HKT

Arrangements for Assignment of the Spectrum in the 3.4 – 3.6 GHz Band for the Provision of Public Mobile Services and the Related Spectrum Utilisation Fee

Response to Consultation Paper

13 June, 2018

HKT

KEY MESSAGES

This consultation is about the assignment and pricing of a 200 MHz block of spectrum in the 3.5 GHz band. However, it is a dangerous mistake to look at this in isolation.

The 200 MHz of spectrum in question is in the 3.4 – 3.6 GHz range, one of the first globally harmonized bands for 5G services.

5G is something totally new. 5G services are expected to change the way people live and the way business is conducted. 5G is not simply about faster Smartphones. 5G is about Smart Cities. Billions of devices will be wirelessly connected to each other and vast quantities of radio spectrum in different bands will be required to offer the huge range of applications and services promised with this next generation of mobile technology. Substantial amounts of new infrastructure are also needed to enable this new spectrum to be used.

This new era of 5G services requires a complete change in business model – a new way of doing business, a new way of charging for mobile services. At the same time, it necessitates a complete overhaul of the current outdated policies for spectrum supply, assignment and pricing. The Government cannot simply continue to regulate in the way it did in the voice-centric mobile world. It needs to implement policy and regulations to facilitate and support the emergence of the 5G era and enable Hong Kong to become a leading Smart City.

The Government ought to have conducted a wide-ranging consultation on the implications of the 5G era and on what changes needed to be made to the policy and regulatory framework in order to ensure that Hong Kong becomes a cutting edge Smart City. This should have been done some time ago. Had the Government done this, it would have identified the issues earlier and have had plenty of time to address them. But the Government did not do this. Instead, the Government continued, and still continues, to conduct narrow consultations with foregone conclusions in relation to small amounts of spectrum which it continues to drip feed into the market and sell off for the highest price it can possibly obtain.

Hong Kong is a services based economy. Hong Kong also aspires to be a leading Smart City. Telecommunications services are the key structural requirement for an effective and efficient services based economy and are a prerequisite for a Smart City. Hong Kong is now widely regarded internationally as being behind in its preparations for 5G. Yet the Government appears to be in denial about this and is doing nothing to fix the problem. If Hong Kong is to catch up, the Government needs to think big and act fast.

Hong Kong needs a state of the art 5G market as soon as possible. No more delays, no more excuses, no more burdensome regulations, no more excessive fees, no more drips of spectrum. The Government needs to focus on the benefits, indeed the necessity, of a vibrant telecommunications market. Hong Kong needs much more spectrum now and at reasonable prices. The Telecommunications Ordinance requires the efficient use of spectrum, not the continued extraction of monopoly rents (which have been held by the courts to be illegal) from operators who must then pass these inflated costs on to users, businesses and the economy as a whole.

It is woefully inadequate to be consulting on a mere 200 MHz of spectrum in the 3.5 GHz band now.

On this basis, HKT would like to make the following general comments and suggestions regarding the arrangements for assignment of the 3.5 GHz Band and the related SUF:

<u>Spectrum Supply</u>

- **The exercise to assign the 3.5 GHz Band needs to carried out in conjunction with the assignment of other spectrum bands which are planned for re-assignment or fresh release by the CA (i.e. the 900/1800 MHz, the 26 GHz and 28 GHz bands), so that there is no "artificially created" competing demand. Building a network requires careful, advance planning. In this way, operators have a wide selection of bands from which to pick and choose, in one process, the frequency bands in which they wish to invest their money.**

- **The CA needs to identify more spectrum for 5G urgently and be more aggressive in clearing existing bands (e.g. the C-Band) which are under-utilized by "dying" services that could be re-assigned for use by more valuable mobile services. In this regard, the CA should also accelerate release of spectrum in the 700 MHz range, even if this has to be conditional on what is happening in Mainland China, as this will be one of the 5G spectrum bands and its release has long been delayed.**
- **Under the current assignment exercise, too little spectrum (200 MHz) is being made available considering the size of the carriers (optimum 100 MHz) needed to make use of the frequency band for 5G and the existing number of mobile operators (4).**
- **The Government and the CA need to be more forward looking and more open and transparent. A long term spectrum roadmap (5 or even 10 years ahead) which identifies the frequency bands being studied by OFCA and those being looked at by the ITU and the expected timing of their release should be made available so that mobile operators are able to make better informed technology choices and investment plans.**

<u>Spectrum Assignment</u>

- **Auctioning spectrum is not the only available option nor is it the only available market-based approach, as the Government seems to assume. Assigning spectrum to the incumbent mobile operators could be justified on public interest grounds if the particular circumstances so merit or, if sufficient spectrum were made available such that there was enough for all operators and no competing demand.**
- **The current manner in which the CA assigns spectrum, in limited amounts and via auction, artificially constrains supply and increases prices. It serves no benefit other than to fatten the Government's coffers. Furthermore, it puts undue financial stress on operators and does not benefit consumers, as operators are forced to bid aggressively in order to acquire the limited amount of spectrum being made available each time, leaving few dollars for network infrastructure investment.**

Spectrum Swapping, Pooling and Trading

- **Operators must be given maximum flexibility in the use of spectrum in order to achieve maximum efficient use. There is no fundamental reason why spectrum cannot be swapped and pooled together for use by operators. This is the only way to ensure the most efficient use of the frequency bands, particularly when spectrum is in such short supply.**
- **As the amount of 3.5 GHz Band spectrum on offer is insufficient to enable individual operators to provide an optimum level of 5G service, spectrum swapping and pooling should not only be permitted but should be encouraged by the CA so that end users can benefit from the best possible use of the frequency bands and lower prices due to lower network build out costs.**
- **Now that spectrum trading in Hong Kong has apparently been inexplicably ruled out by the Government, there is an even greater need to give operators more flexibility in how they deploy spectrum. HKT maintains its position that spectrum trading should be introduced in Hong Kong as a way of encouraging the efficient use of spectrum.**

Spectrum Pricing

- **Continuing to price spectrum on a per MHz basis will no longer be sustainable in the 5G era when large blocks of spectrum are required. This will put significant financial strain on mobile operators who need to decide whether they spend their dollars on spectrum fees or on network infrastructure. This will inevitably constrain 5G and Smart City development. Higher spectrum costs will also need to be passed onto consumers through retail prices, yet we are entering a world where many of the new Smart applications and services can only be charged at ultra low rates.**
- **A fundamental change needs to be made to the way spectrum is priced. On its own, spectrum is worthless. SUF should be charged as a percentage of 5G service revenues generated from use of the spectrum rather than from simply assigning the**

spectrum. Charging on such as basis also allows the Government to share in the fruits of 5G and hence is a win-win for both Government and industry.

Hong Kong needs giant steps forward if it hopes to catch up with global leaders, including China. While other regulators around the world are taking a more proactive approach to the development of 5G services and making this a priority, it is disturbing to note that the Hong Kong Government does not seem to understand what is at stake and, while making Hong Kong a Smart City is stated as a policy objective, there seems to be no recognition that no city can become a Smart City unless 5G is introduced early and widely.

In the UK, for instance, Ofcom published a discussion document in March 2018 entitled: *Enabling 5G in the UK* in which it recognized the importance of 5G and outlined its role in the development of 5G services, in terms of releasing different types of spectrum bands for 5G, ensuring site access and planning are not a barrier, and acting as a facilitator to work across different sectors to encourage them to work together to understand the potential applications of 5G.

Similarly, in Australia, the Government released a directions paper in October 2017 entitled: *5G – Enabling the future economy* outlining the immediate actions it would take to support the timely roll out of 5G in Australia, including: making spectrum available in a timely manner, actively engaging in the international standardization process, streamlining arrangements to allow mobile operators to deploy infrastructure more quickly, and reviewing existing telecommunications regulatory arrangements to ensure they are fit for the purpose.

Hong Kong needs to follow these global best practices.

Given that telecommunications is the bedrock infrastructure that supports Hong Kong's pillar industries, particularly financial services, the consequences are potentially disastrous for Hong Kong and its role as a regional hub and gateway to the Mainland. Hong Kong deserves better. What is urgently needed is a radical overhaul of the whole approach to telecommunications policy and spectrum management in

Hong Kong and the implementation of a forward looking system which is truly fit for the future. The assignment of 200 MHz of spectrum in the 3.5 GHz spectrum band cannot be looked at in isolation.

INTRODUCTION

1. Hong Kong Telecommunications (HKT) Limited ("**HKT**") welcomes the opportunity to provide its comments in response to the Consultation Paper issued by the Commerce and Economic Development Bureau (Communications and Creative industries Branch) and Office of the Communications Authority ("**OFCA**") on 2 May 2018 regarding *Arrangements for Assignment of the Spectrum in the 3.4 - 3.6 GHz Band ("**3.5 GHz Band**") for the Provision of Public Mobile Services and the Related Spectrum Utilisation Fee* ("**Consultation Paper**").

2. The 3.5 GHz Band will be one of the first globally harmonized 5G frequency bands to be released in Hong Kong. It is therefore critically important for the Government to "get it right" as regards the assignment and pricing of this spectrum band, otherwise the Government's actions could adversely affect the development of Hong Kong as a Smart City and cause significant damage to Hong Kong's businesses and its position as a communications hub in the region.

3. Before HKT addresses the specific questions raised in the Consultation Paper, it would like to deal with certain preliminary matters which are discussed in the opening sections of the Consultation Paper.

Assignment Arrangements for the 3.5 GHz Band

4. The purpose of this current consultation, per the opening paragraph of the Consultation Paper, is to:

> *[…] seek views and comments of the industry and interested parties on the arrangements for assignment of the spectrum in the 3.4 – 3.6 GHz band […]*

HKT is concerned, however, that the Communications Authority ("**CA**") has already formed the view that an auction process is to be used to assign the spectrum, and hence the consultation process is a sham.

5. The CA gives itself away when talking about the Spectrum Utilisation Fee ("**SUF**") (which is payable for the use of frequency bands)

in paragraph 8 of the Consultation Paper by specifically referring to the minimum fee for the SUF as "the auction reserve price".

6. While Section 32I(4) of the Telecommunications Ordinance ("**Ordinance**") permits the Secretary to specify the "minimum fee" for the SUF, there are several ways indicated under this section by which this fee can be determined by the Secretary, e.g. a minimum fixed fee, a minimum fee determined by reference to a formula or percentage or the occurrence of an event or series of events, etc. The Ordinance does not dictate that the minimum fee be set as the opening price in a spectrum auction.

7. HKT finds this worrying as it strongly suggests the CA has already made up its mind, as early as in paragraph 8 of the Consultation Paper, that an auction process will be used to determine assignment of the 3.5 GHz Band. If this is the case, the current consultation process is clearly flawed and cannot be accepted as an open and fair process to decide on the method to assign the spectrum in question. The outcome is already determined.

Competing Demands for the Spectrum

8. In paragraph 14 of the Consultation Paper, on the basis of the potential use of the 3.5 GHz Band for 5G services (which is expected to see tremendous demand) and the technical characteristics of the frequency band, the CA concludes that there are likely to be *competing demands* for the 3.5 GHz Band and hence, according to the **Radio Spectrum Policy Framework**[1], a market-based approach must be adopted for the assignment of the spectrum (unless there are overriding public policy reasons to do otherwise).[2]

[1] Radio Spectrum Policy Framework promulgated by the Government in April 2007 ("**RSPF**").

[2] If the CA were to strictly apply the principle of competing demands it would realize that there is in actual fact competing demand between the mobile operators and the satellite operators for spectrum in this band. If that is the case, why aren't the satellite operators being asked to bid for use of the spectrum and pay SUF?

9. HKT, however, considers that such "competing demands" for the spectrum are illusory. They have been artificially created by the CA by long adopting a policy to only release limited amounts of spectrum in dribs and drabs over a number of years (instead of all in one go), so that there is insufficient spectrum being made available each time for the number of operators who are interested in acquiring the frequency bands.

10. Such a policy hurts the mobile industry (and ultimately consumers) as interested parties are required to pay high prices in order to compete with each other to acquire the small amount of spectrum being offered each time. This course of action only serves to increase the coffers of the Government and does little to help the mobile operators who struggle to find the required funds to invest in improving and developing their networks as well as pay such extortionate prices for use of the spectrum. Ultimately, this has a knock-on effect on the whole economy and Hong Kong's standing as a world class communications hub as investment is necessarily curtailed, not just on 5G network infrastructure roll out, but also on other important initiatives such as Hong Kong's Smart City development plans. Indeed, without both sufficient spectrum and the necessary infrastructure to use it, there will be no Smart City.

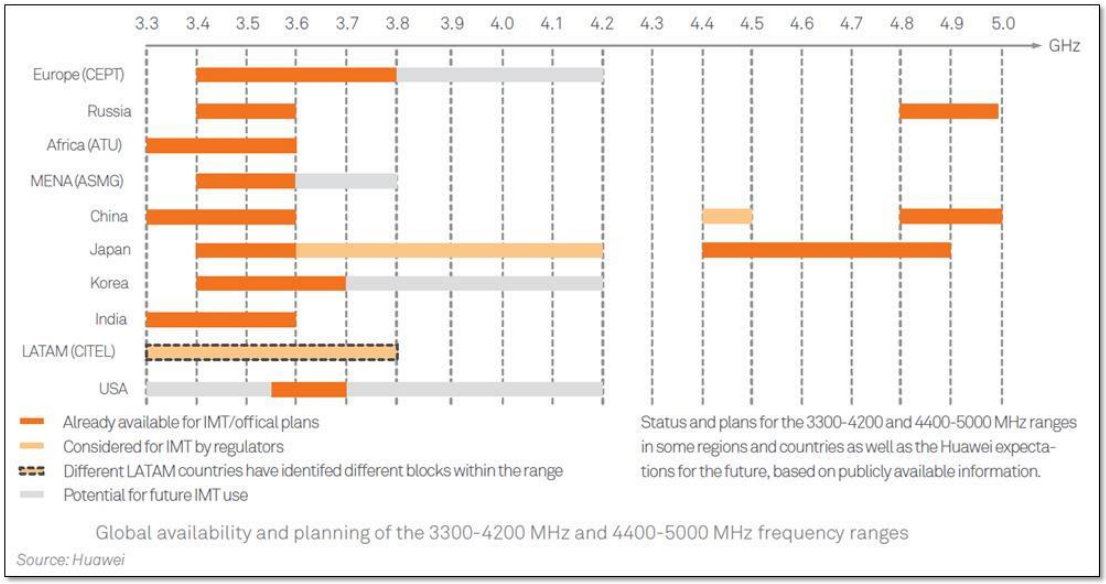
11. This policy needs to stop and some drastic rethinking done. As much spectrum as possible must be made available in one go so that operators do not find themselves unnecessarily competing with each other to acquire spectrum under a scenario of artificially created scarcity. In this regard, the CA should assign at the same time all the spectrum which it has already planned for re-assignment and fresh release for mobile services, i.e. spectrum in the 900/1800 MHz, 26 GHz and 28 GHz range[3]. It makes no sense to drip feed this spectrum into the market unless the Government has a hidden objective of maximizing its revenues. Recent equity research reports published by some of the investment banks, in fact, support the view that the Government is

[3] In fact, there are jurisdictions which have taken this approach in releasing several 5G spectrum bands at the same time, e.g. Italy is set to auction spectrum for 5G services in September this year in the 694 – 790 MHz, 3.6 – 3.8 GHz and 26.5 – 27.5 GHz bands.

deliberately structuring the timing of each spectrum auction in order to maximize its revenues from the auctions!

12. The CA should also work more aggressively to identify frequency bands which are under-utilized, and be more aggressive in clearing out these bands, so that they may be re-allocated for more valuable mobile services, e.g. other spectrum in the C-Band, spectrum in the 700 MHz range.

13. In fact, if we were to look at what other countries are making available for mobile use or considering releasing for mobile use within the C-Band (particularly the 3.3 – 4.2 GHz and 4.4 – 5.0 GHz frequency range, which will be the primary band for 5G services in the initial period), it can clearly be seen in the following table[4] that Hong Kong, by only making plans to release a meagre 200 MHz in the 3.4 – 3.6 GHz range, will seriously lag behind in the development of 5G services and as a Smart City:



Note in particular:

(i) Europe's CEPT has designated the frequency bands 3.4 – 3.6 GHz and 3.6 – 3.8 GHz (a total of 400 MHz) on a non-exclusive basis for mobile/fixed communications networks without prejudice to the

[4] Taken from Huawei's paper on *5G Spectrum – Public Policy Position* published in 2017.

protection and continued operation of other existing users in these bands.

(ii) China's MIIT has promulgated the allocation of the 3.3 - 3.6 GHz and 4.8 - 5.0 GHz range for 5G services (a total of 500 MHz).

(iii) Japan has already made available for mobile services the 3.4 – 3.6 GHz and 4.4 – 4.9 GHz bands (a total of 700 MHz), and is considering the release of the 3.6 – 4.2 GHz band for mobile services.

(iv) While the USA has only made available 150 MHz for 5G services within the 3.3 – 4.2 GHz range, it is actively considering releasing the whole of this band for mobile services. In fact, the Chairman of the FCC recently announced that a plan to utilize 500 MHz of spectrum in the 3.7 – 4.2 GHz band for 5G services would be discussed in their July meeting this year.

14. As can be seen, overseas administrations clearly consider that large blocks of spectrum are needed for the development of mobile services in the C-Band, and are proactively making available different portions of the 3.3 – 4.2 GHz and 4.4 – 5.0 GHz ranges to accommodate the size of the carriers required to maximize the benefits of 5G services.

15. Huawei places great emphasis on the use of the C-Band for 5G services development. In its 2017 paper on *5G Spectrum – Public Policy Position*, Huawei states:

> *Spectrum availability for IMT in the 3300-4200 and 4400-5000 MHz ranges is increasing globally. The 3400-3600 MHz frequency band is allocated to Mobile Service on a co-primary basis in almost all countries throughout the world. Administrations will make available different portions of the 3300-4200 and 4400-5000 MHz ranges at different times, incrementally building large contiguous blocks.*
>
> *The 3GPP 5G NR specification will support 3300-3800 MHz from the start, using a TDD access scheme. In line with the release plans from many countries, the 3300-3800 MHz band will be the primary 5G band with greatest potential for global harmonisation*

over time: it is recommended that at least 100 MHz of contiguous bandwidth from this band be allocated to each 5G network.

[…]

The 5G NR ecosystem of 3300-3800 MHz is expected to be commercially ready in 2018. As a first step, it is highly recommended that countries allocate 3300-3800 MHz or a portion of it and make it available for 5G with consistent timelines and regulatory frameworks (i.e. frequency arrangements and emission masks). Work is ongoing in CEPT ECC PT1 towards the development of the regulatory technical conditions for the 3400-3800 MHz for 5G in Europe, and the final decisions will be published in June 2018 and will represent an important reference also for countries from other regions.

So what work is being carried out in Hong Kong to clear the C-Band for 5G services beyond the allocation of a mere 200 MHz in the 3.4 – 3.6 GHz range? Sadly, nothing. Yet it is not just HKT which has questioned whether a guard band of 100 MHz (3.6MHz – 3.7 MHz) to reduce potential interference is really necessary and whether some of this could be released immediately for mobile use. Taking 40 MHz or 80 MHz out of this guard band would give a total of 240 MHz or 280 MHz of spectrum in this band for mobile use and would allow each of the 4 incumbent operators to have 60 MHz or 70 MHz right away.

16. The CA should aim to release a total of at least 400 MHz of spectrum in the sub-6 GHz band for the development of 5G services in Hong Kong, so that the 4 incumbent mobile operators would each have access to an ideal 100 MHz of spectrum, thereby maximizing the capabilities of 5G services.

17. Accordingly, HKT would strongly suggest that, in addition to the 200 MHz in the 3.4 – 3.6 GHz range that has already been decided for mobile use, the CA actively explore the possibility of releasing a further 200 MHz in either the:

(i) 3.6 – 3.8 GHz range; or

(ii) 4.8 – 5.0 GHz range.

so that Hong Kong does not lag behind other countries in the development and roll out of 5G services.

Furthermore, there is absolutely nothing preventing the release now of the 3.3 GHz – 3.4 GHz band for limited (i.e. indoor/underground) use. Indeed, China has done this already. Clearly, the use of this spectrum in indoor and underground locations cannot conflict with satellite usage as satellite transmissions do not penetrate into these areas, therefore it is an inefficient use of spectrum for the CA to deny the use of all of this spectrum indoors and underground. Needless to say, the most heavily congested places in any mobile operator's network are in dense indoor locations (e.g. at concert venues and shopping centres) and in the MTR network (particularly in peak hours). The CA's failure to distinguish indoor/underground locations from wide-area outdoor locations is a major error in spectrum planning and must be corrected immediately.

ASSIGNMENT ARRANGEMENTS FOR THE SPECTRUM IN THE 3.5 GHZ BAND

Assignment of Spectrum by Auction

18. The CA proposes that 200 MHz of spectrum in the 3.5 GHz Band should be open for bidding by all interested parties, including incumbent mobile operators and new entrants.

19. Bidders are required to:

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

(iv) Demonstrate its capability to provide service in fulfilment of the licensing obligations to the satisfaction of the CA and furnish any other relevant supporting information deemed necessary by the CA.

Question 1:	*Do you have any views on assigning the spectrum in the 3.5 GHz band through an auction?*

20. In paragraph 15 of the Consultation Paper, the CA justifies use of an auction to assign the spectrum on the basis that:

> *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.*

21. However, taking into account:

(i) This is the first globally harmonized 5G spectrum band and one of the first to be made available in Hong Kong;

(ii) The small amount of spectrum being released (200 MHz) in view of the need to make use of larger spectrum blocks to optimize use of the frequency band for 5G services (carriers of bandwidth up to 100 MHz); and

(iii) The number of incumbent mobile operators (4),

under the circumstances, assigning the spectrum via auction may not be the best course of action as this inevitably leads to the following consequences:

(i) Operators only managing to obtain less than 50 MHz of spectrum, which is sub-optimal for the provision of 5G services (bearing in mind that 50 MHz of TDD spectrum is only equivalent to 2 x 25 MHz of FDD spectrum)[5]; or

(ii) Some incumbent operators not being able to acquire any 5G spectrum and the spectrum ending up in the hands of those operators with the deepest pockets. As a result, one or more of the existing mobile operators may not be able to provide 5G services and consumers will suffer from lack of choice of operators providing such services.[6]

22. Instead of an auction, the CA should consider assigning the 3.5 GHz Band on an equal basis, in blocks of 50 MHz, to the 4 incumbent mobile operators. This would be the only way to ensure that the needs of the market are fully met (since an auction process cannot guarantee each operator would be able to secure a minimum of 50 MHz each) and is a perfectly acceptable course of action in the interests of the public.

23. Any spectrum assignment of less than 50 MHz to each operator would undermine the benefits of 5G technology and investment, and would conflict with the CA's responsibility under Section 32G of the Ordinance to:

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[5] Refer to section 2.1 of draft CEPT Report 67 to the European Commission "to develop harmonized technical conditions for spectrum use in support of the introduction of next-generation (5G) terrestrial wireless systems in the Union" in which the CEPT recommended that "5G use cases benefit from minimum contiguous frequency allocations of around 50/80 MHz per operator". The CEPT or European Conference of Postal and Telecommunications Administrations is an organization where policy makers and regulators from 48 countries across Europe collaborate to harmonize telecommunication, radio spectrum and postal regulations to improve efficiency and co-ordination for the benefit of European society.

[6] Indeed, in paragraph 27 of the Consultation Paper, the CA acknowledges the possibility of only two operators being assigned with spectrum in the 3.5 GHz Band for 5G services and hence proposes imposing an Open Network Access requirement, which in itself is a retrograde and unnecessary prescription.

[…] promote the efficient allocation and use of the radio spectrum as a public resource of Hong Kong.

and would be at odds with the spectrum policy objectives per the RSPF to:

(a) facilitate the most economically and socially efficient use of spectrum with a view to attaining maximum benefit for the community;

(b) achieve technically efficient use of spectrum to facilitate the introduction of advanced and innovative communications services and strengthen Hong Kong's position as a telecommunications and broadcasting hub […]

24. It would be meaningless to permit new entrants (if any) to take part in the exercise to assign the 3.5 GHz Band, and assume that they are capable of providing quality 5G services and be able to survive in the long term, given that the spectrum will be used for 5G services which can only feasibly be used by mobile operators with existing networks.

25. This also makes sense since, per the CA's requirements stated in paragraph 17(b) of the Consultation Paper, bidders need to demonstrate their capability to provide service in fulfilment of the stringent licensing obligations as contained in the Unified Carrier Licence ("**UCL**"), which only incumbent mobile operators running existing mobile services would have a realistic chance of achieving given, in particular, the increasing practical constraints in establishing site locations and installing facilities.

26. The loss suffered by the public as a result of the spectrum being assigned to a new entrant and unable to be optimally used (instead of being placed in the reliable hands of the incumbents) far outweighs the value of any performance bond that is required to be provided by the new entrant.

Band Plan

27. The CA proposes to divide the 200 MHz of spectrum in the 3.5 GHz Band into ten frequency blocks, each of 20 MHz, as follows:

Frequency Block	Frequency Range (MHz)	Bandwidth (MHz)
A1	3400 – 3420	20
A2	3420 – 3440	20
A3	3440 – 3460	20
A4	3460 – 3480	20
A5	3480 – 3500	20
A6	3500 – 3520	20
A7	3520 – 3540	20
A8	3540 – 3560	20
A9	3560 – 3580	20
A10	3580 – 3600	20

Question 2:	*Do you have any views on the proposed band plan with division of the available spectrum into ten frequency blocks, each with a bandwidth of 20 MHz?*

28. Without prejudice to its primary position that the available 200 MHz should not be auctioned and should simply be assigned to the 4 incumbent mobile operators, HKT does not agree with the CA's proposal to divide the spectrum into ten frequency blocks, each with a bandwidth of 20 MHz. This does not make sense from any perspective. Ten blocks of spectrum cannot be divided equally among the existing four operators, so it would be better to adopt blocks of 10 MHz or 50 MHz each.

29. The Government's proposed band plan seems to serve only to artificially create competing demand and justify a two stage auction process with the goal of maximizing revenue. This is contrary to the statutory and policy direction to promote the economic and socially efficient use of spectrum as a public resource. It is also contrary to the public interest. To maximize the capability of 5G technology, ideally more spectrum should firstly be made available and then bands of up to 100 MHz should be adopted, as has been done in Mainland China.

Spectrum Cap

30. In order to address competition concerns arising from any over-concentration of spectrum in the hands of a small number of operators,

the CA proposes to impose a cap of 100 MHz of spectrum in the 3.5 GHz Band on any bidder in the auction to be conducted.

Question 3:	*Do you have any views on the proposed spectrum cap of 100 MHz to be imposed on any bidder in the auction?*

31. HKT does not agree to the use of an auction in this case let alone the imposition of a spectrum cap. Imposing a limitation on the amount of spectrum that can be held by an operator is tantamount to preventing that operator from achieving economies of scale in utilizing its holding of spectrum. This does little to help lower costs or bring down retail prices.

32. In this instance, the CA is concerned about the possible over-concentration of spectrum in the hands of a small number of operators and the resulting impact on competition. At the same time, the CA recognizes that maximum spectral efficiency for 5G services can only be achieved using (ideally) a channel bandwidth of 100 MHz in the 3.5 GHz Band. On this basis, the CA suggests setting the spectrum cap at 100 MHz per bidder.

33. However, if maximum efficiency is to be attained (i.e. the use of a 100 MHz block), even a cap of 100 MHz per bidder would still only result in this pioneer 5G spectrum band ending up in the hands of just two (out of four) operators in Hong Kong, hence the CA's concerns are not addressed by the imposition of the proposed spectrum cap.[7]

34. HKT considers it preferable to avoid creating this problem in the first place. Rather than holding an auction and imposing a spectrum cap on each bidder, the CA should assign the 3.5 GHz Band equally amongst the 4 incumbent operators. Ideally, more spectrum should be made available in this band so that each operator could be assigned a larger and more useful block.

[7] Indeed, in paragraph 27 of the Consultation Paper, the CA acknowledges the possibility of only two operators being assigned with spectrum in the 3.5 GHz Band for 5G services and hence proposes imposing an Open Network Access requirement, which in itself is a retrograde and unnecessary regulatory prescription.

Auction Format and Timing

35. In order to ensure that bidders are able to acquire contiguous blocks of spectrum (and thus achieve higher spectral efficiency) in the 3.5 GHz Band, the CA proposes to auction the spectrum using a clock auction format, followed by an assignment stage. Under the SMRA auction format adopted by the CA for previous spectrum auctions, there is a risk that bidders may not end up with contiguous blocks.

36. Under a clock auction format, over a number of rounds, bidders simply bid for the number of frequency blocks they wish to acquire at a particular price. All frequency blocks are generic. The round price increases in each round until the auction stops when the total demand for frequency blocks from all bidders is the same as, or less than, the total number of blocks being offered. Following completion of the clock auction, the CA will then hold an assignment stage in which each successful bidder bids for the priority to select the location of its contiguous frequency block.

37. The CA proposes that the auction take place at the end of 2019 at the earliest.

Question 4:	*Do you have any views on the proposed format of and timing for the auction?*

38. At the outset, HKT repeats that it is opposed to an auction for the 3.5 GHz Band. The CA is not trying hard enough to maximize supply of spectrum and it could easily produce a minimum of 100 MHz for each of the existing 4 mobile operators in Hong Kong. This spectrum could be administratively assigned, in which case there is no need for any auction of whatever format.

39. In terms of the timing of any spectrum assignment, HKT suggests that this should take place as soon as possible so as not to delay any network investment or roll out plans for 5G services. It should also be done at the same time as assignment of the spectrum in the 900/1800 MHz and 26/28 GHz bands.

LICENSING ARRANGEMENT

Licensing and Validity Period

40. The CA proposes to assign the spectrum for 15 years to new or existing mobile operators under the UCL regime, with spectrum assignees being granted a new UCL. Existing holders of UCLs may apply to the CA to combine their current UCL into the new UCL to be issued.

41. A longer spectrum assignment must be granted in order to permit operators sufficient time to recoup their investment, both in terms of the price paid for use of the spectrum and the associated network roll out. The UK, for instance, has already adopted perpetual spectrum licences, and in the EU, agreement was recently reached on the duration of licences per the European Electronic Communications Code, with member states settling on a 20 year duration to ensure return on investment and predictability for all market players.[8]

Restriction on Frequency Swap

42. The CA proposes that, in order to ensure genuine competition and to realize the full market value of each frequency block being offered, operators who successfully acquire spectrum in the 3.5 GHz Band will not be permitted to swap spectrum with another operator within the first 5 years following the date the frequency bands are assigned.

43. This shows a total disregard for market forces despite the CA's claim to adopt a market-based approach. HKT considers that no restrictions should be placed on operators regarding the spectrum they have been assigned. Operators should be permitted to swap their spectrum after the conclusion of any spectrum auction. If frequency swapping is only permissible after the first 5 years, this will result in greater expense being incurred by both operators than if swapping were permitted right from the beginning. HKT is also of the view that operators should be allowed to trade their spectrum.

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[8] See press release from European Commission on 6 June 2018: http://europa.eu/rapid/press-release_IP-18-4070_en.htm

44. Healthy competition is all about economic vibrancy, innovation and consumer benefits. HKT cannot see how any restriction placed on frequency swapping, or indeed on spectrum trading more generally, facilitates any of these benefits. Nor can HKT see how this fulfils the statutory and policy directive to promote the economic and socially efficient use of spectrum as a public resource. On the contrary, placing undue restrictions on the use and management of spectrum will only increase operators' costs. These higher costs prevent operators from investing money elsewhere and will ultimately prevent them from being able to offer many of the new ultra low cost 5G services. In the end, the only winner is the Government which is guaranteed to maximize its revenues.

45. If the CA insists on making available insufficient spectrum in the 3.5 GHz Band for all 4 incumbent operators to deploy carriers of 100 MHz bandwidth (and hence offer their customers an optimal 5G service), then operators holding spectrum in adjacent bands should at least be allowed to pool together their frequency resources in order to create a wider bandwidth to exploit the full benefits of 5G.

46. Spectrum pooling in this manner is technically possible via a Multi-Operator Core Network ("**MOCN**") solution, and is a highly recommended means of achieving substantial cost savings without significant drawbacks, especially during explorative phases such as in the initial period of 5G. Analysys Mason, in their article on *Unlocking 5G* published in April 2018 estimated that the use of spectrum pooling and MOCN could result in cost savings for macro network 5G deployment of 40 – 50%.[9] Lower network costs inevitably translate into lower end user prices.

47. Spectrum pooling and network sharing would accelerate the roll out of 5G services, resulting in positive outcomes for operators and consumers alike. In a scenario, such as the present, where there is limited spectrum availability, and where Hong Kong is acknowledged to be lagging behind on 5G implementation, spectrum pooling allows

[9] See: http://www.analysysmason.com/About-Us/News/Newsletter/unlocking-5g-Apr2018/

operators to maximize the potential of 5G services in a shorter timeframe.

Open Network Access ("ONA") Requirement

48. In recognition that the CA is proposing that only 200 MHz of spectrum is being made available in Hong Kong for this first globally harmonized band for 5G services, the CA suggests it is possible that not every interested bidder will be able to secure some of the spectrum. To address this issue, the CA proposes that there should be an ONA requirement imposed on bidders who successfully acquire spectrum in the 3.5 GHz Band.

49. Under this ONA requirement, which is modeled on the ONA requirement previously imposed on licensees using the 1.9 – 2.2 GHz band for the provision of 3G services ("**3G Spectrum**"), operators will be required to open up at least 30% of their network capacity in the 3.5 GHz Band to other non-affiliated mobile service providers.

Question 5:	*Do you have any views on the proposed ONA requirement?*

50. The fact that the CA finds it necessary to introduce an ONA requirement is a clear recognition that there is not enough spectrum in the 3.5 GHz Band to serve the needs of the existing operators. HKT is therefore puzzled as to why the CA's proposed solution to this state of affairs is to require those who have been successfully assigned spectrum to share their already limited amount of bandwidth with other operators!

51. If the CA were really concerned about there not being sufficient spectrum in the 3.5 GHz Band to satisfy the demand from all interested parties, is this not another indication that the CA ought to be working harder to make 400 MHz to 500 MHz of spectrum available for 5G use!

52. The question of spectrum shortage would not even arise if the CA had approached or was now approaching the task of making more 5G spectrum available with more urgency, by either identifying unused

bands or taking a more aggressive stance against parties who are hogging severely under-used bands for dying services.

53. History has shown that the ONA requirement does not work. Such an obligation merely leads to a degradation in service to an operator's own customers if the spectrum is already heavily loaded even before the operator opens it up to other parties. It did not work when applied to the 3G Spectrum and was not needed for 4G, and yet both services blossomed in Hong Kong. Any requirement for access to another operator's spectrum can be satisfied (and indeed has been satisfied) via commercially agreed network capacity sharing arrangements.

Protection of Telemetry, Tracking and Control ("TT&C") Stations

54. TT&C Stations are set up to manoeuvre satellites in orbit and monitor the operational status of satellites. These stations currently make use of some channels in the 3.4 – 3.7 GHz frequency range and hence may be subject to interference from mobile services operating in the 3.5 GHz Band. On this basis, the CA has previously decided to impose restriction zones in the Tai Po Industrial Estate and Stanley areas (where the TT&C Stations are located) to restrict the use of mobile base stations so that the TT&C Stations would be protected.[10]

55. In addition, given that a TT&C channel of some 1 MHz bandwidth is presently in operation at the lower edge of the 3.5 GHz Band, this means that whoever is assigned spectrum in Block A1 (3400 – 3420 MHz)[11] will be required to take reasonable measures to install, maintain and operate its service and network so as not to cause any harmful interference to the operation of this TT&C channel.

Question 6:	*Do you have any views on the proposed requirements as set out in paragraphs 29 to 31 above?*

[10] Refer to Statement of the CA issued on 28 March 2018 regarding *Change in the Allocation of the 3.4 – 3.7 GHz Band from Fixed Satellite Service to Mobile Service* ("**CA Statement on the 3.5 GHz Band**").

[11] See table in previous section entitled "Band Plan".

56. In general, HKT agrees that there is a need to protect TT&C Stations from interference. However, the restriction zones that have currently been specified per the CA Statement on the 3.5 GHz Band are so wide that this will result in a large number of customers in the Tai Po and Stanley areas not having access to 5G services for 15 years.[12] In fact, a columnist in the Hong Kong Economic Journal recently wrote that the imposition of the restriction zone for Tai Po Industrial Estate alone would actually affect an area well beyond Tai Po, covering Sha Tin, Ma On Shan, Fanling, Sai Kung and also the campus of the Chinese University of Hong Kong as well as the Hong Kong Science Park, thereby affecting a population of around one million people.[13] This is clearly unacceptable to residents living, and people working, within these areas.

57. It is also outrageous and disproportional to require the mobile operator to constrain use of its 20 MHz of spectrum in Block A1 simply to accommodate the operations of the satellite operator who is using a mere 1 MHz of spectrum in the lower end of the 3.5 GHz Band! According to the sharing study between IMT-Advanced Systems and Geostationary Satellite Network in the Fixed-Satellite Service ("**FSS**") as concluded in the **ITU-R M.2019 Report**[14], the minimum required separation distance between IMT-Advanced base stations and an FSS earth station due to in-band co-channel interference or adjacent band interference are at least in the tens of kilometers and may even exceed one hundred kilometers in some cases. As such, it is possible that Block A1 may not be usable at all throughout the entire area of Hong Kong. Whether or not it would be usable would be entirely dependent on the satellite operator(s) concerned. For this reason, it is completely irresponsible for the CA to propose that Block A1 be auctioned on the same terms as the other spectrum blocks.

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[12] The size of the restriction zones imposed in the CA Statement on the 3.5 GHz Band are estimated to be a radius of around 9km for the Tai Po Industrial Estate area and around 5km for the Stanley area.

[13] Column entitled: "5G禁飛區迷思" in the 31 May 2018 edition of the Hong Kong Economic Journal.

[14] "Sharing Studies between IMT-Advanced Systems and Geostationary Satellite Networks in the Fixed-Satellite Service in the 3400-4200 and 4500-4800 MHz Frequency Bands", Report ITU-R M.2019, 2007.

58. As this matter is of serious concern to the 4 incumbent mobile operators, including HKT, a letter was jointly submitted by the mobile operators to OFCA on 24 May 2018 putting forward the following mitigation measures to enable the size of the restriction zones to be narrowed or reduced to one specific part of Hong Kong:

(i) *Adding shielding cover for the TT&C stations*. This would enable less of a spatial separation between TT&C stations and mobile base stations without causing radio interference.

(ii) *Optimizing the radiation directions of mobile base station antennae*. By adjusting the radiation direction of mobile base stations in the vicinity of TT&C stations so that they are not aligned with that of the TT&C stations, this should permit less of a spatial separation between the two types of stations.

(iii) *Relocating the existing TT&C station from Tai Po Industrial Estate to a more remote area or co-location in Stanley*. This would avoid large parts of Hong Kong (where many people reside and work) falling into the restriction zone.

59. Measures (i) and (ii) are interim solutions which should reduce the size of the restriction zones and hence are consistent with the Government's recent drive to develop Hong Kong into a territory wide Smart City. Measure (iii) is the ultimate solution to eliminate the need for any restriction zone and hence is the preferred longer term solution. The cost of any relocation and mitigation measures should be funded by the Government out of the SUF collected.

60. Although, in OFCA's response to the joint letter submitted by the 4 incumbent mobile operators, it recognizes that there is merit in exploring the above suggested mitigation measures as a means of eliminating the restriction zones, HKT is shocked and appalled that OFCA did consider examining such options before the CA made its decision to impose the geographical restriction zones specified in the CA Statement on the 3.5 GHz Band. In the meantime, the restriction zones will come into effect and be yet another handicap to the roll out of future 5G services.

61. Successful implementation of the mitigation measures described above would allow operators to use their spectrum without being hampered by any consideration of where in Hong Kong the spectrum can be used and any associated mitigation costs.

Subsidy Scheme to Support Upgrade of Existing Satellite Master Antenna Television ("SMATV") Systems

62. According to the Consultation Paper there are some 1,600 SMATV systems (as at 28 March 2018, the date the CA Statement on the 3.5 GHz Band was issued) which need to be upgraded in order to be protected from harmful interference once the mobile operators start using spectrum in the 3.5 GHz Band.

63. On this basis, the CA suggests that:

(i) The cost of upgrading these SMATV systems should be subsidized by the mobile operators who have been assigned spectrum in the 3.5 GHz Band (i.e. a one-off subsidy of $20,000 per SMATV system); and

(ii) A fund should be jointly set up and administered by the spectrum assignees (to the satisfaction of the CA) for the purposes of granting the aforementioned subsidies to the SMATV licensees. This would include handling applications from eligible applicants. The amount to be deposited into the fund by each spectrum assignee would be in proportion to the amount of spectrum assigned.

Question 7:	*Do you have any views on the proposed subsidy scheme for the upgrade of existing SMATV systems, including the funding and administrative arrangements for issuing the amount of subsidies to the affected system owners/users?*

64. HKT strongly rejects the notion that the mobile operators who have been assigned spectrum in the 3.5 GHz Band should be responsible for funding (in part or in whole) the costs incurred by the SMATV licensees to upgrade their systems.

65. Assignment of spectrum should not generally be linked to any obligation to provide funding to other parties. This is a separate matter to be handled by the Government.

66. Resolution of the problem as to how the SMATV system upgrade costs are to be funded should be the responsibility of the Government, and the problem should not be passed onto the mobile operators. As the Government is the biggest financial beneficiary from assigning this spectrum (which currently generates no revenue for the Government) in the form of SUF received, the upgrade costs should be funded out of the SUF received for the 3.5 GHz Band. This is generally the practice in other countries.

67. It is neither appropriate nor practical for the mobile operators to be involved in any administration of a fund for the purposes of processing applications from SMATV licensees for financial subsidies in respect of SMATV system upgrades. This represents an onerous responsibility for the mobile operators and has nothing to do with their business operations. OFCA, as a central (and neutral) coordinating party, on the other hand, would be in a much better position to carry out the administration of any such fund alongside its current licensing responsibilities.

Technology Neutrality

68. The CA proposes to maintain its technology neutral policy, such that operators who have been assigned spectrum in the 3.5 GHz Band will be free to use the spectrum for 5G or other generations of mobile services under their UCLs, as long as the technology they adopt is a widely recognized standard and will not cause harmful interference to other services.

Question 8:	*Do you have any views on the adoption of a technology neutral approach in respect of the use of spectrum in the 3.5 GHz band?*

69. HKT welcomes the technology neutral approach being maintained by the CA for this spectrum band in view of the rapid speed at which technology develops in the telecommunications industry. Under this

approach, operators would be in the best position to determine what technology to be deployed with their spectrum bands at each stage in order to provide the best service to their customers.

70. Indeed, HKT considers that any technology restrictions that currently apply to any of the assigned frequency bands in Hong Kong should be immediately abolished.

Network and Service Rollout Obligation

71. The CA proposes to require each successful spectrum assignee to roll out its mobile network and service to provide a minimum coverage of 50% of the population within 5 years from the date its UCL for the 3.5 GHz Band has been granted. For incumbent mobile operators, they may make use of their existing network to fulfill the roll out requirements if they can demonstrate to the CA's satisfaction that the newly acquired spectrum has been used in their network.

72. In addition, each spectrum holder is required to lodge a performance bond for the purposes of safeguarding compliance with its network and service roll out obligation.

Question 9:	*Do you have any views on the proposed network and service rollout obligations, as well as the associated performance bond to be imposed on successful bidders?*

73. At the outset, given the intense competitive environment in the Hong Kong mobile market, operators who have successfully acquired spectrum in the 3.5 GHz Band will be keen to roll out their 5G service as quickly as possible in order to secure new, and retain existing, customers. On this basis, neither minimum coverage obligations nor a performance bond would be necessary to ensure that the assigned frequencies are used by the spectrum holders.

74. Since the roll out of an extensive 5G network is highly dependent upon the availability of cell sites, particularly small cells which will need to be located in street level furniture such as lamp posts, payphone kiosks and bus shelters, all of which require approval from various Government Departments and take time to process, the Government

will play a large part in the success of an operator's 5G network infrastructure roll out. Accordingly, if the CA is to impose any kind of network and service roll out obligation on the spectrum holders, the Government must also, in return, make a commitment to facilitate the speedy approval of street level furniture for the installation of 5G small cells, otherwise the roll out requirement is pointless.

SPECTRUM UTILISATION FEE

75. On the basis that an auction will be used to assign the 3.5 GHz Band, the CA proposes that the SUF will be determined as part of the auction process, with a reserve price being set by the Secretary for Commerce and Economic Development to represent, per paragraph 41 of the Consultation Paper, the:

> *[…] minimum base value of the spectrum for the purpose of kick-starting the competitive bidding process.*

76. The CA proposes to allow the SUF to be paid either in:

(i) One lump sum upfront, as determined in the auction; or

(ii) 15 annual installments (one installment for each of the years the spectrum will be assigned), with the first installment equivalent to the lump sum in (i) above divided by 15, and the subsequent installments being increased each year by a fixed percentage to reflect the time value of money to the Government.

Question 10:	*Do you have any views on the proposals in relation to SUF above?*

77. At the outset, HKT would state it is crucial that the basis on which SUF has been levied in the past is reviewed and radically overhauled. In the era of 5G, the amount of spectrum that will be used to provide mobile services will be measured in hundreds of MHz, not in small amounts of ten or twenty MHz.

78. Accordingly, if the SCED were to adopt the traditional SUF charging methodology based on $ millions per MHz and at the same levels as levied in previous spectrum auctions in Hong Kong, this will result in extortionate spectrum charges, leaving operators unable to offer services in Hong Kong at affordable prices and leaving few funds for network investment, thereby stifling the development of 5G services in Hong Kong.[15]

[15] It is ridiculous for the Government to pretend that high spectrum prices have no impact on mobile retail prices. Higher spectrum charges will eventually feed through

79. Mobile services are critical to the Hong Kong economy, the development of a Smart City and to the role of Hong Kong as a leading telecommunications hub (if not THE leading hub) in the region and a gateway to Mainland China. It is therefore crucially important that the Government should actively facilitate the development of next generation 5G services in Hong Kong. This will not happen if the Government continues to adopt backward policies and out-of-date charging mechanisms.

80. Accordingly, the Government needs to change its mindset and consider charging the economic activity which results from use of the spectrum rather than the use of the bandwidth itself. Spectrum on its own has little value. It is the mobile services which are offered by making use of the spectrum that creates the value. As operators only earn revenue through the mobile services they sell to their customers, it is perfectly feasible for the Government to levy SUF based on a percentage[16] of the revenues collected by the operator through the services it sells using the spectrum. In this way, as 5G services take off, revenues increase and the SUF payments made to the Government also increase. This is a win-win situation for both industry and Government.

81. The development of 5G services is of great importance to Hong Kong yet, before the first commercial services are even available, Hong Kong is already behind and faces an uphill battle to catch up. If operators are required to pay excessive amounts for use of the spectrum, this will adversely impact the amount of dollars that can be allocated for network investment, which is crucial to the roll out of infrastructure for the Internet of Things to enable millions of devices

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into consumer prices. The higher the spectrum costs paid by operators the higher the costs that must be passed onto customers. It is simply irresponsible to pretend that operators will always absorb the costs when industry profitability is already in serious decline. Furthermore, many of the new applications and services can only be charged at ultra low rates. See for example: www.pcmarket.com.hk/2017/11/01/sigfox網絡正式運作-20年費搶生意

[16] The percentage can be set by the Government or determined via auction. In fact, HKT understands that the 3G Spectrum auction process, which was intended to be held in 2001, required participants to place bids on the percentages that would be used to levy SUF payments.

(not just mobile handsets) to be connected with each other. As the CEO of Deutsche Telekom neatly puts it:

> *We can only spend each euro once – either on spectrum or network build-out. My suggestion would be on buildout.*[17]

82. Contrary to the inexplicable suggestions previously made by OFCA, high spectrum prices paid by operators to acquire spectrum (in the form of SUF payments) do have a strong negative impact on consumers. In a report prepared by NERA for the GSMA on *Effective Spectrum Pricing: Supporting better quality and more affordable mobile services* published in February 2017, NERA presents empirical evidence that links high spectrum prices with:

(i) Lower quality networks and reduced take-up of mobile data services owing to reduced incentives for investment;

(ii) Higher consumer prices for mobile broadband data; and

(iii) Lost consumer welfare with a purchasing power of US$250 billion across a group of countries where spectrum was priced above the global median.

On this basis, NERA urges regulators to set modest reserve prices, ideally at a below conservative estimate of market value so that there is scope for competition and price discovery during the auction.

83. The CA has stated in the Consultation Paper its proposal to auction the 3.5 GHz Band and that the auction reserve price is only intended to "kick-start" the auction process. The reserve price therefore does not need to be set with any strong correlation to current market value of the spectrum. An auction which finishes in only a few of rounds, for instance, would clearly indicate that the reserve price has been set too high.

84. While HKT disagrees that the spectrum should be auctioned, and hence the SUF being set by way of auction, it has looked at the reserve prices that were set for recent spectrum auctions in Hong Kong, the

[17] Timotheus Hoettges at the company's annual shareholders meeting on 17 May 2018.

number of rounds it took for the auction to be completed, and the average SUF paid for the spectrum:

Year	Frequency Band (MHz)	Reserve Price per MHz	No. of Bidding Rounds	SUF Payable per MHz (Average Bidding Price)
2011	850/900	$3m	41	$97.6m
2012	2300	$5m	6	$5.2m
2013	2500/2600	$15m	18	$30.8m
2014	1900/2200	$48m	6	$49.2m

The reserve price for the most recent auction ($48m per MHz in 2014) was overly aggressive and resulted in only 6 rounds of bidding. The result was an SUF which was largely in line with the reserve price. This is a strong indication that the reserve price was too high.

HKT also notes that the reserve price has risen significantly over the past four spectrum auctions and has been artificially inflated more than three times over the last two auctions alone, increasing from $15m per MHz in 2013 to $48m per MHz in 2014. As HKT has pointed out on many occasions, Hong Kong operators are already paying rates per MHz which are multiples above what operators in other jurisdictions are paying. How can Hong Kong compete?

85. The importance of reasonable spectrum prices has already been recognized in Mainland China, where the Government recently announced very significant spectrum fee cuts (of 37%) and fee waivers for spectrum in the same 3.5 GHz Band for the mobile operators with the specific objective of lowering their 5G spectrum costs. This clearly demonstrates the Government's strong commitment to the development of 5G services in China[18] from which the Hong Kong Government should learn.

[18] See news article: http://www.changeself.cn/news/shownews.php?lang=en&id=88

CONCLUSION

86. This is an important consultation as it concerns the manner in which the first globally harmonized 5G spectrum band will be assigned in Hong Kong and how that spectrum will be charged. It is therefore important for the Government to establish the right framework in order not to jeopardize the future development of 5G services in Hong Kong and Hong Kong's aspiration to be a leading Smart City.

Submitted by
Hong Kong Telecommunications (HKT) Limited
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