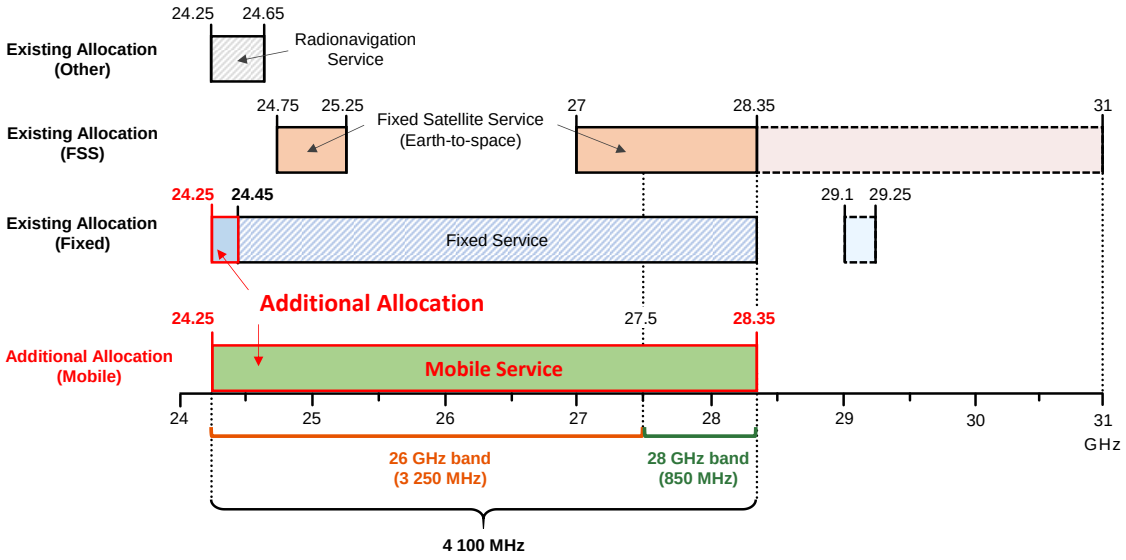
16. The proposal to allocate the 26 GHz and 28 GHz bands to mobile service has the support of the mobile industry, but is opposed by the satellite industry. As regards the proposed arrangements for spectrum assignment, there are different views and comments submitted by the respondents on various aspects of the proposed arrangements. The salient features of the views and comments received in the public consultation, as well as the respective responses of the CA and SCED, are summarised in the **Annex**.

THE DECISION OF THE CA ON ALLOCATION OF THE 26 GHZ and 28 GHZ BANDS TO MOBILE SERVICE

17. Having carefully considered the submissions received and taking into account the spectrum demand for 5G services in the two relevant frequency bands internationally and relevant international compatibility studies between IMT services and existing services, **the CA decides 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 having already been allocated to fixed service) on a primary basis with effect from 1 January 2019, on top of the existing allocation in Hong Kong. Details are shown in Figure 1 below.

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



18. Under this arrangement, 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. allocation on a co-primary basis. As explained in the Consultation Paper, a new radio base station of a co-primary service must refrain from causing harmful interference to, and will not be entitled to gain protection from harmful interference caused by, stations of other co-primary users already in existence. In gist, the base stations of co-primary users will be protected on a first-come-first-served basis. The CA considers that such an arrangement would allow fair access to the spectrum by the relevant co-primary users. The CA's detailed response to the submissions received is set out in paragraphs 2.12 – 2.19 and 2.22 – 2.23 of the **Annex**.

19. Furthermore, the use of the 26/28 GHz bands for public mobile services in Hong Kong will need to observe relevant resolutions and co-existence rules to be promulgated by ITU, where applicable.

THE DECISION OF THE CA ON THE ARRANGEMENTS FOR ASSIGNMENT OF THE 26/28 GHZ BANDS

Administrative Approach in Spectrum Assignment

20. With 4 100 MHz of spectrum available in the 26/28 GHz bands, respondents to the Consultation Paper do not advocate that the demand for the relevant spectrum for providing public mobile services including 5G services would exceed the supply. The CA therefore maintains the view that there are unlikely to be competing demands for the spectrum in the 26/28 GHz bands from providers of non-Government services.

21. In accordance with the Spectrum Policy Framework, where competing demands are considered unlikely, the CA may decide whether to assign the spectrum concerned based on a market-based approach or any other approaches. Having arrived at the view that there are unlikely to be competing demands for non-Government use of the spectrum in the 26/28 GHz bands, and further considering that the adoption of an administrative approach in the current case should be an efficient method to optimise the distribution of the available spectrum to multiple operators with variable demands and could also achieve timely release of radio spectrum to facilitate the launch of 5G services, **the CA decides to adopt an administrative approach for the assignment of spectrum in the 26/28 GHz bands**.

Categorisation of Spectrum in the 26/28 GHz Bands

22. As set out in the Consultation Paper, the 5G New Radio technology is envisaged to support a new telecommunications infrastructure which allows different scale and configuration of deployment to cater for a variety of innovative services and applications. The CA therefore proposed to set aside a small part of the available spectrum (in the range of 400 MHz to 800 MHz) for provision of small scale localised wireless services in specified locations ("localised wireless services"), while the majority of spectrum (in the range of 3 300 MHz to 3 700 MHz) would be designated for conventional large scale public mobile services which may be provided in any or all locations of the territory ("large scale public mobile services"). Having regard to the views and comments of the respondents, the CA considers that the demand of spectrum

for the provision of large scale public mobile services should be met with a higher priority given the potential to serve a larger proportion of the community. Therefore, **the CA decides to set aside 3 700 MHz of spectrum in the 26/28 GHz bands as Non-shared Spectrum for provision of large scale public mobile services; and 400 MHz of spectrum as Shared Spectrum for provision of localised wireless services including fixed services**. Subject to the arrangements as elaborated in the ensuing sections, any spectrum left unassigned will be put back to reserve and the Spectrum Release Plan will be updated accordingly.

23. The Shared Spectrum set aside for provision of localised wireless services will be assigned on a geographically sharing basis for use in different specified locations such as university campuses, industrial estates, airport, technology parks, etc. It may also be used to support fixed wireless access or smart city applications in scattered locations. Due to the short range propagation characteristics of the mmWave spectrum and the resulting limited cell site coverage, the same frequency band may be re-used by different assignees at different locations. The sharing arrangement aims to widen the scope of 5G services and the choice of service suppliers in the 5G era. The Shared Spectrum will be assigned under a light-handed regulatory regime to encourage the introduction of innovative 5G services. Assignees of the Shared Spectrum should not deploy the spectrum assigned on a wholesale or retail basis to provide conventional public mobile services which are generally available to members of the public with the use of smartphones or other mobile gadgets[8]. In other words, the services to be provided with the use of the Shared Spectrum should be confined to specific groups of users for innovative 5G services.

24. In the Consultation Paper, the CA has also distinguished the new type of localised wireless services from the conventional large scale public mobile services by limiting the aggregate network coverage of the former to 50 square kilometres. Having regard to the submissions received and considering that more flexibility should be given to allow the development of

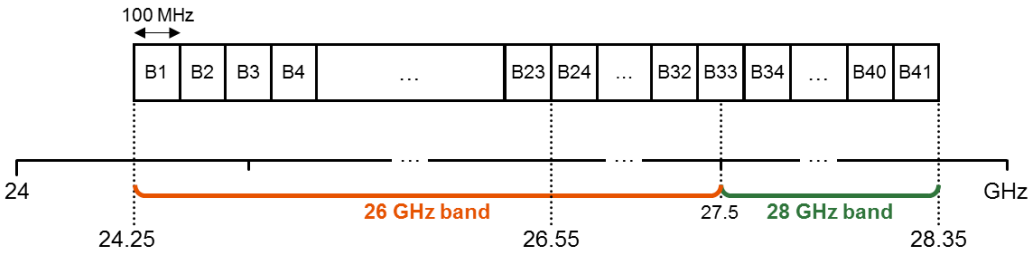
[8] For reference purpose, "conventional public mobile services" refer to mobile voice and data services (including eMBB services) provided by MNOs over their mobile networks to the general public. Subscribers use these services on their smartphones or other mobile gadgets for various personal applications such as internet access, social networking, electronic payment, or streaming of videos and songs. Mobile services provided for some specialised applications such as cargo and fleet management, electronic monitoring, etc. to selected groups of users are considered to be outside the scope of "conventional public mobile services".

innovative and diversified applications (supported by both mobile and fixed wireless access) and evolution of such applications using the Shared Spectrum, the CA considers it appropriate to maintain the limit on aggregate network coverage by each assignee of the Shared Spectrum at 50 square kilometres. It should be noted that an assignee of the Shared Spectrum is not automatically authorised to provide services to a total area of 50 square kilometres. Applicants for use of the Shared Spectrum will be required to submit information about their proposed scope of service and network coverage in their technical proposals and this will be subject to the CA's approval. The scope of service and limit on aggregate geographic network coverage will then be specified in the assignee's licence. For further details as to the CA's response to the submissions received, please refer to paragraphs 3.9 – 3.10 of the **Annex**.

Band Plan

25. According to the technical specifications for 5G and information from equipment vendors, 5G equipment operating in the 26/28 GHz bands supports channel bandwidths of 50, 100, 200 and 400 MHz, based on the Time Division Duplex ("TDD") mode with the spectrum divided into unpaired frequency slots. Respondents' views on the channel bandwidth which should be adopted in Hong Kong are diverse. Having regard to the submissions received and the latest state of technology development, **the CA decides to adopt a channel bandwidth of 100 MHz for the 4 100 MHz of spectrum in the 26/28 GHz bands, making it a total of 41 frequency slots available for assignment**, as shown in Figure 2 below. This provides the flexibility required to cater for different numbers of applicants, and for meeting the requirements of different 5G use cases in future. Assignees can aggregate multiple 100 MHz slots assigned to form larger channel bandwidth. The currently available technology already enables carrier aggregation up to 800 MHz.

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



Spectrum Cap

26. Whilst the CA is of the view that there are unlikely to be competing demands for the spectrum in the 26/28 GHz bands, it pointed out in the Consultation Paper that the imposition of spectrum cap is required to enable efficient utilisation of the administratively-assigned spectrum, and to avoid overconcentration of spectrum in the hands of any one assignee so as to promote effective competition in the market for mobile services. Having considered the general support of MNOs in setting a spectrum cap at 800 MHz (except for one MNO which asks for assignment without any spectrum cap) and taking into account the bandwidth required for achieving the peak downlink speed of 20 Gbps targeted by ITU for 5G implementation and the potential of equipment supply in the market, **the CA decides to set a cap of 800 MHz for the amount of Non-shared Spectrum which may be held by an assignee** for providing large scale public mobile services. It will be applied on an aggregate basis to the holding of spectrum by all connected companies[9] of each assignee in both the 26 GHz and 28 GHz bands.

27. **As for the Shared Spectrum, the cap is set at 400 MHz.** While the cap enables the maximum channel bandwidth allowed in the current 5G technical standard specifications (i.e. 400 MHz) to be used by an assignee for providing innovative localised wireless services, the actual amount of spectrum which will be assigned by the CA to an applicant will depend on the merits of its application. The cap will be applied on an aggregate basis to the holding of spectrum by all connected companies[10] of each assignee.

Assignment of Non-Shared Spectrum for Provision of Large Scale Public Mobile Services

28. Under the administrative approach for spectrum assignment, the CA will publish relevant guidelines for interested parties to apply within a specified application period for the assignment of Non-shared Spectrum in the two

[9] 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, 25% or more of the issued share capital or voting power in respect of 25% or more of the issued share capital of Company B).

[10] Please see Footnote 9 for definition of "connected companies".

frequency bands for providing large scale public mobile services. The incumbent MNOs and any new entrants interested in providing public mobile/ wireless fixed telecommunications services may submit their applications. Subject to applicants meeting relevant pre-qualification and licensing criteria, the CA will assess the demand of the qualified applicants and decide on the amount and frequency range of spectrum to be offered for assignment to individual qualified applicants. The CA intends to publish the guidelines and to invite applications for assignment of the Non-shared Spectrum by the end of December 2018, with a view to receiving the applications in January 2019 and completing the assessment by early March 2019 such that the mmWave spectrum in the 26/28 GHz bands can be assigned for providing large scale public mobile services from April 2019 onwards.

29. For each application received, a pre-qualification exercise will be conducted to determine whether the applicant is qualified for participation in the administrative spectrum assignment process. In order to be qualified, each applicant will be required to –

(a) state the types of services it plans to provide and the amount of spectrum it applies for with justifications;

(b) demonstrate its technical, organisational and financial capabilities to provide the services in a timely manner in fulfilment of the licensing obligations to the satisfaction of the CA and submit any other relevant supporting information as requested by the CA; and

(c) 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.

30. Apart from specifying the amount of spectrum applied for (which will be subject to the spectrum cap of 800 MHz), applicants will also be asked whether they have any preference for spectrum in the 24.25 – 26.55 GHz band (i.e. slots B1 to B23, "lower band") or the 26.55 – 28.35 GHz band (i.e. slots B24 to B41, "upper band"), and if this cannot be fully satisfied whether they would be willing to accept assignments in the alternative frequency band. The demarcation into the lower and upper frequency bands makes reference to the latest development of chipsets for network and customer equipment. On the basis of the total amount of spectrum applied for in the lower and upper

frequency bands respectively within the 26/28 GHz bands, the CA will determine the spectrum in each of the two frequency bands to be assigned for the provision of large scale public mobile services.

31. In assigning the spectrum in the 26/28 GHz bands, the CA aims to meet the demand of each applicant in a fair and equitable manner as well as to promote efficient use of the spectrum by the assignees as far as possible. If the demands for spectrum in each of the lower and upper bands of all qualified applicants taken together are equal to or less than the amount of spectrum available in the respective frequency bands, each qualified applicant will be assigned the amount of spectrum it applies for. In the situation where the total spectrum demand in either or both of the bands exceeds the available supply, the CA will apply the two-stage spectrum distribution mechanism as elaborated in paragraph 32 below to distribute the available supply to the qualified applicants.

Two-Stage Spectrum Distribution Mechanism

32. The two-stage spectrum distribution mechanism can be applied to the lower and upper bands either separately or jointly, depending on the applicants' preference for spectrum assignments and frequency band(s) in which excess demand occurs, which will be known only after all the applications have been received and qualified. The mechanism for distribution is nevertheless the same in whichever frequency band it is applied, depicted as follows (further details will be set out in the relevant guidelines for application to be published) –

First stage

- For spectrum in the frequency band(s) with excess demand, each applicant will be provided with one frequency slot by turn for each round of distribution (i.e. $\boldsymbol{x}$ frequency slots will be distributed for $\boldsymbol{x}$ 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.

Second Stage

- The remaining frequency slots in the frequency band(s) being considered will be distributed to the remaining applicants by drawing lots.

Location of Frequency Assignments

33. After completing the above stage(s) of distribution, the exact amount of spectrum to be assigned to each applicant will be determined. The CA will then arrange the frequency slots to form contiguous frequency blocks as far as possible for assignment to achieve better spectral efficiency. Taking into account the technical constraints in carrier aggregation, the CA will determine the exact position of the frequency blocks to be assigned to each successful applicant administratively as for other administratively-assigned spectrum. Further details will be set out in the relevant guidelines for application to be published.

Unassigned Spectrum

34. If any amount of Non-shared Spectrum is left unassigned, it will be put back to reserve. When there is indication of interest in the unassigned spectrum from the industry in future, the CA is prepared to launch a new round of invitation for spectrum application about two years after the coming application exercise (i.e. around end-2020). The spectrum cap of 800 MHz for the holding of spectrum for providing large scale public mobile services is expected to apply to the overall holding of the relevant spectrum in the 26/28 GHz bands by an assignee if it seeks to acquire additional spectrum in this new round of application. For example, an MNO having been assigned 400 MHz of the spectrum in the coming application exercise may apply for another 400 MHz in the subsequent round of application. Notwithstanding the above, depending on the amount of spectrum leftover and having regard to the latest market situation (including but not limited to the degree of concentration

of the spectrum assigned for the provision of public mobile services), the CA may review the level of the spectrum cap in the new round of invitation for spectrum application, and any change will apply to the aggregate spectrum holdings of assignees across the two rounds of spectrum assignment.

Licensing Arrangement

35. Each of the successful applicants will be granted a Unified Carrier Licence ("UCL") to effect the assignment of the spectrum in the 26/28 GHz bands. Schedule 2 of the Telecommunications (Carrier Licences) Regulation (Cap. 106V) requires UCLs to be issued for a term of 15 years from the day on which they are issued. For the spectrum assigned in the coming application exercise, the assignments will be for a period of 15 years from 1 April 2019 to 31 March 2034.

36. For leftover spectrum (if any) to be assigned in the subsequent round of assignment (paragraph 34 above refers), the assignment period will be shorter than 15 years and will terminate on the same day as the first batch of spectrum assigned so that all frequencies in the Non-shared Spectrum can be re-assigned together in future upon the expiry of the initial assignment period.

Assignment of Shared Spectrum for Provision of Localised Wireless Services

37. Application for assignment of the Shared Spectrum for provision of localised wireless services will take place immediately after the assignment of spectrum for provision of large scale public mobile services has been completed and the CA will publish relevant guidelines for application. To facilitate the introduction of innovative services as technologies evolve and demands arise, applications for assignment of the Shared Spectrum may be submitted any time after the commencement of the application process, and the assignments will be made on a first-come-first-served basis. As specified in paragraph 24 above, assignees may each deploy the Shared Spectrum assigned to provide innovative 5G services (but not the conventional public mobile services) with network coverage within an aggregate specified areas of no more

than 50 square kilometres. The restriction on network coverage will be applied to all connected companies[11] of an assignee on an aggregate basis.

38. Assignees of spectrum in the 26/28 GHz bands designated for providing large scale public mobile services will not be eligible for assignment of the Shared Spectrum, such that a certain amount of spectrum in the 26/28 GHz bands will be reserved for assignment to entities other than those providing large scale public mobile services with the assigned Non-shared Spectrum. The CA is prepared to review the arrangements for use of the Shared Spectrum after around five years in 2024, when more 5G use cases come on stream following finalisation of all 5G technical standards. Further details on the application criteria and procedures will be included in the relevant guidelines for application to be published.

Licensing Arrangement

39. Given the expected scale and innovative nature of operation of those localised wireless services which may be provided by assignees of the Shared Spectrum, the CA does not consider that such services should be subject to the same stringent set of regulations as those applied to conventional public mobile services licensed under UCL. As such, the CA intends to apply a more light-handed licensing approach to encourage entry of a wider range of service providers into the new 5G market and to avoid disproportionate regulatory burdens for an assignee of limited geographic scope. A new Localised Wireless Broadband Service ("LWBS") Licence under section 7(6) of the TO will be created to effect the assignment of the Shared Spectrum for the provision of innovative 5G services (excluding the conventional public mobile services). The LWBS Licence will be a non-carrier licence with a set of less stringent licence conditions as compared with the UCL. The LWBS Licence and the spectrum assignment will be for a period of five years, and may be extended for a further period of up to five years. After the approval of the CA, the form and conditions of the LWBS Licence to be created will be published in the Gazette pursuant to section 7(8) of the TO. It will be posted on the website of the CA thereafter for application by interested parties. Please refer to paragraphs 3.27 – 3.28 of the **Annex** for more details on the CA's response to the submissions received.

[11] Please see Footnote 9 for the definition of "connected companies".

Network and Service Rollout Obligations

Spectrum for Provision of Large Scale Public Mobile Services

40. In order to encourage early deployment of the 5G network using the administratively-assigned mmWave spectrum, the CA proposed in the Consultation Paper to impose network and service rollout obligations on the assignment of spectrum in the 26/28 GHz bands designated for providing large scale public mobile services. Given the limited propagation of the mmWave spectrum which makes it suitable for providing high-capacity transmission at traffic hot spots rather than the provision of wide area network coverage, the CA considers that it would be more appropriate to specify the rollout obligations in terms of the number of radio base stations installed instead of by the percentage of population covered.

41. Having considered the submissions received, in particular on the number of radio base stations required to be installed and the configuration of radio transmitting equipment which could be qualified as a radio base station, the CA agrees that due to the limited propagation and other technical characteristics of the mmWave spectrum, there could be more than one radio unit at the registered address of a radio base station in order to provide good network coverage to different directions of the area. Therefore, for the purpose of fulfilling the network and service rollout obligations, the CA will count the number of "radio units" (i.e. active antenna unit, antenna integrated radio, or remote radio head/unit) installed at the registered address of a radio base station instead. For example, if three radio units are connected to the baseband unit of a radio base station, this will be counted as three radio units for the purpose of meeting the minimum rollout requirement. Assignees of the Non-shared Spectrum are required to state clearly the number of radio units installed at the registered address of each radio base station in their applications to be submitted to the CA for approval of installation of radio base stations.

42. **The CA decides that each assignee of the Non-shared Spectrum in the 26/28 GHz bands designated for the provision of large scale public mobile services will be required to install and put into use a minimum number of radio units within the first five years following spectrum assignment and such requirement will be proportional to the amount of spectrum assigned. Specifically, if an applicant is assigned with 800 MHz**

of Non-shared Spectrum in the 26/28 GHz bands, a minimum of 5 000 radio units should be installed and put into use within the first five years following spectrum assignment. The network and service rollout obligations will be reduced proportionately in accordance with the amount of spectrum assigned. For example, the minimum network and service rollout obligations of an assignee of 400 MHz of Non-shared Spectrum will be 2 500 radio units within the first five years following spectrum assignment. For the avoidance of doubt, if another round of spectrum application for the Non-shared Spectrum is launched in future (paragraph 34 above refers), the same network and service rollout obligations will be imposed.

43. With the network and service rollout obligations to be set in accordance with the amount of spectrum assigned, the number of radio units to be installed in four phases within the first five years following spectrum assignment is specified as follows: 20% of the radio units required to be installed shall be installed within the first one and a half years following spectrum assignment; an addition of 20% of the radio units within the next one and a half years; an addition of 30% of radio units by the end of the fourth year; and an addition of the remaining 30% of radio units by the end of the fifth year.

44. In setting the above requirement for network and service rollout, the CA has made reference to the existing total number of more than 12 000 radio base stations installed by the four incumbent MNOs for operating the existing second generation ("2G"), 3G and 4G mobile networks and the special technical characteristics of the mmWave spectrum. While the mmWave spectrum is not expected to be deployed to provide as extensive coverage as the current 2G, 3G and 4G networks initially, the density of the radio base station sites has to be higher and more radio units may have to be installed in a particular location. The CA is of the view that the above rollout requirement is reasonable and practical for implementation of a large scale 5G network using the mmWave spectrum by a serious market player. Please refer to paragraphs 3.32 – 3.33 of the **Annex** for more details on the CA's response to the submissions received.

<u>Shared Spectrum for Provision of Localised Wireless Services</u>

45. As proposed in the Consultation Paper, **the CA maintains that the Shared Spectrum to be assigned for the provision of small scale localised**

wireless services should not be subject to network and service rollout obligations, in order to encourage the introduction of innovative services making use of the mmWave spectrum and New Radio technology. Furthermore, since assignment of the Shared Spectrum will be for a period of five years initially, and the spectrum 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.

Performance Bond

46. As proposed in the Consultation Paper and confirmed by the CA, only assignees of spectrum designated for providing large scale public mobile services will be required to provide performance bonds proportionate to the amount of spectrum assigned, in order to guarantee their fulfilment of the network and service rollout obligations. Assignees of the Shared Spectrum will not be subject to any rollout obligations.

47. **The size of the performance bond is 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 CA considers this level of performance bond appropriate to encourage early 5G network rollout as well as more efficient and timely use of the assigned spectrum. The bond will be released to the assignees in four phases on equal portions and in accordance with their fulfilment of the four milestones mentioned in paragraph 43 above set for the first five years following assignment of the relevant spectrum. If the assignee fails to fulfil any of the milestones as required, the relevant part of the bond will be forfeited. Please refer to paragraphs 3.36 – 3.37 of the **Annex** for more details on the CA's response to the submissions received.

SPECTRUM UTILISATION FEE

48. As detailed in paragraphs 20 – 21 above, the CA decides that the 26/28 GHz bands will be assigned administratively. For such spectrum not

released through auction or other market mechanisms, the Spectrum Policy Framework provides that the SUF may be set to reflect the opportunity costs of the spectrum, with a view to encouraging 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.

49. In view of this and having received general support on such during the public consultation, **SCED decides to adopt the SUF charging scheme for spectrum assigned administratively ("SUF Charging Scheme")[12] for charging SUF in the 26/28 GHz bands**, under which SUF will not be charged if less than 75% of the spectrum in these frequency bands is assigned or occupied; or a SUF will be charged if the frequency bands become congested (i.e. 75% or more occupied) and are anticipated to become more congested in the future.

50. If the 75% threshold mentioned in paragraph 49 above is reached, SCED decides to adopt the least cost alternative ("LCA") approach for deriving the opportunity cost for the spectrum[13]. The level of SUF for the Non-shared Spectrum is set at $21,600 per MHz per annum, since it is the SUF levied on carrier licensees for use of fixed links or satellite uplinks under the SUF Charging Scheme; while the level of SUF for the Shared Spectrum will be set at $1,080 per MHz per annum given the limited geographic scope the Shared Spectrum can be applied in and with a view to encouraging the introduction of innovative services by new market entrants.

51. Since the SUF Charging Scheme took effect only from 1 January 2018, there is a five-year transitional period in place before it is fully in force. As the 26/28 GHz bands will be assigned from 1 April 2019, i.e. within the five-year transitional period of the SUF Charging Scheme, the payment schedule for the Scheme will also apply to the 26/28 GHz bands if SUF needs to be levied. It means that no SUF will be charged for the

[12] The SUF Charging Scheme was introduced in 2011 and it 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.

[13] It means that 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 cost.

26/28 GHz bands in 2019, 30% will be charged and payable for 2020, 70% for 2021 and full amount only for 2022 and beyond. SCED considers that this arrangement should have given the spectrum users sufficient time and allowance to adapt to the Scheme.

52. SCED also decides 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). This could ensure that the levels of SUF will keep reflecting the opportunity costs of the spectrum, and aligns the arrangement of the 26/28 GHz bands with other spectrum under the SUF Charging Scheme.

WAY FORWARD

53. Following the promulgation in this Statement of the decisions of the CA on frequency allocation and assignment and of SCED on arrangements for the related SUF, the CA will invite applications for the assignment of the Non-shared Spectrum in the 26/28 GHz bands to be used for the provision of large scale public mobile services by end December 2018. The target is to announce the assignment results by early March 2019, so as to effect assignment to the successful applicants for their use from 1 April 2019 onwards. As for the Shared Spectrum to be assigned for the provision of localised wireless services, the CA will invite applications for spectrum assignment in the second quarter of 2019, alongside the creation of the new LWBS Licence.

54. For the avoidance of doubt, nothing in this Statement will affect, limit or prejudice the exercise of the powers of the CA and SCED under the CAO, TO or its subsidiary legislation.

Communications Authority
Secretary for Commerce and Economic Development
13 December 2018

Annex

Summary of Submissions to the Consultation Paper and the Responses of the Communications Authority and the Secretary for Commerce and Economic Development

Section 1: Introduction

1.1 On 26 July 2018, the Communications Authority ("CA") and the Secretary for Commerce and Economic Development ("SCED") jointly issued a public consultation paper ("Consultation Paper") to seek the views and comments of the telecommunications industry and other affected persons on the proposal to allocate a total of 4 100 MHz of spectrum in the 26 GHz band (24.25 – 27.5 GHz) and the 28 GHz band (27.5 – 28.35 GHz) (collectively referred to as the "26/28 GHz bands") to mobile service; and on the proposed associated arrangements for spectrum assignment and charging of spectrum utilisation fee ("SUF")[1].

1.2 Upon the close of the public consultation on 22 August 2018, submissions were received from the 20 respondents below listed under different categories and in alphabetical order[2] –

Mobile network operators ("MNOs") and a related organisation

- China Mobile Hong Kong Company Limited ("CMHK")
- Hong Kong Telecommunications (HKT) Limited ("HKT")
- Hutchison Telephone Company Limited ("Hutchison")
- SmarTone Mobile Communications Limited ("SmarTone")
- GSM Association ("GSMA")

Satellite operators and related organisations

- APT Satellite Company Limited ("APT")
- Asia Satellite Telecommunications Company Limited ("AsiaSat")

[1] The Consultation Paper is available at: https://www.coms-auth.hk/filemanager/en/content_711/cp20180726_e.pdf.

[2] Submissions to the Consultation Paper are available at: https://www.coms-auth.hk/en/policies_regulations/consultations/completed/index_id_467.html.

- SES World Skies Singapore Pte Ltd. ("SES")
- Viasat Incorporated ("Viasat")
- Asia Video Industry Association ("AVIA")
- Asia-Pacific Satellite Communications Council ("APSCC")
- EMEA Satellite Operators Association ("ESOA")
- Global VSAT Forum ("GVF")

Fixed network operator ("FNO")

- HGC Global Communications Limited ("HGC")

Equipment vendors and a related organisation

- Nokia
- Qualcomm Incorporated ("Qualcomm")
- Samsung Electronics Company Limited ("Samsung")
- Global Mobile Suppliers Association ("GSA")

Individuals

- Chris Lau
- Simon Lo

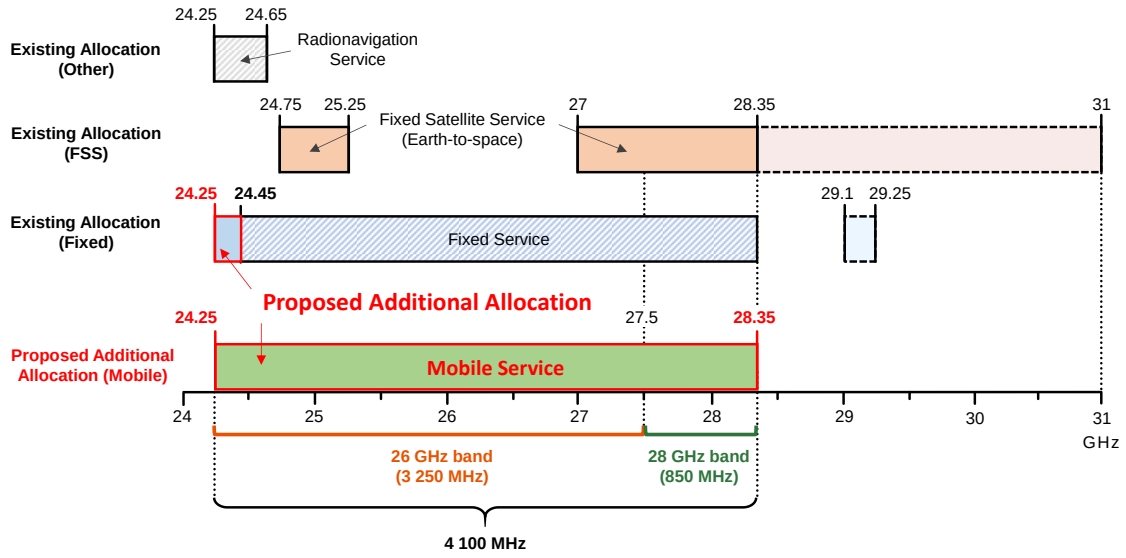
1.3 Having carefully considered the submissions received, the CA and SCED set out in this Annex their respective responses to the respondents' views and comments on the proposal to allocate the 26/28 GHz bands to mobile service, as well as the proposed associated arrangements for assignment of the spectrum concerned and charging of SUF. For the avoidance of doubt, the CA and SCED have taken into account and given thorough consideration to all the submissions which are relevant to frequency allocation and assignment and the related SUF, although not all of the issues raised are specifically mentioned or addressed herein.

1.4 Nothing in this Annex represents or constitutes a decision made by the CA or SCED. Please refer to the Statement issued together with this Annex for the respective decisions of the CA and SCED. The views and comments set out in this Annex are without prejudice to the exercise of the powers by the CA or SCED under the Communications Authority Ordinance (Cap. 616), Telecommunications Ordinance (Cap. 106) ("TO") or any subsidiary legislation.

Section 2: Allocation of the 26/28 GHz Bands

2.1 Under the CA's proposal as set out in the Consultation Paper, the 26 GHz and 28 GHz bands will be allocated 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 are already allocated to fixed service) on a primary basis, on top of the existing allocation of fixed satellite service (Earth-to-space) ("FSS") in the 24.75 – 25.25 GHz and 27 – 28.35 GHz bands and radionavigation service ("RNS") in the 24.25 – 24.65 GHz band.

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?***

Proposed Allocation of the 26 GHz and 28 GHz Bands to Mobile Service on a Primary Basis

Views and Comments of the Respondents

2.2 12 respondents, including ten from the telecommunications industry

(CMHK, GSA, GSMA, HGC, HKT, Hutchison, Nokia, Qualcomm, Samsung and SmarTone) and two individuals, support the proposed allocation of the 26/28 GHz bands to mobile service on a primary basis and share the view that the CA should make available additional spectrum to facilitate 5G development. Besides, Hutchison and GSMA support allocation of the sub-band 24.25 – 24.45 GHz to fixed service on a primary basis.

2.3 HKT further suggests that the 26/28 GHz bands should be re-allocated to mobile service on a primary basis and that existing allocation to fixed service, FSS and RNS be revoked or downgraded to a secondary basis, as necessary. HKT claims that such arrangement will be conducive to the development of advanced public mobile services in Hong Kong and will avoid burdensome coordination with other co-primary services. By adopting such arrangement, 5G services will be fully protected from interference caused by other services which share the same band as a secondary service.

2.4 Samsung expects that commercial equipment supporting the 5G new radio bands of n257 (26.5 – 29.5 GHz) and n261 (27.5 – 28.35 GHz) will be available within the year of 2018, while Nokia anticipates that chipset/terminal supporting the 28 GHz band will be available in the first half of 2019. Nokia, Qualcomm, CMHK and Samsung encourage the CA and SCED to make 26.5 – 28.35 GHz available first in consideration of the early global availability of equipment to support this range.

2.5 Furthermore, Samsung proposes that the CA should take into account the relevant decisions of World Radiocommunication Conference 2019 ("WRC-19") and the results of the compatibility studies on the potential adjacent channel interference to the 23.6 – 24 GHz band for the protection of Earth-Exploration Satellite Service ("EESS") currently being conducted by the International Telecommunication Union ("ITU") Task Group 5/1 ("TG 5/1"). The study results may probably limit 5G deployments in the 26 GHz band, such as more stringent unwanted emission levels applied on 5G systems and introduction of a guard band, etc.

2.6 CMHK requests the Office of the Communications Authority ("OFCA") to disclose current usage of FSS in the band of concern so as to assess the potential impact on 5G deployment in this regard. On the other hand, SmarTone considers that the chance of co-channel interference between

5G services and other co-primary services in the 26/28 GHz bands should be minimal, noting that the existing spectrum users of fixed service in the 26 GHz band will be vacated by April 2019 and there is currently no spectrum user in the 28 GHz band.

2.7 On the other hand, eight respondents from satellite industry (i.e. AsiaSat, APT, APSCC, AVIA, ESOA, GVF, SES and Viasat) object to the proposed allocation of the 28 GHz band to mobile service. They argue that, having considered the importance of this band for FSS worldwide, the World Radiocommunication Conference 2015 of ITU decided not to include the 28 GHz band as a candidate band for International Mobile Telecommunications (i.e. 5G services) for discussion in the coming WRC-19 to be held in 2019. As a result, they urged the CA not to allocate the 28 GHz band to mobile service on a primary basis.

2.8 Respondents from the satellite industry emphasise that there is existing and rapidly growing use for FSS uplinks in the 28 GHz band in Hong Kong. Given the growing number of High Throughput Satellites ("HTS") deployment in the 28 GHz band, APT, AVIA and APSCC indicate that a number of satellite operators, including those of Hong Kong, are building earth stations for HTS operating in the 28 GHz band. Moreover, WRC-19 will discuss the operation of Earth Station In Motion ("ESIM"), involving both fixed and mobile terminals, in the 27.5 – 29.5 GHz uplink band (paired with the 17.7 – 19.7 GHz downlink band) under its Agenda Item 1.5. All such development worldwide will further expand FSS applications in the 28 GHz band.

2.9 APT opines that the allocation of the 26 GHz band should only be considered on the basis of upcoming outcomes of WRC-19. APSCC, AsiaSat and AVIA consider that SCED or the CA should adhere to any limitations which may be prescribed by WRC-19 on mobile service regarding its use in the 26 GHz band. GVF considers that there should be appropriate conditions to protect the space stations and to allow continuing deployment of FSS earth stations in the 26 GHz band.

2.10 APSCC, APT, AsiaSat, AVIA and ESOA anticipate that the 24.65 – 25.25 GHz band would primarily be used for feeder links for broadcasting-satellite service ("BSS"), which can complement terrestrial 5G services by efficiently distributing frequently accessed content that may then be delivered

through 5G networks, including broadcast and time shifted video content as well as application updates, among others. Hence, development and deployment of BSS in this band should be safeguarded.

2.11 APSCC, AsiaSat, AVIA and ESOA comment that relevant ITU studies fail to consider the impact due to 5G services on deployment of new FSS earth stations, or the scenario in which signals transmitted from a large number of 5G base stations and user equipment are collected and reflected by dish antennas of earth stations towards the satellites in orbit. AsiaSat, ESOA and AVIA disagree that the ITU study results could confirm the feasibility of introducing mobile service on top of the existing services in the relevant frequency bands, i.e. the 26 GHz and 28 GHz bands.

Responses of the CA

2.12 The CA notes the views and concerns of respondents. As stated in the Consultation Paper, 5G services require spectrum in both low and high frequency bands. With the availability of a very large bandwidth, the high frequency band can support ultra-high capacity of 5G services. Indeed, ITU has identified a number of frequency bands within the range of 24.25 – 86 GHz for global harmonisation for 5G services for deliberation at WRC-19. The 26 GHz band is the lowest band amongst the 11 candidate bands identified by ITU for 5G services, and is expected to gain wide support from different economies for development of 5G services. As for the 28 GHz band, although it is not one of the candidate bands identified by ITU for 5G deployment, it has been designated by a number of advanced economies including the United States, South Korea and Japan for the provision of 5G services, and there is support of vendors on equipment/devices for this band.

2.13 In Hong Kong, save for the existing assignments for fixed service which will be withdrawn from 1 April 2019, part of the spectrum within the 26 GHz band is allocated to RNS and FSS, which has not, however, been put to use for the purposes. Likewise, the 28 GHz band is currently allocated to both fixed service and FSS as primary services, but it has not been used for either purpose. Although the local satellite operators have three licensed satellites carrying payload in the 28 GHz band, they are only transmitting test signals in relation to the control of the satellites under their respective Space Station Carrier Licences. Without disclosing details on the specific frequency plan and

other technical parameters of FSS (which are commercially sensitive information) in this regard, the CA notes that the 26/28 GHz bands are not being used for FSS in Hong Kong at present.

2.14 As regards ESIM in the 28 GHz band, the CA considers it unlikely that there would be such deployments for terrestrial services in Hong Kong, which is small in area and has well-developed terrestrial mobile networks. Indeed, pursuant to Section 10 and Section 11 of the TO, save as otherwise provided in those sections, radiocommunications apparatus, including ESIM, on board a vessel or an aircraft shall not be used while the vessel or the aircraft is in the waters of Hong Kong or at any aerodrome in Hong Kong respectively save for permission of the CA. Regarding HTS earth stations functioning as a communications hub in the region, the CA considers that they would probably be established at a specific location, such as at satellite farms in Hong Kong, and should be able to coexist with 5G systems.

2.15 The CA understands that TG 5/1 of the ITU has conducted studies on sharing and compatibility of FSS and mobile service operating in the 26 GHz band and will submit the study results to WRC-19 for consideration. According to its study results, subject to certain deployment constraints, 5G services are compatible with FSS services in the 26 GHz band. Regarding the sharing and compatibility studies on EESS operating in the 23.6 – 24 GHz band and 5G services operating in the 26 GHz band, TG 5/1 has proposed options for consideration by WRC-19 with a view to ensuring the compatibility between EESS operating in the 23.6 – 24.0 GHz band and 5G services operating in 26 GHz band. The CA will keep in view the development of WRC-19 and observe the relevant requirements of the Radio Regulations.

2.16 While some respondents allege that no ITU study has ever been conducted on impacts of mobile service on deployment of new FSS earth stations, the CA notes that, in addition to the potential aggregated interference from mobile service into FSS space stations, the TG 5/1 studies also cover potential interference from FSS earth stations into mobile service, and accordingly the future deployment of FSS earth station has been considered.

2.17 The TG 5/1 studies cover FSS operating in the 24.65 – 25.25 GHz band (primarily for BSS feeder links) and 27 – 27.5 GHz band. Considering that the 27 – 27.5 GHz is part of the Ka band (27 – 31 GHz), the deployment

scenarios of the 27 – 27.5 GHz band and the 28 GHz band would be very similar. Given the similar radio environment of these two bands, the CA considers that the TG 5/1 study results for the 27 – 27.5 GHz band are highly relevant to the co-existence of FSS and 5G services in the 28 GHz band.

2.18 Regarding the comment that signals transmitted from 5G base stations and user equipment might be collected and reflected by existing satellite dish antenna thereby causing interference to the co-frequency satellites in orbit, as satellite dish antenna and the associated signal feed horn require precise alignment towards the target satellite for normal operation, the CA opines that any interference caused by such an inadvertent signal coupling mechanism to the in-orbit satellites should be minimal. Indeed, the CA notes that the TG 5/1 studies do not cover this scenario, suggesting the remote possibility of such case.

2.19 The CA would like to clarify that it does not propose to change the allocation of the 26/28 GHz bands from FSS to mobile service. It only proposes to additionally allocate the 26/28 GHz bands to mobile service and fixed service respectively. The existing FSS allocations in these two bands remain intact and the satellite industry will continue to be allowed to use these bands for the provision of FSS. The CA would like to emphasise that the proposed allocation of the 26/28 GHz bands and the existing allocation to FSS are all in line with the ITU frequency allocations for Region 3[3].

Protection of Radio Base Stations of Co-Primary Users on a First-come-first-served Basis

Views and Comments of the Respondents

2.20 Qualcomm and an individual respondent support the proposed protection of radio base stations of co-primary users on a first-come-first-served basis. GSMA is of the view that such principle, if adopted, would create superior priority of one co-primary service over another and is against the rules set out in the ITU Radio Regulations. GSMA recommends that all co-primary users in 26/28 GHz bands should have equal priority instead. Hutchison and an

[3] ITU, in its Radio Regulations, divides the world into three regions for the purposes of managing the global radio spectrum. Each region has its own set of frequency allocations. Region 3 comprises those Asian countries east of Iran and including Iran, as well as the majority of those in Oceania.

individual respondent seek clarification on whether the first-come-first-served criterion is determined by the time of application, by date of installation of equipment, or by use of frequency. SmarTone seeks clarification on the possible harmful interference between co-primary users.

2.21 Respondents from the satellite industry generally do not agree with the proposed protection mechanism for the co-primary users. They opine that the widespread deployment of 5G would actually confine the satellite uplinks to only the existing locations and frequency bands. As a result, the proposed protection mechanism would prohibit the future development of FSS. Certain satellite operators are of the view that it takes a long time for them to design and install a satellite network. Hence, 5G services, as a late comer, should not be allowed to interfere, degrade or limit FSS transmission, service quality or applications in any form. AsiaSat, APSCC, AVIA and ESOA suggest that 5G services should be operated on a non-protected basis. In this regard, 5G base stations or mobile phones should be required to switch to other frequency bands intelligently in case of interference from FSS.

Responses of the CA

2.22 The CA notes the views of respondents and their concerns on the matter. The CA wishes to emphasize that the "first-come-first-served" principle aims to facilitate the co-existence of co-primary services in a specific band. Under the "first-come-first-served" principle, a new base station of a co-primary service must refrain from causing harmful interference to, and will not be entitled to gain protection from harmful interference caused by, stations of other co-primary users already approved by the CA for use in Hong Kong.

2.23 The CA notes that with the adoption of the above-said principle, there will be constraint on the deployment of 5G base stations and FSS earth stations in future. Nevertheless, the use of the 26/28 GHz bands for 5G services in Hong Kong would need to observe any relevant regulations stipulated by ITU now and in future. With a view to striking a balance between the spectrum needs among different spectrum users and promoting efficient use of the scarce spectrum resource, the CA considers that the proposed first-come-first-served approach allows both public mobile services and FSS fair access to the spectrum in the 26/28 GHz bands.

Section 3: Arrangements for Spectrum Assignment

3.1 The CA proposed in the Consultation Paper to adopt an administrative approach for the assignment of the 4 100 MHz of spectrum in the 26/28 GHz bands on the consideration that there are unlikely to be competing demands for the spectrum from providers of non-Government services. The majority of the spectrum concerned is proposed to be assigned to individual MNOs ("Non-shared Spectrum") for the provision of large scale public mobile services in any locations of the territory ("large scale public mobile services"), with the remaining spectrum proposed for assignment to non-MNOs on a shared basis ("Shared Spectrum") for the provision of small scale localised services in specified locations ("localised wireless services"). The proposed arrangements for the assignment of these two categories of spectrum were highlighted in the eight questions below to seek the views and comments of the telecommunications industry and other affected persons.

Assignment Approach

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

<u>Views and Comments of the Respondents</u>

3.2 The administrative assignment approach proposed for the release of spectrum in the 26/28 GHz bands is supported by a wide range of respondents, including the MNOs, GSMA, a FNO (HGC), equipment suppliers (Samsung, GSA), and an individual respondent, with some considering it as facilitating timely release of spectrum to the industry. SmarTone suggests assignment of the spectrum in the 26/28 GHz bands to be made after those of the sub-6 GHz bands, at least after the 3.5 GHz band, to allow interested parties to have a holistic view of 5G spectrum and network planning. An individual respondent recommends allocating some spectrum to new players or small local players who are interested in providing 5G and related services.

<u>Responses of the CA</u>

3.3 The CA notes the support of respondents to the administrative assignment approach and has decided to adopt this approach for assignment of

the 4 100 MHz of spectrum in the 26/28 GHz bands. It has been a long established practice of the CA to release potentially usable spectrum to the market as soon as it is available. The CA does not see a need to depart from the established practice, given that some industry participants have been urging the CA to make available spectrum for the provision of 5G services as soon as possible. The 26 GHz band, after vacating the two existing assignees, will be available for mobile use from 1 April 2019 onwards, which is also the time when 5G equipment and user devices are expected to be launched commercially. Therefore, the CA considers it timely to assign the spectrum in the 26/28 GHz bands administratively in the first quarter of 2019 for use commencing on 1 April 2019. With the decisions of the CA on the arrangements for assignment of spectrum in the 3.3 GHz, 3.5 GHz and 4.9 GHz bands also announced in parallel with this decision on the 26/28 GHz bands[4], interested parties will have a holistic view of the 5G spectrum to be released in the coming year before submitting their applications for assignment of spectrum in the 26/28 GHz bands.

3.4 In regard to the suggestion of allocating some spectrum to new players or small local players who are interested in providing 5G and related services, the CA has put forward proposals concerning the use of the Shared Spectrum for the provision of localised wireless services in the Consultation Paper and confirmed to set aside 400 MHz of spectrum for that arrangement in the Statement. Please see paragraphs 22 – 24 and 37 – 39 of the Statement for details about the arrangements for assignment of the Shared Spectrum.

Band Plan

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

Views and Comments of the Respondents

3.5 A number of respondents, including HKT, SmarTone, GSMA,

[4] The Joint Statement of the CA and SCED on arrangements for assignment of spectrum in the 3.3 GHz and 4.9 GHz bands is available at: https://www.coms-auth.hk/filemanager/statement/en/upload/482/joint_statement_st_072018.pdf. The Joint Statement of the CA and SCED on arrangements for assignment of spectrum in the 3.5 GHz band is available at: https://www.coms-auth.hk/filemanager/statement/en/upload/481/joint_statement_st_062018.pdf.

Qualcomm, Samsung, GSA, etc. indicate support of the proposed band plan with 41 unpaired frequency slots of 100 MHz each. Hutchison suggests smaller slots of 50 MHz each to increase flexibility while CMHK suggests larger slots of 400 MHz each to realise the full capacity of 5G New Radio equipment using the millimetre wave or mmWave spectrum.

Responses of the CA

3.6 With 5G technical standard specifications supporting channel bandwidths of 50, 100, 200 and 400 MHz and carrier aggregation technology enabling larger channel bandwidths for the provision of higher capacity and faster transmission speed, the CA will adopt the band plan as proposed in the Consultation Paper and will divide the 4 100 MHz of spectrum in the 26/28 GHz bands into 41 slots of 100 MHz each. This should provide the flexibility required to cater for different numbers of assignees, and for meeting the requirements of different 5G use cases in future.

Categorisation of Spectrum in the 26/28 GHz Bands

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?***

Views and Comments of the Respondents

3.7 MNOs and GSMA object to the proposal of reserving 400 MHz to 800 MHz of spectrum in the 26/28 GHz bands for assignment to entities other than MNOs to provide small scale localised 5G services in specified locations. They consider that this will create a non-level playing field in the market and will potentially cause inefficient spectrum utilisation. HKT, SmarTone and GSMA opine that only spectrum not taken up by MNOs for the provision of large scale public 5G services should be assigned for such localised services. CMHK suggests that at most 100 MHz of spectrum should be assigned for the purpose while Hutchison advocates the use of unlicensed bands. CMHK and

SmarTone recommend to confine the localised services to non-commercial uses such as academic and research purposes. The proposed aggregate network coverage of no more than 50 square kilometres set for using the Shared Spectrum is regarded by CMHK, SmarTone and Hutchison as excessive. Hutchison considers this as enabling the operation of a de facto MNO.

3.8 The proposal to assign spectrum for the provision of large scale public 5G services and small scale localised services respectively has the support of equipment vendors. Qualcomm also highlights the need to allow sufficient spectrum for MNOs to provide high quality 5G services. An individual respondent recommends the 4 100 MHz of spectrum in the 26/28 GHz bands be assigned to two groups of operators, namely MNOs and non-mobile service providers, instead of two service categories, with no more than 50% of the spectrum assigned to MNOs and for indoor services only.

Responses of the CA

3.9 The CA intends to reserve part of the spectrum in the 26/28 GHz bands for the provision of localised wireless services since the 5G New Radio technology is envisaged to be able to support a new telecommunications infrastructure which allows different scale and configuration of deployment to cater for a variety of innovative services and applications. Nevertheless, the CA agrees that sufficient spectrum should be made available to support the provision of conventional large scale public mobile services, as it will benefit a large number of mobile users in the community. Therefore, it has decided to set aside 3 700 MHz (or 90%) of spectrum in the 26/28 GHz bands as Non-shared Spectrum for the provision of large scale public mobile services, which is considered sufficient for meeting the spectrum demand for providing enhanced mobile broadband ("eMBB") services as the initial phase of 5G service deployment.

3.10 Having regard to the views and comments of the respondents to the Consultation Paper, the CA has decided to reserve 400 MHz of spectrum in the 26/28 GHz bands for assignment on a geographically sharing basis to entities other than assignees of Non-shared Spectrum for the provision of localised wireless services including fixed services. Noting that the 5G technology and service types are still evolving and the CA is minded to ensure efficient utilisation of the spectrum resource, the spectrum concerned will be assigned

for an initial period of five years under the new Localised Wireless Broadband Service ("LWBS") Licence to be created. The CA is prepared to review the arrangements for this category of spectrum in around five years' time. It nevertheless considers it appropriate to maintain the restriction on aggregate network coverage at no more than 50 square kilometres, as the spectrum concerned may be deployed with more flexibility in the future, such as for supporting fixed wireless access or smart city applications on a localised basis, in addition to uses at university campuses, industrial estates, airport, technology parks, etc. For details about the assignment of the Shared Spectrum for provision of localised wireless services, please refer to paragraphs 23 – 24, 37 – 39 and 45 of the Statement.

Spectrum Cap

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?***

Views and Comments of the Respondents

3.11 CMHK, Hutchison, SmarTone and some equipment vendors (Qualcomm, Samsung and GSA) support the cap of 800 MHz for the assignment of spectrum in the 26/28 GHz bands for providing large scale public 5G services. Specifically, Qualcomm comments that an 800 MHz cap allows MNOs to take advantage of the 800 MHz carrier aggregation technology that has already been announced. SmarTone suggests imposing sub-caps of 400 MHz in each of the 26 GHz and 28 GHz bands.

3.12 HKT considers the imposition of a spectrum cap contradictory to the CA's assessment that there is no shortage of spectrum supply in the 26/28 GHz bands and without regard to future technology development. An individual respondent suggests MNOs be subject to a 400 MHz cap and non-MNOs an 800 MHz cap, as non-MNOs do not have as much resources as MNOs.

Responses of the CA

3.13 Notwithstanding the ample supply of spectrum in the 26/28 GHz bands, spectrum is still a finite public resource and efficient use should be promoted. The imposition of spectrum cap is necessary in order to prevent overconcentration of spectrum in the hands of any one market player so as to promote effective competition in the market for mobile services.

3.14 In deciding on the size of the spectrum caps, the CA has taken into account the technical standards specified for the 5G technology and the mobile market environment. While 400 MHz is the maximum channel bandwidth currently allowed by the 5G technical standard specifications, a bandwidth of 800 MHz (by aggregating multiple 100 MHz slots based on the band plan adopted by the CA for the 26/28 GHz bands) is required for providing the peak downlink speed of 20 Gbps targeted by ITU for the 5G eMBB services. MNOs may also aggregate spectrum in the 26/28 GHz bands with that in the other frequency bands to form larger bandwidths as the technology evolves further. On this basis, the CA considers it appropriate to set the respective spectrum caps of 800 MHz for spectrum assigned for providing large scale public mobile services and 400 MHz for spectrum assigned for providing localised wireless services. Such an arrangement serves to enable efficient utilisation of the limited spectrum resource and provision of state-of-the-art mobile services to the general public.

3.15 The setting of sub-caps within each of the 26 GHz and 28 GHz bands is not recommended since this may result in the situation of spectrum in a particular band being left unassigned when there are still unsatisfied demands. As stated in paragraph 30 of the Statement, applicants will be asked whether they have any preference for spectrum in the 24.25 – 26.55 GHz band ("lower band") or the 26.55 – 28.35 GHz band ("upper band"). The amount of spectrum demanded in the two frequency bands will be known after all the applications for spectrum assignment have been received. Within the overall cap of 800 MHz, the CA aims to meet the demand of individual applicants for spectrum designated for the provision of large scale public mobile services as far as possible in a fair and equitable manner.

Spectrum Assignment Methods

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

Views and Comments of the Respondents

3.16 CMHK, Hutchison and SmarTone have no adverse comments on the two-stage spectrum distribution mechanism proposed for the assignment of spectrum in the 26/28 GHz bands to qualified applicants for providing large scale public 5G services in case where the total demand for spectrum exceeds the available supply. HKT considers it unnecessary as feedback to the invitation for expression of interest ("EOI") in using the spectrum in the 26/28 GHz bands for the provision of 5G services indicate that aggregate spectrum demand to be less than available supply. CMHK, HKT and Hutchison are all concerned about assignment of contiguous spectrum. CMHK further suggests shifting of frequency assignments among MNOs to attain contiguous blocks. An individual respondent opines that the criteria for evaluating the 5G services spectrum requirements should be open and transparent, and there should also be a clear set of key performance indicators and implementation dates to govern MNOs' operation.

3.17 Regarding assignment of spectrum for the provision of large scale public 5G services, HKT and Hutchison advocate a longer spectrum assignment period of 20 years, 25 years or even perpetual assignment, in view of the massive investment required for developing the 5G network and the fact that relevant technology is still in its infancy.

Responses of the CA

3.18 The CA notes that most MNOs support the two-stage spectrum distribution mechanism. With a total of 3 700 MHz of spectrum in the 26/28 GHz bands designated as Non-shared Spectrum for the provision of large scale public mobile services and a spectrum cap of 800 MHz for assignment to each MNO, the total spectrum demand is not expected to exceed the available supply. However, applicants must have a clear knowledge of how the available spectrum will be distributed to qualified applicants in case the total demand for

spectrum in the 26/28 GHz bands exceeds the available supply. It is for this reason that the CA has set out the two-stage spectrum distribution mechanism for the assignment of the Non-shared Spectrum. Further details on the criteria and methods to be adopted by the CA in assigning this category of spectrum will be provided in the guidelines for submission of application for administrative assignment of Non-shared Spectrum in the 26/28 GHz bands for the provision of large scale public mobile services to be separately published by the CA. Following spectrum assignment, the operation of MNOs will be governed by the provisions in the TO and licence conditions.

3.19 On the concern about assignment of contiguous spectrum, the CA is minded to ensure efficient spectrum utilisation. As stated in paragraph 33 of the Statement, the CA will arrange contiguous frequency assignments as far as possible with reference to applicants' preference for spectrum in the lower band and/or the upper band.

3.20 In regard to the period of spectrum assignment, the CA considers it appropriate to align the arrangement for the 26/28 GHz bands with that for the other frequency bands, i.e. all with a validity period of 15 years. This should strike a balance between the need for a stable environment to facilitate investment in building 5G networks on the one hand, and the need for ensuring effective and updated regulatory oversight on the other.

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

Views and Comments of the Respondents

3.21 CMHK prefers assignment of spectrum within the n257 band, which is an operating band defined by the 3rd Generation Partnership Project ("3GPP") with the frequency range of 26.5 – 29.5 GHz, in view of the early availability of equipment for this frequency range. It is for a similar reason that Nokia suggests assigning first the 28 GHz band and then the 26 GHz band, and Qualcomm regards the 28 GHz band as enabling early 5G deployment. Hutchison nevertheless prefers the 26 GHz band. HKT and SmarTone have not indicated any preference in the range of frequencies to be assigned.

3.22 On the basis of ecosystem readiness and development in overseas economies, CMHK and SmarTone opine that the frequency band of 28.35 – 29.5 GHz should also be allocated for 5G deployment in Hong Kong. Samsung and GSA also encourage the CA to extend the boundary of the 28 GHz band up to 29.5 GHz. The satellite industry however has contrary views, as noted from their views and comments in response to Question 1 above.

Responses of the CA

3.23 Based on the preference of frequency range for assignment of spectrum in the 26 GHz and 28 GHz bands respectively as expressed by some respondents and the demand for spectrum previously indicated by MNOs in their submissions to the EOI invitation, the 4 100 MHz of spectrum available in the two frequency bands should be sufficient to satisfy the potential demand for spectrum for the provision of 5G services. Coupled with the fact that equipment and devices are being developed to support also the 26 GHz band on top of the 28 GHz band and the availability of mmWave spectrum in other candidate bands identified by ITU, the CA has no plan to extend the upper boundary of the 28 GHz band beyond 28.35 GHz.

3.24 Noting that MNOs may have preference for assignment of spectrum in different frequency ranges within the 26/28 GHz bands, applicants will be asked to state clearly in their applications their preference for spectrum in the lower band and/or the upper band. Taking into account all the applications received, the CA aims to meet the demand of each applicant in a fair and equitable manner, and to promote efficient use of the spectrum by the assignees as far as possible. For details about the methods for distributing spectrum available in the lower and upper bands to applicants and for determining the location of frequency assignments, please refer to paragraphs 28 – 33 of the Statement and the relevant guidelines to be published.

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

Views and Comments of the Respondents

3.25 While MNOs oppose the arrangements for assignment of the Shared

Spectrum, Hutchison submits that assignees of the Shared Spectrum should be subject to the same licensing conditions and obligations as holders of the Unified Carrier Licence. HKT and Hutchison suggest the imposition of network and service rollout obligations on assignees of the Shared Spectrum, similar to that imposed on assignees of the Non-shared Spectrum. CMHK suggests that the spectrum assignment should be withdrawn if the assignee concerned cannot fulfil the network and service rollout plan proposed in its application. SmarTone considers that assignees of the Shared Spectrum should pay the same licence fee as licensees providing large scale public 5G services, but they shall not receive any fees from the services provided. HKT proposes to impose a time limit on the application process, and if no application for assignment of the Shared Spectrum is received after the deadline, say after one year, the spectrum reserved should be released for providing large scale public 5G services. GSMA urges the CA to remove the restriction on MNOs in gaining access to the Shared Spectrum.

3.26 To facilitate the development of 5G services of different nature and characteristics using the Shared Spectrum, HGC opines that the licensing regime and requirements should be geared towards that purpose. Therefore, it considers that the Public Radiocommunications Service Licence mentioned in the Consultation Paper, which is in substance a mobile service licence, may not be appropriate for the assignment of the Shared Spectrum if it is deployed for providing non-mobile 5G services.

Responses of the CA

3.27 The reason why the CA proposes to reserve a certain amount of spectrum in the 26/28 GHz bands for providing small scale localised wireless services by entities other than MNOs has been explained in paragraph 23 of the Statement and paragraph 3.10 above. The CA agrees that if the Shared Spectrum is left unassigned after a certain period of time, it may be appropriate to release such spectrum for the provision of large scale public mobile services. Given that both the 5G technology and applications are still being developed, the CA considers it more appropriate to review the arrangements for the use of the Shared Spectrum in around five years' time following its release to the market.

3.28 The CA does not agree to the view that assignees of the Shared

Spectrum should be subject to the same licensing requirements as for assignees of the spectrum designated for the provision of large scale public mobile services. It is unreasonable to impose the same regulatory requirements on the two categories of spectrum assignees on the one hand, and yet limiting assignees of the Shared Spectrum to a smaller amount of spectrum and restricting their operation to some specified locations on the other. More importantly, as clarified in paragraph 23 of the Statement, assignees of the Shared Spectrum should not deploy the spectrum assigned on a wholesale or retail basis to provide conventional public mobile services which are generally available to members of the public. Taking into account respondents' views on assignment of the Shared Spectrum, the CA will create a new LWBS Licence to effect the assignment of the Shared Spectrum for the provision of localised wireless services. Validity of the newly created licence will be set for an initial period of five years, and may be extended for a further period of up to five years. A mid-term review of the licence will provide an opportunity for the CA to assess whether the Shared Spectrum has been utilised efficiently, which is considered a more effective mechanism than the imposition of network rollout obligations due to the varied nature of the services to be provided using the Shared Spectrum. For details about the arrangements for assignment of the Shared Spectrum for provision of localised wireless services, please refer to paragraphs 37 – 39 of the Statement.

Network and Service Rollout Obligations

<u>Question 9</u>: ***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?***

<u>Views and Comments of the Respondents</u>

3.29 MNOs do not oppose to the imposition of network and service rollout obligations on the spectrum assigned for the provision of large scale public 5G services. However, they all suggest the adoption of a more conservative and flexible approach for implementation due to concerns about equipment availability, administrative procedures, processing time required for approving installation of radio base stations, and take up of 5G services.

3.30 While Samsung and GSA consider the requirement to install a minimum of 5 000 radio base stations in five years might be reasonable, this is regarded by MNOs as unrealistic or impractical. To meet the figure of 5 000, Hutchison is of the view that radio heads instead of radio base stations should be counted for meeting the proposed rollout requirement. Terminologies such as "radio heads/radio access points" and "radio transmitters" are also proposed by Nokia and SmarTone respectively for setting the rollout requirement. They also cite the case of South Korea which sets the rollout obligations in terms of "radio units". CMHK suggests setting the requirement at establishing 1 000 5G new radio units in five years.

3.31 Insofar as the pace for installation of 5G radio base stations is concerned, MNOs prefer either having the rollout requirement set in an aggregate basis within the five-year period without detailed breakdown into annual milestones, or with the phased requirement to be specified only for the later part of the five-year period. They all urge the Government to take a more proactive role in coordinating with relevant departments to facilitate access to Government premises, street level facilities (e.g. lamp poles, traffic light poles, bus shelters, etc.) and new development project sites for the installation of 5G small cells, and to streamline the procedures for approving the applications for installation of radio base stations. GSMA encourages the CA to provide assistance to MNOs to gain access to sites. An individual respondent requests the CA to liaise with owner corporations of private buildings for installation of radio base stations at rooftops, and to arrange with property developers to reserve sufficient space in new buildings for the installation of antennas and other equipment.

Responses of the CA

3.32 The CA appreciates that deployment of spectrum in the 26/28 GHz bands requires the installation of a large number of small cells at traffic hot spots in order to enhance network capacity. Having regard to the submissions received including those on terminology, it is clarified in paragraph 41 of the Statement that for the purpose of fulfilling the network and service rollout obligations, the CA will count the number of "radio units" (i.e. active antenna unit, antenna integrated radio, or remote radio head/unit) installed at the registered address of a radio base station. In addition, as stated in paragraph 42 of the Statement, the number of radio units required to be installed and put to

use will be proportional to the amount of spectrum assigned. The phased implementation requirement is maintained to ensure early rollout of the 5G network. The requirement for the initial years is nevertheless adjusted downwards, with 40% of the rollout requirement to be fulfilled within the first three years following spectrum assignment, as compared to 50% as proposed in the Consultation Paper. For details about network and service rollout obligations relating to assignment of the Non-shared Spectrum for the provision of large scale public mobile services, please refer to paragraphs 41 – 43 of the Statement.

3.33 The industry's concern about the difficulties in gaining access to suitable sites for installing radio base stations is noted. As announced in the 2018 Policy Address, to facilitate the rollout of 5G network by MNOs, the Government will launch a pilot scheme in the first quarter of 2019 to proactively open up around 1 000 suitable Government premises for installation of base stations. A list of such Government premises will be provided for operators' selection, and the application procedures will be streamlined to speed up the application and approval process.

Performance Bond

***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?**

Views and Comments of the Respondents

3.34 MNOs comment that the proposed performance bond at $1 million per MHz of spectrum assigned for the provision of large scale public 5G services is too high due to the large bandwidth of spectrum involved in the 26/28 GHz bands. SmarTone considers the level as high relative to the level of SUF payable for the spectrum concerned. CMHK counter-proposes a performance bond at $50 million per 400 MHz (i.e. $125,000 per MHz). An individual respondent regards the performance bond as a hurdle to small and new players but not incumbent MNOs.

3.35 On the release of the performance bond, HKT, Hutchison and SmarTone suggest that it should be released in phases based on the network and service rollout obligations which have been achieved by spectrum assignees. CMHK suggests that fulfilment of the rollout obligation should be assessed in one go at the end of the five-year period, and opposes the forfeiture arrangement in case assignees fail to meet any rollout milestones.

Responses of the CA

3.36 Apart from guaranteeing the fulfilment by spectrum assignees of their network and service rollout obligations, the performance bond also serves to discourage non-committed applicants for assignment of spectrum in the 26/28 GHz bands, especially when the spectrum is assigned administratively and the level of SUF, if applicable, is relatively low. Therefore, the CA has decided to maintain the level of the performance bond at $1 million per MHz of spectrum assigned. MNOs may minimise their cost of financing the performance bond by applying only for the necessary amount of spectrum in the 26/28 GHz bands and meeting the relevant milestones for network rollout as soon as possible so that the standing amount of performance bond can be reduced and ultimately released.

3.37 With the network and service rollout requirement set proportional to the amount of spectrum assigned and the number of radio units required to be installed in the initial years adjusted downward, CMHK's concern about the possibility of a certain phase of the performance bond be forfeited due to failure of spectrum assignees in meeting the relevant rollout milestones should be alleviated. The phased release of the performance bond to spectrum assignees in four phases has the merit of encouraging licensees to install the 5G base stations in the most timely manner possible.

Section 4: Arrangements for Charging Spectrum Utilisation Fee

4.1 SCED proposed in the Consultation Paper to adopt the SUF charging scheme for spectrum assigned administratively ("SUF Charging Scheme") for 26/28 GHz bands, i.e., not to charge any SUF if less than 75% of the spectrum in these frequency bands is 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 future.

4.2 If the 75% threshold is reached, SCED proposes to adopt the least cost alternative ("LCA") approach in determining the level of SUF. For spectrum to be assigned for provision of large scale public mobile services, SCED proposes that the level of SUF be set at $21,600 per MHz per annum, while that for Shared Spectrum be set at $1,080 per MHz per annum per geographical coverage of 50 square kilometres. SCED also 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.

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

Views and Comments of the Respondents

4.3 MNOs in general have not raised objection to the adoption of the SUF Charging Scheme for spectrum assigned administratively for 26/28 GHz bands and the use of the LCA approach in deriving the opportunity cost for the spectrum. On the level of SUF, CMHK considers that the 26/28 GHz bands are rarely used for other purposes and thus a much lower SUF should be set to reflect the minimal opportunity cost. HKT and SmarTone consider it unclear how the level of SUF for Shared Spectrum was derived, while Hutchison and AVIA opine that it is unclear how the "congestion" of frequency bands which trigger off the SUF obligations is defined. APSCC and SES suggest that SUF should be applied to all spectrum users and according to their specific characteristics and spectrum usage in a fair and reasonable manner. APT quotes the case of Mainland China, which waived the uplink SUF payable by

end users or gateway stations and suggests that the SUF Charging Scheme is not suitable for FSS stations. GSA suggests that relaxed and flexible arrangements would be suitable as using the 26/28 GHz bands for provision of 5G services is a totally new concept. An individual raises that SUF should be lowered and should be charged on a revenue share basis.

4.4 On the transitional period and review of SUF level, Hutchison and SmarTone consider that the charging timetable for the 26/28 GHz bands should commence from 1 April 2019 (i.e. the five-year transitional payment arrangement and review should count from 1 April 2019). HKT considers that the review mechanism for SUF may pose high risks to spectrum holders and suggest that some assurance in the form of price cap should be provided. SmarTone also raises that review of the SUF level for spectrum used for broadcasting purpose should be conducted as not charging SUF on such use may not provide incentive for efficient spectrum usage.

Responses of SCED

4.5 SCED notes that MNOs do not object to the adoption of the SUF Charging Scheme and the use of LCA approach, which 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.

4.6 The level of SUF for the Non-Shared Spectrum is set at $21,600 per MHz per annum since it is the SUF levied on carrier licensees for use of fixed links or satellite uplinks under the SUF Charging Scheme. The level of SUF for the Shared Spectrum is set at $1,080 per MHz per annum given the limited geographic scope which the Shared Spectrum can be applied and also with the objective to encourage the introduction of innovative services by new market entrants. Readers may further refer to the document relating to the SUF Charging Scheme[5] for details of the charging mechanism which the charging of SUF for the 26/28 GHz bands adopts.

4.7 For the transitional period and review of the SUF level, since the SUF Charging Scheme will be adopted for charging SUF for the 26/28 GHz

[5] A briefing paper on the SUF Charging Scheme for the Panel on Information Technology and Broadcasting of the Legislative Council is available at: https://www.legco.gov.hk/yr16-17/english/panels/itb/papers/itb20170508cb4-950-3-e.pdf.

bands, it is natural to apply the same transitional period and review mechanism of the Scheme to the 26/28 GHz bands, or else the arrangements of the 26/28 GHz bands and other spectrum under the Scheme will not be aligned. It should also be noted that the five-year transitional period is an one-off arrangement for the launch of the SUF Charging Scheme which took effect from 1 January 2018 instead of a standard arrangement for assignment of spectrum, so there is little reason for the transitional period to count from 1 April 2019 when the 26/28 GHz bands are assigned. SCED considers that this arrangement should have given the spectrum users sufficient time and allowance to adapt to the SUF Charging Scheme.

Communications Authority
Secretary for Commerce and Economic Development
13 December 2018