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

Submission by
SmarTone Mobile Communications Limited

Introduction

1. SmarTone Mobile Communications Limited ("SmarTone") is pleased to provide its comments on the captioned consultation paper jointly issued by the Communications Authority ("CA") and the Secretary for Commerce and Economic Development ("SCED") on 26 July 2018 ("Consultation Paper").

2. On the same day, the CA also announced an updated Spectrum Release Plan for 2018-2020 where an additional 200 MHz of spectrum in the 4.9 GHz band and 3.3 GHz band would be made available for the provision of 5G services. SmarTone welcomes the various initiatives taken by the CA and SCED which aim at making available more spectrum for 5G services. We would also like to provide our comments on the new spectrum available for 5G services at the end of this submission.

3. The implementation of 5G network is a fundamental building block for the smart city development in Hong Kong which will enable various emerging technologies, such as Internet of Things ("IoT"). 5G network is critical to the development of smart city as it will provide high capacity and low-latency mobile connectivity that are required by future smart city applications.

Comments on the Consultation Paper

4. The following sections set out SmarTone's views with respect to the questions raised in the Consultation Paper.

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?

5. In many advanced markets, the 26/28 GHz bands have been allocated together with the 3.5 GHz or other mid-frequency bands for 5G services. We therefore support the proposed allocation of the 26/28 GHz bands to mobile service and fixed service on a co-primary basis. However, we would like to seek clarifications on the possible harmful interference issues between the co-primary users as pointed out in paragraph 16 of the Consultation Paper.

6. It is noted that the CA has issued notices of withdrawal to two network operators for vacating the 26 GHz band with effect from 1 April 2019, and both 26/28 GHz bands are not occupied for any other purposes at the moment. Hence there is currently no incumbent user in the 26/28 GHz bands. As such, the chance of co-channel interference could be minimized by careful spectrum management planning. As the 26/28 GHz bands are important millimeter-wave (mmWave) spectrum for meeting the public demand of high capacity and low-latency 5G services, it is important to control and minimize the chance of interference in the bands.

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

7. SmarTone welcomes the administrative assignment approach for the release of spectrum in the 26/28 GHz bands.

8. As regard the timing for the assignment of 26/28 GHz bands, we consider that it should be done after the assignment of the sub - 6 GHz spectrum for the following reasons.

    a. The mmWave spectrum in the 26/28 GHz bands are for enhancing capacity and performance at hotspots. However, territory-wide 5G mobile service coverage cannot be built using only the 26/28 GHz

bands. Mid-band frequencies (such as 3.3 GHz, 3.5 GHz & 4.9 GHz) are important in providing ubiquitous 5G coverage in the territory.

b. Hence, in order to allow individual interested party to have a holistic view on spectrum and network planning for 5G services, it is advisable to align the timing for the assignment of various spectrum for 5G services so that the assignment of the 26/28 GHz band should be done after that of sub - 6 GHz bands.

c. In many countries, the 3.5 GHz band is usually assigned first (e.g. Australia, Austria, Finland, France, Germany, Ireland, Spain and UK) or at the same time as the 26/28 GHz band (e.g. Japan and South Korea).

d. If it is not possible to align the timing for all 5G spectrum, we submit that at least the two imminently available spectrum bands (i.e., the 3.5 GHz and 26/28 GHz bands) should be aligned so that the decision on 26/28 GHz bands could be made after the assignment of 3.5 GHz band.

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

9. We have no objection to the proposed frequency slots size of 100 MHz each.

10. As regard the frequency band available for assignment in the 26/28 GHz bands, it is noted that the current proposed allocation is from 24.25 to 28.35 GHz (4100 MHz). However, according to the 3GPP's recommendation, the 28 GHz band (n257) refers to 26.5 – 29.5 GHz. The frequency from 28.35 to 29.5 GHz is currently vacant as indicated in the Hong Kong Frequency Table published by OFCA. It is noted that in the recent assignment of 28 GHz band in South Korea, frequency range of up to 28.9 GHz has been assigned for 5G services. Japan also plans to assign the whole 28 GHz band (i.e. 26.5 to 29.5 GHz) in 2019. Hence, we submit that the frequency band from 28.35 to 29.5 GHz should also be allocated for 5G mobile services. We would therefore like to seek clarification on whether the frequency from 28.35 to 29.5 GHz could also be made available for assignment.

Question 4: Do you have any views on the proposal of assigning (a) 3300 MHz to 3700 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?

11. SmarTone does not support the proposal to reserve or assign 400 MHz to 800 MHz in the 26/28 GHz bands for the smaller scale localized services in specified locations with use of the spectrum on a shared basis ("specified location services") for the following reasons.

    a. As pointed out earlier, the 26/28 GHz bands are important mmWave spectrum for deploying a high capacity and low latency 5G network. Hence spectrum in this band should be assigned to the highest value use in order to ensure that spectrum is efficiently used and public benefit is maximized. The creation of such specified location services licence would inevitably reduce the amount of spectrum available for the large scale public 5G services.

    b. Also, we are not aware of any international precedent case for such kind of specified location services. There should be a robust cost and benefit analysis in the consideration of whether to create such a "special licence".

    c. As compared to the large scale public 5G services, the specified location services would bring less benefit to the public as a whole since the number of users on these services would inevitably be less than the public 5G services.

    d. It is noted that the proposed regulatory requirements on the specified location services are substantially less than that applicable to the large scale public 5G services. Not only the spectrum utilization fee ("SUF") is only 5% of that for the large scale public 5G services, there is no network and service rollout obligation. It means the licensee of the specified location services may have a much lower network cost structure and only cherry-pick those locations with high traffic demand. The creation of such licence would therefore create an unlevel playing field in the market and would be detrimental to the future 5G services market.

e. Such specified location services would also create issues on the consumer side. While both the service level and limitations of the specified location services are different from the large scale 5G public services, consumers may not understand the difference and consumer confusion is likely to arise.

f. The demand for such specified location services, if any, could be satisfied by the large scale public 5G services under the new network feature such as network slicing. Network slicing is a new capability in the upcoming 5G network to offer tailor-made enterprise applications with dedicated network resources and performance attributes. With this new feature, institutions such as universities and technology parks can have access to the 5G operators' network for running proprietary applications meeting their specific requirements. An obvious benefit of this approach is to minimize duplication of network infrastructure and maximize efficient use of spectrum.

12. However, if the CA/SCED is still minded to create such new licence for specific entities for using the shared spectrum in specific locations, such as university campus and technology parks, to promote innovation and research & development (R&D), SmarTone considers that the following measures should be put in place to minimize the adverse impacts as mentioned above.

    a. The scope of the licence should be solely for educational and R&D purposes and for entities such as educational institutions (e.g., university but excluding education enterprises) and technology parks only. The use of the spectrum should be restricted to the campus of the educational institutions and technology parks as approved by the CA and specified in the licence.

    b. The spectrum shall be used solely for the purpose specified in the licence and shall not be used for any commercial purpose. The licensee of the spectrum shall not receive any fees which include but not limited to the following: fees from the public or from other companies through any wholesale or resale arrangement; receive or share any revenue or profit or receive any commission, funding, subsidy or surcharge for providing services or access to its network.

c. The aggregate network coverage of each of such licence should be substantially reduced so as to fit for the abovementioned purposes. The proposed aggregate network coverage of 50 square kilometres per such network is too large, as it is as big as the Kowloon Peninsula. It should be reduced to cover only the area of a university campus or a technology park as specified in the licence.

d. The amount of spectrum reserved for such specified location services should be substantially reduced to ensure that spectrum is used efficiently. Also, the allocation of spectrum to such services should only be considered after all current and future demand for the large scale 5G services is considered and satisfied.

e. The proposed licence period of 15 years (until 31 March 2034) is too long for such licence. The licence should be subject to annual review and the licence should only be renewed if it could be demonstrated by the licensee that the spectrum has actually been used for educational and R&D purposes.

f. The SUF and licence fee for such licence should be equal to the large scale 5G services to ensure efficient use of spectrum.

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?

13. We have no objection to the proposed cap of 800 MHz of spectrum in the 26/28 GHz bands for the large scale public 5G services. However, given that the 26 GHz and 28 GHz bands are two separate bands according to 3GPP standard, and operators may have preference on these two bands, we would propose to have a sub-cap of 400 MHz for each of the bands. Please also refer to our answer on Question 6 below.

14. As mentioned in our answer on Question 4 above, we object to the creation of licence for the specified location services. However, if the CA is minded to issue such licence, the scope of such licence should explicitly state that it is not for commercial purpose, and the use of spectrum should be solely for education and

R&D purposes and not for commercial purpose. Hence we do not agree that as much as 400 MHz of the 26/28 GHz bands should be set aside for the provision of specified location services.

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

15. The current proposed method is that each qualified applicant will only indicate the total amount of spectrum in the 26/28 GHz band it seeks for assignment. The exact positions of the frequency slots to be assigned to each qualified applicant will be decided by drawing lots.

16. We wish to point out that the 26 GHz and 28 GHz bands are under different band plans in 3GPP (i.e., n257 and n258), and the qualified applicants may have preference on the assignment of the 26 GHz or 28 GHz bands. The current proposal would create a situation that a qualified applicant would not be able to get any spectrum in its preferred band. To address the issue, we would like to propose that applicants should also be required to indicate their preference and amount seeks for assignment under the two frequency bands respectively.

17. With this additional information regarding each qualified applicants' preference and spectrum sought on the 26 GHz and 28 GHz bands respectively, the assignment process may then follow the proposed method as per paragraph 30 of the Consultation Paper. The CA could assign the spectrum equally among the qualified applicants according to their preference subject to the proposed sub-cap of 400 MHz for each band. When the demand for a particular band has exceeded the amount available, then the extra demand will be satisfied by allocating spectrum in the other frequency band.

18. The above proposed method would allow applicants to be assigned with as much spectrum as possible in their preferred spectrum band, subject to the sub-cap of 400 MHz for each band, while achieving the principle that there would be equal sharing of the available spectrum in the 26 GHz and 28 GHz band respectively.

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

19. As mentioned above, it is our view that applicants should indicate their preference and required spectrum in the 26 GHz and 28 GHz bands respectively.

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

20. As mentioned above, we object to the creation of licence for the specified location services. However, if the CA is minded to issue such licence, the use of the spectrum should be solely for educational and R&D purpose and should not be for commercial purpose, and the use of spectrum should be restricted to in specific area as approved by the CA.

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

21. SmarTone in principle supports that there should be network and service rollout obligation to ensure the scare spectrum resources are being put to good use.

22. SmarTone has some specific comments on the following issues related to the details of the proposed network and service rollout obligations.

    a. Terminology of "radio base stations"

        i. 5G radio base stations using 26/28GHz bands will be used as small cells to provide coverage and capacity for traffic hotspots. There are, however, different configurations of radio equipment in 5G implementation. For example, a common baseband pool can be implemented in certain location and many small cells / radio transmitters are connected to this common pool. Such implementation will become more and more popular in future to

support new 5G applications such as URLLC (ultra reliable and low latency communications) and massive IoT (Internet of things). Similar to Wi-Fi access points, multiple 5G small cells / radio transmitters will be deployed in a venue to provide coverage and capacity for traffic hotspots, e.g. in a shopping mall, one 5G small cell / radio transmitter for a restaurant, another 5G small cell / radio transmitter for a coffee shop, yet another 5G small cell / radio transmitter for a lift, and so on.

ii. In view of the above, for the sake of meeting the network and service rollout obligation for 26/28GHz bands and for clarity, we suggest to use the term "radio transmitters" instead of "base stations" for the purpose of network and service rollout obligation. We also note that number of "radio transmitters" are used in measuring the network and service rollout obligation in South Korea. The use of "radio transmitters" will not affect existing procedures in which "base stations" are used, e.g. schedule 3 application or calculation of base station license fee.

b. Network Rollout Target

i. Currently it is proposed that a minimum of 5000 small cells should be installed in five stages (i.e., 500 for 1st year, 1000 each for 2nd, 3rd and 4th years, 1500 for 5th year).

ii. Given that 26/28 GHz bands are for hotspots while territory-wide coverage will be provided by the mid-band frequency, the rollout of small cells using 26/28 GHz bands will be largely driven by market demand. Also, the 26/28 GHz bands are not very suitable for indoor coverage use (please refer to paragraph 35 below for our detailed explanation). Since it is uncertain at the moment about the take-up rate of 5G services in the market, we would suggest that more flexibility should be allowed for operators to meet the network and service rollout obligations.

iii. Furthermore, the mobile equipment vendors are now focusing on developing 5G radio equipment on the mid-band frequency for outdoor / roof-top cell sites and the product portfolio of 5G radio

on mmWave frequency for indoor / pico applications will be very limited in 2019/2020 timeframe, if available at all. It is difficult for mobile operators to find suitable 5G radio equipment for all applications of small cells using mmWave in the initial years.

iv. In South Korea where both the 3.5 GHz and 28 GHz are assigned, the rollout obligation in terms of number of radio transmitters is set higher for the 3.5 GHz band than the 28 GHz band. SmarTone believe this can encourage the mobile operators to rollout more roof-top and macro cell sites using the 3.5 GHz band to achieve wider area 5G coverage.

v. Thus, instead of setting specific rollout targets for each year, operators could rollout their network according to their business plan and market situation throughout the 5 years' period. Nevertheless, to provide an incentive for operators to rollout their network earlier, it is suggested that operators would be able to get partial release of the performance bond depending on the number of small cells established (e.g., release 50% of the performance bond upon achieving 50% of the total rollout target).

vi. Lastly, we wish to reiterate that setting the rollout obligation for 26/28 GHz too high may hinder the development of 5G development in Hong Kong. We suggest a more conservative approach in setting the rollout target for 26/28 GHz so that the mobile operators can make balanced investment on both coverage and capacity planning for 5G and avoid the risk of unnecessarily early investment on 5G small cells which overburdens the industry. Given that the future 5G network will comprise of both mmWave and mid-band spectrums in order to provide a territory coverage of 5G with high data rate at hotspots, the rollout strategy of 5G services should be a balanced mix of both types of spectrum.

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?

23. In addition to our views as expressed above regarding the structure of the performance bond (as in paragraph 22 (b) (v) above), we wish to comment on the proposed size of the performance bond. Currently it is proposed that the size of the performance bond is to be set at $1 million per MHz of spectrum assigned.

24. It is our view that the current proposed level of $1 million per MHz is way too high. In previous licensing exercise where rollout obligations and performance bond were required, the normal size of the performance bond was $50 million. As pointed out in paragraph 37 of the Consultation Paper, the size of the performance bond would be $400 million if 400 MHz of spectrum is assigned under the proposed. Hence, under the spectrum cap of 800 MHz, the maximum amount of performance bond would be $800 million. We consider that the amount is very high, not only compared to past practices but also to the total amount of SUF payable under the licence. (i.e., the total maximum licence fee for the 15-year term for an assignment of 800 MHz of spectrum is about $259 million if the 75% congestion threshold is met).

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

25. SmarTone welcomes the proposal of applying the same principles as the SUF charging scheme for spectrum assigned administratively ('SUF Charging Scheme") for SUF of the 26/28 GHz bands. The following sets out our comments on the issues related to the proposed SUF.

26. Transitional period of SUF

    a. It is proposed that the SUF payment for the 26/28 GHz bands will follow the payment timetable as set out in the SUF Charging Scheme if payment of SUF is required. As stated in paragraph 43 of the Consultation Paper,

the SUF Charging Scheme has a 2-year "no SUF" grace period which took effect from 1 Jan 2018. Given that the 26/28 GHz bands is proposed to be assigned in April 2019, it would only have 9-month "no SUF" grace period under the current proposal.

b. Given that the rollout of 5G network is subject to substantial investments and uncertainties especially during the initial years, we propose to apply the same 5-year transitional period starting from April 2019 with "no SUF" for the first two years (i.e., from April 2019 to April 2021).

27. Review of SUF

a. It is currently proposed in paragraph 50 of the Consultation Paper that the review of SUF under the SUF Charging Scheme conducted every five years (starting from 1 January 2018) will cover the 26/28 GHz band. It would mean that the next review of SUF for the 26/28 GHz band will be conducted in January 2023, which is less than 4 years from the date of assignment of the 26/28 GHz bands.

b. To follow the same principle of the SUF Charging Scheme, we would suggest that the proposed SUF review for the 26/28 GHz bands should be conducted 5 years from the date of assignment of the 26/28 GHz bands.

28. Level of SUF

a. While the proposed SUF for the large scale 5G public services is set at $21,600 per MHz per annum, it is noted that there is no SUF for spectrum used for broadcasting purpose[1]. We believe the latter may not be able to provide an incentive for efficient use of spectrum. Also, the different SUF treatment between telecommunications and broadcasting users would result in market distortion especially in the era of converging communications markets. We wish the CA and SCED would conduct a review of the SUF in light of the above.

b. It is noted that the proposed SUF for the specific location services is only $1080 per MHz per annum, which is at 5% of the SUF for large scale 5G public services. We wish to know the basis for such a low SUF. In any

[1] Statement of the Communications Authority, The Approach to the Assignment of Broadcasting Spectrum to be Withdrawn from Asia Television Limited following Expiry of its Domestic Free Television Programme Service Licence, 31 July 2015

event, we wish to highlight that SmarTone is in objection to the creation of such licence. However, if the CA is minded to issue such licence, the use of the spectrum should be solely for educational and R&D purpose and should not be for commercial purpose. To promote efficient use of spectrum, the SUF should be the same as the public 5G services.

Implementation Issues related to the rollout of small cells for 26/28 GHz bands

29. Besides the above issues that are specifically raised in the consultation paper, we would like to take this opportunity to highlight the following issues related to the rollout of small cells for 26/28 GHz spectrum. We believe that these issues warrant the attention of the CA/SCED at an earlier stage as they would have a substantial bearing on the rollout of 5G networks in Hong Kong.

    a. There are no established guidelines for installation of small cells, e.g. on building outer wall, telephone booth, bus stop, etc.; current guidelines are for installation of roof-top sites only.

    b. Existing procedure for installation of small cells on lamp poles (MCBS) takes long processing time and cannot cater for installation of large amount of small cells; some of the lamp poles, especially those in business districts, are excluded from applications of MCBS.

    c. The Government should open up government buildings and other government furniture (e.g. foot-bridges, traffic light poles, parks, etc.) to facilitate installation of small cells; a streamlined procedure should be available with a target approval time for application (e.g. 3 months).

    d. The base station licence fee for small cell should be waived, with aims to promote installation of small cell for smart city development.

    e. The Schedule 3 procedure for small cell should be simplified; a self-registration procedure similar to Wi-Fi should be adopted.

New spectrum available for 5G

30. SmarTone welcomes the various initiatives taken by the CA and SCED which aim at making available more spectrum for 5G services. It is imperative that suitable frequency range and sufficient amount of new spectrum be available to support 5G rollout.

31. According to a recent report by GSA, "Spectrum for Terrestrial 5G Networks: Licensing Developments" dated July 2018[2], there are 42 countries in the world that have planned or released spectrum specifically for 5G, and another 15 countries planned or released spectrum that can be used for 5G. It shows clearly that the most common spectrum is around the 700 MHz, 3400-3800 MHz and 24-29.5 GHz frequency ranges. These are the globally harmonized frequency bands for 5G, in which both network equipment vendors and terminal device vendors are focusing their efforts in developing the eco-system for early 5G service launch.

32. In 3GPP Release 15, the spectrum for 5G can be divided into two ranges:

- FR1 – from 450 MHz to 6000 MHz
- FR2 – from 24250 MHz to 52600 MHz

33. Frequency range FR1 is low and mid-band frequencies in the sub-6GHz range and is for providing 5G coverage, while frequency range FR2 is millimeter-wave (mmWave) frequencies and is mainly for providing 5G capacity.

34. As concurred in the GSA report, the 3.5 GHz band is the most popular band among all available new spectrum[3], and will be the global band for 5G. SmarTone understands the importance of having universal access to the 3.5 GHz band for 5G services in Hong Kong and will continue to work with OFCA and the industry stakeholders to find solution to reduce the restriction zone for mobile services while not affecting the normal operation of satellite services.

35. SmarTone wishes to point out that the 3.5 GHz and 26/28 GHz bands are not very suitable for indoor coverage use.

    a. The 26/28 GHz band has radio propagation of very short-range and is more suitable for small cell applications.

    b. The 3.5 GHz and 26/28 GHz bands are not compatible with existing distribution antenna system in many indoor locations including MTR. Thus, installation of new antenna systems is required to cover those

[2] The report can be downloaded from the GSA web site: https://gsacom.com/

[3] The frequency band 3400-3800MHz is the most popular band, according to Figure 2 on Page 18 of the GSA report, by counting all countries using the frequency ranges between 3400MHz and 3800MHz.

indoor locations. This can cause disruption to the normal activities in these locations.

36. SmarTone submits that the CA should consider allocating the 700 MHz band, and even the 600 MHz band for mobile services in indoor locations, including in the underground part of the MTR, and assign it at an early timeframe, preferably together with the assignment of the 3.5 GHz band.

    a. As mentioned in the GSA report, 700 MHz band is one of the most popular frequency bands to be used for 5G. To our knowledge, the 700 MHz band will be available for mobile services in Hong Kong pending coordination with Mainland China on the frequency use.

    b. Both 600 MHz (3GPP band n71) and 700 MHz (band n28) are early 5G bands. There are 35 MHz x2 and 45 MHz x2 of spectrum bandwidth available in 600MHz and 700MHz respectively according to the 3GPP band plan.

    c. While the 600 MHz and 700 MHz band may be interfered by TV broadcast signal when used for mobile services in outdoor environment, there is no interference issue if the band is used only in MTR and indoor locations.

    d. The 700 MHz band is compatible with the antenna system in many indoor locations such as in office buildings and shopping malls. It is also compatible with the existing mobile infrastructure in the MTR. Thus, most of the ancillary equipment including antennas, feeders, leaky cables and combiners can be reused; only minor equipment upgrade or expansion is required before it can be used to provide 5G services in these indoor and MTR locations.

37. By allocating the 600 MHz and 700 MHz spectrum for indoor mobile use, and assigning the 600 MHz and 700 MHz bands together with the 3.5 GHz and 26/28 GHz bands, it will greatly speed up the 5G rollout in Hong Kong.

SmarTone Mobile Communications Limited

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