

**Arrangements for Assignment of Additional Spectrum in the
4.9 GHz Band for the Provision of Public Mobile Services
and the Related Spectrum Utilisation Fee**

Consultation Paper

22 July 2020

PURPOSE

This paper is jointly issued by the Communications Authority (“CA”) and the Secretary for Commerce and Economic Development (“SCED”) to seek views and comments of the industry and other affected persons on the proposals in relation to the arrangements for assignment of additional 80 MHz of spectrum in the 4.80 – 4.96 GHz band (“4.9 GHz band”) for the provision of public mobile services and the related spectrum utilisation fee (“SUF”).

BACKGROUND

2. In the joint statement of the CA and SCED on the arrangements for assignment of the spectrum in the 3.3 – 3.4 GHz band (“3.3 GHz band”) and 4.83 – 4.93 GHz band for the provision of public mobile services and the related spectrum utilisation fee published on 13 December 2018 (“2018 Joint Statement”)¹, the CA promulgated its decisions among others to release 80 MHz of spectrum in the 4.9 GHz band to the market for the provision of public mobile services, consisting of two 40 MHz blocks (viz. 4.84 – 4.88 GHz and 4.88 – 4.92 GHz, hereafter referred to as “Block B1” and “Block B2” respectively) for assignment by way of auction. In addition, two 10 MHz blocks (viz. 4.83 – 4.84 GHz and 4.92 – 4.93 GHz) were reserved for combining with spectrum which might be made available in the future for assignment at a later stage (“Reserved Blocks”). As some Government services were operating in the 4.94 – 4.99 GHz band, 10 MHz of spectrum in the 4.93 – 4.94 GHz band was

¹ The 2018 Joint Statement is available at:
https://www.coms-auth.hk/filemanager/statement/en/upload/482/joint_statement_st_072018.pdf.

left vacant as a guard band (“Vacant Block”) to minimise potential mutual interference between public mobile and Government services.

3. Following completion of the auction on 23 October 2019 and the necessary licensing procedures, two mobile network operators (“MNOs”)² have been assigned with Block B1 and Block B2 respectively from 30 December 2019 for a period of 15 years. The existing assignment of spectrum in the 4.9 GHz band is shown in Figure 1 at **Annex I**.

4. As an on-going effort to identify and release more spectrum for the provision of public mobile services including the fifth generation mobile (“5G”) services, the CA has recently vacated further 50 MHz of spectrum in the frequency ranges of 4.80 – 4.83 GHz and 4.94 – 4.96 GHz by relocating the original Government users to other frequency bands, including the 4.97 – 5.00 GHz band. Together with the aforementioned Reserved Blocks and Vacant Block (i.e. 30 MHz of spectrum in the 4.83 – 4.84 GHz and 4.92 – 4.94 GHz bands), a total of 80 MHz of additional spectrum in the 4.9 GHz band, configured as two 40 MHz blocks (viz. 4.80 – 4.84 GHz and 4.92 – 4.96 GHz, hereafter referred to as “Block B3” and “Block B4” respectively), can be released to the market for the provision of public mobile services. The additional frequency blocks in the 4.9 GHz band available for public mobile services are shown in Figure 2 at **Annex I**.

5. Against the above background, the CA sets out in this consultation paper the proposed amendment to the Hong Kong Table of Frequency Allocations for the 4.9 GHz band³ and the assignment arrangement of Block B3 and Block B4 totalling 80 MHz in the band for the provision of public mobile services. SCED also sets out in this consultation paper his proposal for the arrangement of the SUF for the use of the two frequency blocks concerned.

² China Mobile Hong Kong Company Limited (“CMHK”) and Hong Kong Telecommunications (HKT) Limited (“HKT”).

³ At present, spectrum in the 4.80 – 4.83 GHz band is allocated to fixed service only. There is hence a need to allocate such spectrum to mobile service before it can be assigned for the provision of public mobile services. There is also a need to allocate the 4.99 – 5.00 GHz band to fixed service, in addition to the existing allocation to radio astronomy service so that the Government services originally operating in the 4.80 – 4.83 GHz and 4.94 – 4.96 GHz bands could operate in the whole 4.97 – 5.00 GHz band. See also paragraphs 10 and 11 below.

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 radio frequencies and to designate which of them shall be subject to the payment of SUF following consultation with the telecommunications industry and other affected persons. Section 32I(2) of the TO empowers SCED to prescribe the level of SUF or the method for determining the SUF. Before exercising the respective statutory powers conferred on them by the TO, the CA and SCED jointly conduct the present public consultation.

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

8. The Radio Spectrum Policy Framework (“Spectrum Policy Framework”)⁴ promulgated by the Government in April 2007 sets out the policy objectives and the guiding principle in spectrum management which the CA should take into account in discharging its spectrum management responsibilities under the TO. By a statement issued in April 2007, the former Telecommunications Authority (“TA”) (now the CA) explained that, in exercising his statutory powers under the TO, he would, in addition to all relevant considerations as required by law, give due regard to the Spectrum Policy Framework to the extent that there would be no inconsistency with the objectives and provisions of the TO⁵.

⁴ The Spectrum Policy Framework is available at:
<http://www.cedb.gov.hk/ccib/eng/legco/pdf/spectrum.pdf>.

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

9. Pursuant 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.

PROPOSED AMENDMENT TO THE HONG KONG TABLE OF FREQUENCY ALLOCATIONS FOR THE 4.9 GHz BAND

10. In April 2019, the Hong Kong Table of Frequency Allocations has been updated to reflect the co-primary allocation of the 4.83 – 4.99 GHz band to mobile and fixed services, which covers the Reserved Block in the 4.83 – 4.84 GHz band, Block B1 and Block B2 that were assigned to two MNOs in December 2019, and Block B4 in the 4.92 – 4.96 GHz band under the present consultation. At present, spectrum in the 4.80 – 4.83 GHz band within Block B3 under the present consultation is allocated to fixed service only, while the 4.99 – 5.00 GHz band is allocated to radio astronomy service in Hong Kong. The existing allocation of the 4.80 – 5.00 GHz band is given at Figure 3 at **Annex II**.

11. The CA proposes, pursuant to section 32H of the TO, to allocate the 4.80 – 4.83 GHz band to mobile service on a co-primary basis in addition to the existing allocation for fixed service, such that it can be released for the provision of public mobile services, and to allocate the 4.99 – 5.00 GHz band to fixed service on a co-primary basis in addition to the existing allocation for radio astronomy service, such that the whole 4.97 – 5.00 GHz band would be used for the relocated Government services. The aforesaid additional allocations comply with the global frequency allocation for Region 3 of the International Telecommunication Union (“ITU”)⁶.

12. With the original 10 MHz Vacant Block in the 4.93 – 4.94 GHz band now subsumed under Block B4 for mobile use, the CA plans to make provision for a 10 MHz guard band adjacent to Block B4 (viz. 4.96 – 4.97 GHz) to minimise potential mutual interference with the relocated Government

⁶ 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.

services operating in the 4.97 – 5.00 GHz band. The proposed additional allocation and utilisation are illustrated by Figure 4 at **Annex II**.

Question 1: Do you have any views on the proposed amendment to the Hong Kong Table of Frequency Allocations as regards the allocation of the 4.80 – 4.83 GHz band to mobile service on a co-primary basis in addition to fixed service, and the 4.99 – 5.00 GHz band to fixed service on a co-primary basis in addition to radio astronomy service?

PROPOSED ARRANGEMENTS FOR THE ASSIGNMENT OF ADDITIONAL SPECTRUM IN THE 4.9 GHz BAND

Demand for Spectrum in the 4.9 GHz Band

13. The 4.9 GHz band, which is below 6 GHz, has good radio propagation characteristics for providing wide area coverage if used for the provision of mobile services including 5G services. It has been identified together with the 3.3 GHz band and the 3.4 – 3.6 GHz band (“3.5 GHz band”) by the Ministry of Industry and Information Technology of the Mainland China for deployment of 5G services starting from 2020. Japan and Russia have also planned to deploy spectrum in the 4.9 GHz band for 5G services. In Hong Kong, 5G services were commercially launched on 1 April 2020, with assigned frequencies in the 4.9 GHz band being deployed for the provision of services. In view of the local and worldwide developments regarding deployment of the 4.9 GHz band in 5G network rollout, it is expected that 5G network equipment and user terminals operating in this frequency band will become more commonly available to meet the demand of the market.

14. In Hong Kong, there was clear support from the industry in the relevant consultation in 2018 that spectrum below 6 GHz would be suitable for the deployment of public mobile services. Compared to the spectrum in the 3.3 GHz and 3.5 GHz bands assigned for the provision of 5G services, the 4.9 GHz band has the advantage of being able to support deployment of 5G services at all indoor and outdoor locations in Hong Kong.

15. The 80 MHz of spectrum configured as Blocks B1 and B2 was successfully bid for by two MNOs in the auction conducted in October 2019 and operators requested during the relevant public consultation in 2018 that more spectrum in the 4.8 – 5.0 GHz band should be released to meet the market demand. With supply of additional 80 MHz of spectrum in the 4.9 GHz band, not only MNOs which currently do not hold any spectrum in the band may take the opportunity to acquire the newly available spectrum, MNOs which are assigned spectrum in the band may also have incentive to acquire additional spectrum to expand their network capacity in a cost-efficient manner, as the incremental equipment cost for deploying additional spectrum in the same frequency band would be minimal. As such, the CA's assessment is that there are likely to be competing demands for additional spectrum in the 4.9 GHz band from providers of non-Government services. According to the guiding principle in spectrum management as set out in the Spectrum Policy Framework, the CA proposes that a market-based approach should be used for the assignment of the additional 80 MHz of spectrum in the 4.9 GHz band, and there is no overriding public policy reason to do otherwise.

Assignment of Spectrum by Auction

16. Auction is regarded as the most appropriate market-based approach for the assignment of spectrum resources as it provides a fair, transparent, objective and economically efficient means to determine to whom the spectrum should be assigned. Auction is also commonly used by many overseas economies for assigning spectrum for provision of public mobile services. In line with the assignment arrangement adopted for Blocks B1 and B2 in the 4.9 GHz band, the CA proposes to assign Blocks B3 and B4 by way of auction.

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

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

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

18. Having considered the likely market demand and competition landscape (see also paragraphs 20 and 21 below), the CA proposes that all interested parties, including new entrants and the existing assignees of spectrum in this frequency band, may apply for participation in the auction to be conducted for the assignment of the additional spectrum in the 4.9 GHz band.

Question 2: Do you have any views on assigning the additional spectrum in the 4.9 GHz band by way of auction and allowing all interested parties to apply for participation in the auction?

Band Plan

19. According to the technical specification adopted by the 3rd Generation Partnership Project (“3GPP”) for 5G equipment and devices, the allowable channel bandwidths for the 4.9 GHz band include 40 MHz, 50 MHz, 60 MHz, 80 MHz and 100 MHz⁷. Given that the newly vacated frequencies in the 4.9 GHz band can be consolidated with the adjacent Reserved Blocks and the Vacant Block to form two 40 MHz blocks, the CA proposes that the additional spectrum should be released in the form of two 40 MHz blocks (i.e. Block B3 and Block B4) as shown in Figure 2 at **Annex I** in order to enable effective deployment by incumbent or non-incumbent assignees of the 4.9 GHz band⁸ and thereby maximise overall efficient usage of spectrum.

Question 3: Do you have any views on the proposal to divide the additional spectrum in the 4.9 GHz band into two 40 MHz blocks?

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

⁸ If the additional spectrum available is divided into smaller block size and part of which is acquired by the incumbent assignees of the 4.9 GHz band, the remaining spectrum having carrier bandwidth of less than 40 MHz will not be usable to any non-incumbent assignees of the 4.9 GHz band or incumbent assignees not holding the adjacent blocks.

Spectrum Cap

20. Having considered the overall spectrum holding in various frequency bands by the incumbent MNOs and the holding of 5G spectrum acquired by them in the last year, the CA proposes to set a cap for each bidder at 40 MHz, in order to prevent over-concentration of spectrum holding by any individual MNO. This level of cap is the same as that adopted for the last auction of the spectrum in the 4.9 GHz band conducted in October 2019.

21. If the above proposed spectrum cap is applied, the two existing assignees of spectrum in the 4.9 GHz band may bid for a further 40 MHz of spectrum in the 4.9 GHz band, and therefore at most hold a total of 80 MHz or 50% of the spectrum in the band. This should not give rise to any competition concern as each of the major MNOs has been assigned with hundreds of MHz of spectrum across various frequency bands, including the 3.3 GHz and 3.5 GHz bands which are being deployed for the provision of 5G mobile services. Furthermore, spectrum being used for the provision of the second, third and fourth generation mobile services could also be re-farmed for the provision of 5G services. The existing distribution of spectrum among major MNOs is given in Table 1 at **Annex III**. If the MNO which is an existing assignee of 40 MHz spectrum in the 4.9 GHz band and currently holds the largest amount of spectrum overall acquires another 40 MHz of the additional spectrum in the 4.9 GHz band, its share in the spectrum available for the provision of public mobile services will slightly increase from 30.5% to 32%⁹, while the shares of spectrum holding by the other major MNOs will be in the range of 19% – 30%. Bearing in mind that the CA will continue to identify and release more spectrum for mobile use, the spectrum cap proposed in the above should not give rise to over-concentration of spectrum holding by any individual market player and will unlikely have any impact on effective competition in the mobile telecommunications market.

Question 4: Do you have any views on the proposed spectrum cap of 40 MHz to be imposed on each bidder?

⁹ Calculation of the spectrum holding shares by major MNOs does not include spectrum assignments in the 26 GHz and 28 GHz bands, as this millimetre-wave spectrum is of different radio propagation characteristics and serves different purposes as compared to the low- and mid-band frequencies in the provision of mobile services.

Auction Format

22. Since there are only two frequency blocks in the 4.9 GHz band available for auction, and the CA proposes for each bidder to be eligible to bid for only one frequency block, the CA proposes to adopt the simultaneous multiple-round ascending (“SMRA”) auction format for the auction. This auction format was often used in auctions conducted in the past including the last auction for the 4.9 GHz band in October 2019, and the industry is familiar with it.

Question 5: Do you have any views on adoption of the SMRA auction format for the assignment of the additional spectrum in the 4.9 GHz band?

LICENSING ARRANGEMENT

Licensing and Validity Period

23. The CA will grant a new unified carrier licence (“UCL”) to each successful bidder of the additional spectrum in the 4.9 GHz band. According to Schedule 2 of the Telecommunications (Carrier Licences) Regulation (Cap. 106V), UCLs are issued with a period of validity of 15 years from the day on which they are issued. The validity period of the frequency assignment will last for 15 years and be coterminous with the term of the newly issued licence. For incumbent licensees who successfully acquire spectrum in the proposed auction, they may apply to the CA for combining their existing UCLs with the new UCL to be issued.

Restriction on Frequency Swap

24. In order to realise the full market value of each individual frequency block in the auction, the CA proposes that swapping of any frequency assignment in the 4.9 GHz band within the first five years of the frequency assignment will generally not be considered.

Technology Neutrality

25. In the assignment of spectrum for the provision of public mobile services, the CA in general adopts a technology neutral approach whereby the assignees are free to use whatever technology they choose based on widely recognised standards for service provision. Unless there is any overriding reason worth special consideration, the CA will adhere to this technology neutral approach in assigning and licensing the additional spectrum in the 4.9 GHz band. The assignees will be free to use the spectrum assigned for providing 5G or other generations of mobile services under their UCLs, so long as the technology to be used is a widely recognised standard and will not cause any harmful interference to other legitimate services.

Network and Service Rollout Obligations

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

27. Taking into account the implementation work required by successful bidders to deploy the newly acquired spectrum in the 4.9 GHz band and having regard to the rollout requirements prescribed in general for successful bidders in other auctions, the CA proposes to require each successful bidder of the additional spectrum in the 4.9 GHz band to roll out its network and services with use of the assigned spectrum for providing a minimum coverage of 50% of the population within the first five years from the date of spectrum assignment.

28. In principle, each successful bidder is required to lodge a performance bond for guaranteeing its compliance with the network and service rollout obligations. However, for the existing assignees of spectrum in the 4.9 GHz band (i.e. assignees of Blocks B1 and B2), each of them has already lodged a performance bond to guarantee its fulfilment of the obligation to roll out a mobile network operating at the 4.9 GHz band. Considering that the same mobile network can be readily used for deployment of any additionally acquired spectrum in the 4.9 GHz band, the CA is prepared to offer an option for a successful bidder who is an existing assignee of the spectrum in the 4.9 GHz

band to provide an undertaking in lieu of a performance bond for guaranteeing compliance with the network and service rollout obligations as specified in paragraph 27 above. The amount of the performance bond and the details about the undertaking for guaranteeing compliance in lieu will be specified by the CA in the auction documents which will be issued for inviting participation in the auction.

Question 6: Do you have any views on the network and service rollout obligations proposed to be imposed on the successful bidders of the additional spectrum in the 4.9 GHz band, and the associated performance bond (in the case of new assignees of spectrum in the 4.9 GHz band) or undertaking (in the case of existing assignees of spectrum in the 4.9 GHz band) proposed to be provided by successful bidders to secure compliance?

SPECTRUM UTILISATION FEE

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

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

31. Regarding the method of payment of SUF, SCED proposes that spectrum assignees will be given a choice to pay the SUF either by –

- (a) lump sum payment upfront, which is the lump sum amount determined in auction; or
- (b) annual instalments, with the first instalment equivalent to the lump sum amount obtained in (a) above divided by 15 (i.e. the number of years of assignment), and subsequent instalments increased

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

Question 7: Do you have any views on the proposal in relation to the setting and collection of SUF as specified in paragraphs 30 and 31 above?

INVITATION OF COMMENTS

32. This consultation paper sets out preliminary views as well as respective proposals of the CA and SCED on the arrangements for assignment of the additional 80 MHz of spectrum in the 4.9 GHz band and the related SUF. For the avoidance of doubt, all the information provided and views expressed in this consultation paper are for the purpose of discussion and consultation only. Nothing in this consultation paper represents or constitutes any decision made by the CA or SCED. The content of this consultation paper is without prejudice to the exercise of the powers by the CA and SCED under the TO or any subsidiary legislation thereunder.

33. The CA and SCED will carefully consider the submissions received in this public consultation and is minded to make a decision on the arrangements for assignment of the additional 80 MHz of spectrum in the 4.9 GHz band and the related SUF in around the first quarter of 2021. Taking into account the time required for making the relevant legislative amendments, the spectrum concerned is expected to be put to auction in the fourth quarter of 2021.

34. Any person who would like to respond to this public consultation should do so on or before **18 August 2020**. **Late submissions would not be considered.** The CA and SCED may publish all or part of the views and comments received, and disclose the identity of the source in such manner as they see fit. Any part of the submissions considered commercially confidential should be clearly marked. The CA and SCED would take such markings into account in making the decision as to whether or not to disclose such information. Submissions should be sent to –

Office of the Communications Authority
29/F., Wu Chung House
213 Queen's Road East
Wan Chai
Hong Kong
(Attention: Principal Regulatory Affairs Manager (R22))

Fax: 2803 5112
Email: consult-4.9GHz@ofca.gov.hk

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

**Commerce and Economic Development Bureau
(Communications and Creative Industries Branch) and
Office of the Communications Authority
22 July 2020**

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Figure 1: Existing Status of Spectrum in the 4.9 GHz Band

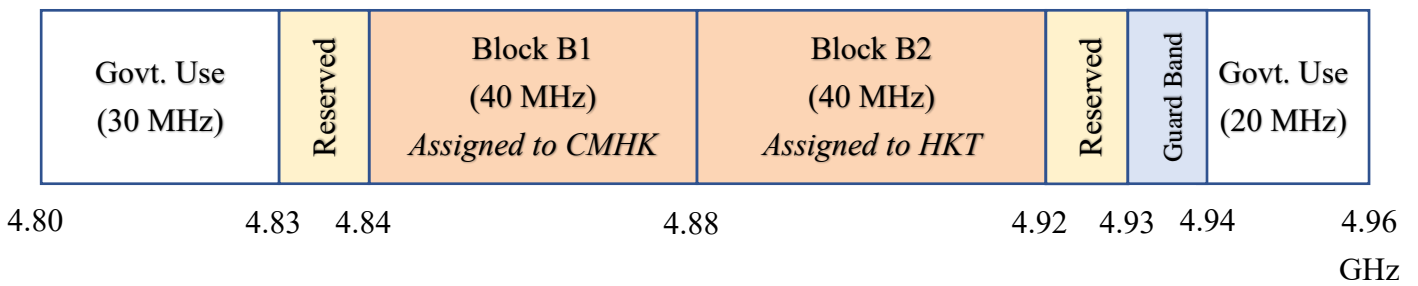


Figure 2: Proposed Band Plan for the 4.9 GHz Band

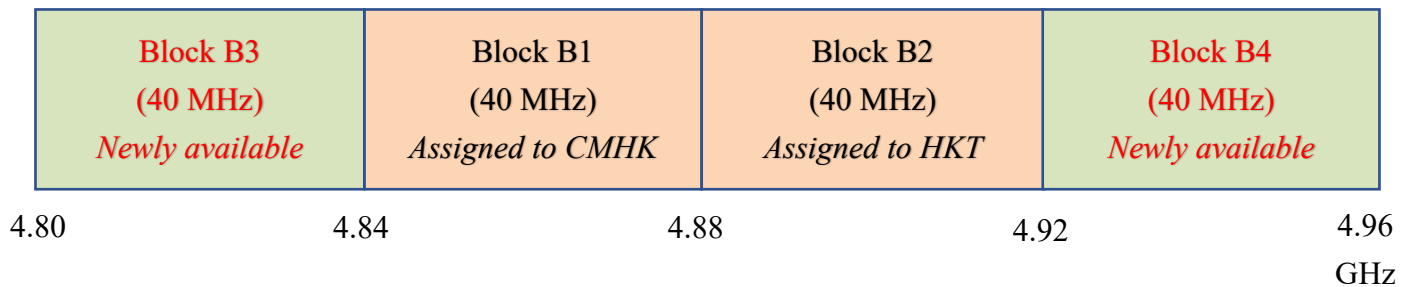


Figure 3: Existing Allocation of the 4.80 – 5.00 GHz Band

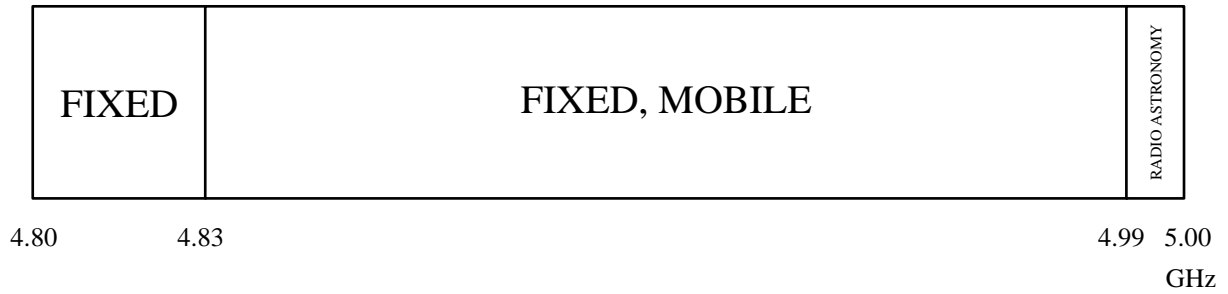
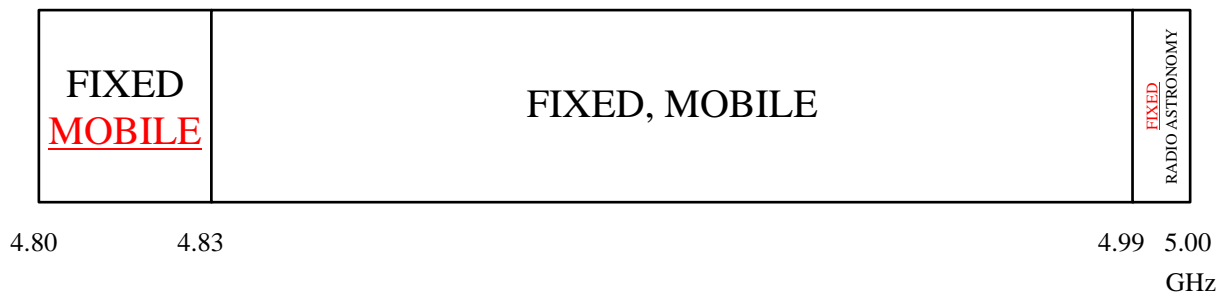


Figure 4: Proposed Additional Allocation and Utilisation

Allocation



Utilisation



**Table 1: Distribution of spectrum below 6 GHz by major operators
as at 30 September 2021 (MHz)**

| | 850/ 900 MHz | 900 MHz [^] | 1800 MHz [^] | 1.9 - 2.2 GHz | 2.3 GHz | 2.5/ 2.6 GHz* | 3.3 GHz | 3.5 GHz | 4.9 GHz | Total | Share in Total |
|------------------|--------------------|-------------------------|--------------------------|---------------------|------------|---------------------|------------|------------|------------|--------------|----------------------|
| CMHK | | 10 | 40 | 19.6 | 30 | 40 | 20 | 60 | 40 | 259.6 | 27.8% |
| HKT | 15 | 20 | 40 | 29.6 | | 60 | 30 | 50 | 40 | 284.6 | 30.5% |
| Hutchison | 10 | 10 | 30 | 29.6 | 30 | 20 | 30 | 40 | | 199.6 | 21.4% |
| SmarTone | 10 | 10 | 40 | 39.6 | | 20 | 20 | 50 | | 189.6 | 20.3% |
| Total | 35 | 50 | 150 | 118.4 | 60 | 140 | 100 | 200 | 80 | 933.4 | 100% |

Notes:

- ([^]) Distribution of the spectrum in the 900 MHz and 1800 MHz bands is based on the arrangements for re-assignment of the spectrum concerned to be effective on 12 January 2021 and 30 September 2021 respectively.
- (*) Assuming that the 40 MHz of spectrum in the 2.5/2.6 GHz band held by Genius Brand Limited, a joint venture between HKT and Hutchison, is divided equally between HKT and Hutchison for calculation purpose.