

**PROVIDING RADIO SPECTRUM FOR
BROADBAND WIRELESS ACCESS SERVICES**

THIRD CONSULTATION PAPER

11 May 2007

INTRODUCTION

Broadband Wireless Access (BWA) is a technology aimed at providing high-speed access, using wireless means, to networks for users over a wide area. In addition to deployment in customer access networks (such as broadband wireless local loops for fixed customers or direct access networks for fixed or mobile customers), the technology may also be used as wireless backhaul for fixed or mobile networks. Customer access networks based on this technology can be rolled out relatively quickly as no road opening is involved. Such networks also have the potential of reaching locations which would not be economically viable to be reached by copper and optical fibre networks. Over the past two years, the BWA technology has attracted substantial interest in different economies and a number of technical trials and commercial deployments of BWA have been reported. In Hong Kong, some telecommunications operators have also expressed interest in BWA and conducted technical trials to assess BWA performance under the local environments.

2. The Telecommunications Authority (TA) has conducted two rounds of consultation on the deployment of BWA in Hong Kong. The first consultation paper (the First Consultation Paper) which was issued on 20 December 2004 sought views of the industry and interested parties on the proposed use of the 3.4 – 3.6 GHz band (the 3.5 GHz band) for BWA and the relevant issues for the

introduction of BWA services. The TA later issued the second consultation paper (the Second Consultation Paper) on 31 August 2005 and invited further views on the proposed use of the 3.5 GHz band and regulatory framework for BWA.

3. The TA received 22 submissions in response to the Second Consultation Paper. The submissions have been published on the web site of the Office of the Telecommunications Authority (OFTA) at <http://www.ofta.gov.hk>. The respondents are:

- PCCW Limited (PCCW)
- PanAmSat (PanAmSat)
- Motorola Electronics Pte Ltd (Motorola)
- AT&T Global Network Services Hong Kong Ltd (AT&T)
- Asia Satellite Telecommunications Company Ltd (AsiaSat)
- Pacific Internet (Hong Kong) Limited (Pacific Internet)
- Alcatel Asia Pacific (Alcatel)
- WiMAX Forum (WiMAX Forum)
- APT Satellite Company Limited (APT)
- New World Telecommunications Limited (NWT)
- CM Tel (HK) Limited (CM Tel)
- China Resources Peoples Telephone Company Ltd (CR Peoples)
- STAR Group Limited (STAR)
- Netfront Information Technology Limited (Netfront)
- Reach Ltd (Reach)
- Hong Kong Broadband Network Limited (HKBN)
- Hong Kong Internet Service Provider Association (HKISPA)
- Galaxy Satellite Broadcasting Limited (Galaxy)
- Qualcomm International (Qualcomm)
- GSM Association (GSM Association)

- Cable & Satellite Broadcasting Association of Asia (Cable & Satellite)
- Joint Submission from 13 Operators (Joint Submission)

4. In response to the Second Consultation Paper, operators of fixed satellite services (FSS) systems have raised concerns that BWA deployment in the 3.5 GHz band would cause harmful interference to downlinking earth stations operating in the same and adjacent bands. In response to the operators' concerns, the Radio Spectrum Advisory Committee (RSAC)¹ established a working group in February 2006 to assess the impact of the said band sharing. The working group conducted a series of technical assessments and produced an assessment report². The working group concluded that the deployment of BWA service in the 3.5 GHz band would cause interference to the FSS and the measures required for protecting FSS would make it difficult for wide and cost effective deployment of BWA systems in the 3.5 GHz band in Hong Kong. As a result, the TA considers that the proposed allocation in the 3.5 GHz band for BWA should be held in abeyance.

NEED TO PROCEED WITH FURTHER CONSULTATION

5. There is a growing demand for pervasive high-bandwidth wireless coverage in municipal areas for the provision of telecommunications services including voice, video, multi-media, data and Internet access services to mobile and portable (or “nomadic”) user devices. For user devices at fixed locations, BWA is one of the alternatives to the wireline technologies for access to buildings and individual customers. It is also one of the options to be used by

¹ RSAC is an advisory committee established by the TA to advise him on the planning of the use of the radio frequency spectrum as well as the strategies, policies and procedures in the management of the radio frequency spectrum.

² The assessment report is included in the RSAC Paper No. 5/2006. The paper can be downloaded from OFTA's website at “<http://www.ofta.gov.hk/en/ad-comm/rsac/paper/rsac5-2006.pdf>”.

the local fixed network operators to build their customer access networks and mobile operators to build their backhaul links. In accordance with the TA Statement issued on 6 July 2004 on the review of Type II Interconnection Policy, mandatory Type II interconnection at telephone exchanges would be withdrawn by 30 June 2008, except for buildings meeting the “essential facilities” criteria. Some fixed network operators have expressed interest to deploy BWA technology in their customer access networks.

6. The Government’s vision is to make broadband Internet access available to all citizens in Hong Kong, regardless of whether they are at home or on the move. In this connection, 3G, Wi-Fi and BWA will play complementary roles in providing ubiquitous wireless coverage for Internet access outdoors. The 3G networks have played significant roles in providing ubiquitous and high-speed connections to light-weight, highly mobile devices, but such devices, which need to support voice communications, might not be entirely suitable for Internet access. The communications needs for the portable (nomadic) devices, which predominantly would be employed for Internet access, can be fulfilled by municipal Wi-Fi networks during the next few years. However, Wi-Fi networks work in shared bands and have their limitations due to spectrum capacity, service range and radio interference. When BWA equipment becomes more commonly available, it is expected that some of the demand for portable (or nomadic) devices will be taken over by BWA services. Moreover, BWA can provide cost-effective backhaul links for a territory-wide Wi-Fi network, especially in less populated areas where laying of wireline facilities would be prohibitively expensive. Therefore, BWA complements Wi-Fi and 3G, and the introduction of BWA services should be conducive to the establishment of Hong Kong as a ubiquitous wireless city.

7. Many economies including Australia, France, Germany, Japan, New Zealand, Singapore, South Korea, Taiwan, the UK and the US have already

deployed or planned to deploy BWA shortly. It is not for the TA to decide whether BWA services should be rolled out in Hong Kong. The TA's role is to make spectrum available to the market. The industry and investors will consider the market need and determine whether and when to invest on the provision of the BWA services. In order to maintain Hong Kong's position as a leading telecommunications hub of the region, it is necessary to ensure that investors' plans to invest in BWA services whenever they identify a business opportunity are not artificially held back as a result of non-availability of spectrum. For these reasons, the TA considers it necessary to further consult the industry on making spectrum available to the market for the provision of BWA services in Hong Kong. Further, given the problem of deploying the 3.5 GHz band for BWA services, the TA would like to seek the views of the industry about the allocation of the 2.3 – 2.4 GHz band (the 2.3 GHz band) and the 2.50 – 2.69 GHz band (the 2.5 GHz band) instead of the 3.5 GHz band for BWA deployment.

8. This Consultation Paper is consequential to the preceding two consultation exercises conducted on 20 December 2004 and 31 August 2005 and invites views from the industry and interested parties on the proposed allocation in the 2.3 GHz band and the 2.5 GHz band for BWA deployment and the related issues.

9. This Consultation Paper is also aimed to assess the likely market demand for spectrum in the 2.3 GHz band and the 2.5 GHz band (including the preferred frequency bands, the width of spectrum required, etc.) so as to assist the TA in deciding the appropriate amount of spectrum in these bands to be made available to the market, the band plans, the spectrum packaging for auction and the timing for inviting bids.

THE SPECTRUM POLICY FRAMEWORK

10. Taking into account the views collected in response to the 3-month public consultation on spectrum policy framework review, the Commerce, Industry and Technology Bureau (CITB) issued the Radio Spectrum Policy Framework³ on 24 April 2007. The Radio Spectrum Policy Framework sets out the policy objectives, principles and key issues for the management of radio spectrum in Hong Kong. The Radio Spectrum Policy Framework provides additional policy considerations to the TA in discharging his spectrum management responsibilities.

11. Under the Radio Spectrum Policy Framework, the policy inclination is that the market-based approach⁴ in spectrum management will be used for spectrum allocation wherever the TA 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. Spectrum utilisation fee will be applicable to all non-Government use of radio spectrum. A spectrum release plan will be published annually to inform the industry about the potential supply of spectrum from the TA through an open, competitive bidding or tendering process in the following three years.

12. The TA will, in addition to all relevant considerations as required by law, give due regard to the Radio Spectrum Policy Framework in exercising his statutory powers under the Telecommunications Ordinance (“the Ordinance”), including the proposed allocation and assignment of spectrum for BWA services in this exercise.

³ The Radio Spectrum Policy Framework can be downloaded from CITB’s website at “<http://www.citb.gov.hk/ctb/eng/legco/pdf/spectrum.pdf>”.

⁴ Market-based approach for spectrum management means methods relying on market forces to ensure the efficient use of spectrum as a public resource.

SPECTRUM AVAILABILITY

Frequency Bands

13. The Institute of Electrical and Electronics Engineers (IEEE) 802.16 Working Group on Broadband Wireless Access Standards develops standards and recommended practices to support the development and deployment of BWA applications. The IEEE 802.16e-2005 standard approved by the IEEE in December 2005 is capable of providing both fixed and mobile services. Meanwhile, mobile WiMAX equipment based on IEEE 802.16e-2005 standard can work on the 2.3 GHz, 2.5 GHz and 3.5 GHz bands.

14. According to the current market information and technology developments, BWA deployments in the 2.3 GHz and 2.5 GHz bands are gaining momentum. At its meeting of 17 February 2006, the RSAC also identified that 2.3 – 2.4 GHz and 2.50 – 2.69 GHz would be the candidate bands for the deployment of BWA applications in Hong Kong⁵.

2.3 GHz Band (2.3 – 2.4 GHz)

15. The 2.3 GHz band has been deployed or will be deployed for BWA applications by some economies including Australia, New Zealand, Singapore and South Korea. In Mainland China, the 2.3 GHz band is allocated for fixed, mobile and radiolocation services. It is also the future expansion band for the TD-SCDMA mobile services. As such, **the TA considers that the 2.3 GHz band can be allocated for the BWA applications in Hong Kong.**

⁵ More discussion on the 2.3 GHz and 2.5 GHz for BWA applications can be found from the RSAC Paper No. 3/2006 entitled “Frequency Bands for Broadband Wireless Access”. The paper can be downloaded from OFTA’s website at “<http://www.ofa.gov.hk/en/ad-comm/rsac/paper/rsac3-2006.pdf>”.

16. The usage of the 2.3 GHz band in Hong Kong for BWA applications is subject to further coordination with the Mainland authorities. There are established procedure and arrangement between Hong Kong SAR and the Guangdong Province for coordinating terrestrial radiocommunications services of the respective areas in order to avoid radio interference. OFTA has been coordinating with the counterpart authorities of the Guangdong Province about the proposed allocation of 2.3 – 2.4 GHz band for provision of BWA services in Hong Kong. After coordination, there may be a set of technical criteria or constraints for using the 2.3 GHz band in Hong Kong. The BWA licensees may be required to comply with a set of technical requirements to be specified by the TA in order to avoid excessive signal overspill to the border areas in Guangdong Province.

2.5 GHz Band (2.50 – 2.69 GHz)

17. Apart from the 2.3 GHz band, the TA has also considered the 2.5 GHz band. In accordance with the frequency allocation of International Telecommunication Union (ITU), the 2.5 GHz band (a total of 190 MHz) has been identified for the expansion of 3G mobile services. However, there are changes in the worldwide development trends recently. For instance, Taiwan, Singapore and the US have designated the 2.5 GHz band for provision of BWA services. The telecommunications authorities in UK, Sweden, Japan, Malaysia and Thailand also have shown their interest to allocate the 2.5 GHz band for BWA services. In South Korea, part of the 2.5 GHz band has been assigned for satellite mobile TV service. In Mainland China, part of the 2.5 GHz band has been allocated for Multipoint Microwave Distribution Systems (MMDS) and some other part of the band is also planned for satellite mobile TV service.

18. There are competing demands for 3G, BWA and mobile TV services to operate in the 2.5 GHz band in Hong Kong. The World Radiocommunication Conference 2007⁶ (WRC-07) to be held in October 2007 will discuss the allocation of 2.5 GHz band. In the public consultation paper entitled “Consultation on Digital Broadcasting: Mobile Television and Related Issues” issued by the Commerce, Industry and Technology Bureau (CITB) on 26 January 2007, it is proposed that the deployment of the frequency channels in 2.50 – 2.69 GHz for mobile TV will be subject to the outcome of the WRC-07. The same consideration will also be applicable about the use of the 2.5 GHz band for BWA. In the light of the above, **it is pre-mature to consider the allocation of the 2.5 GHz band for BWA service. The TA will keep in view the development in WRC-07 and determine the way forward for the allocation of 2.5 GHz band.**

19. Notwithstanding the fact that the allocation of 2.5 GHz band for BWA services may not be decided before WRC-07, in view of the potential availability of equipment operating in this band and the deployment of BWA services in this band in other territories, **the TA intends to use this consultation to assess the interest and demand for the use of 2.5 GHz band for BWA services in Hong Kong so that the appropriate amount of spectrum would be included in the bidding exercise planned for 2008.**

Question (1): Do you agree that the 2.3 GHz band be allocated for BWA services? If agreed, when the spectrum should be made available?

Question (2): Do you agree that the opening up of the 2.5 GHz band for BWA

⁶ The World Radiocommunication Conference 2007 will be held in Geneva from 15 October to 9 November 2007. World Radiocommunication Conferences (WRC) are international treaty-making conferences held under the auspices of the Radiocommunication Sector of ITU. WRC revise and update the Radiocommunication Regulations, which govern the use of spectrum by a growing number of services worldwide.

should be considered at a later stage? If agreed, when and how much of the bandwidth should be made available to the market?

Question (3): Do you have any preferred frequency bands for BWA services? How much spectrum do you need initially and for future expansion (number of blocks, spectrum width of each block, in which bands) and when the spectrum should be made available to the market?

Potential Supply of Spectrum

2.3 GHz Band (2.3 – 2.4 GHz)

20. The TA notes that Singapore and South Korea have adopted a block size of 5 MHz and 8.75 MHz respectively in the 2.3 GHz band for BWA allocation. New Zealand also proposes a block size of 5 MHz in the 2.3 GHz band. In fact, the Mobile WiMAX equipment based on IEEE 802.16e-2005 operating in the 2.3 GHz band can support a channel bandwidth of 5 MHz, 8.75 MHz and 10 MHz. In order to ensure wide availability of BWA equipment, it is logical to adopt a base unit compatible with the channel bandwidth of the typical BWA equipment. **The TA therefore considers that potentially the 2.3 GHz band could be divided into 20 blocks of 5 MHz width⁷, with 17 frequency blocks (Block 2 to Block 18) available for BWA deployment (please refer to Annex 1 for details and see also paragraphs 59 and 60).** BWA licensees may be allocated with more than one frequency block for the deployment of BWA services as discussed in paragraph 21.

⁷ There will be 20 frequency blocks of 5 MHz each starting from 2.3 GHz. The 1st, 19th and 20th blocks are for guard band purpose while the remaining 17 blocks are available for BWA services. With the additional technical condition governing the use of the 1st block as discussed in paragraph 60 in place, the maximum available bandwidth for BWA could be increased to 90 MHz.

Question (4): Do you agree with the proposed frequency allocation plan given in Annex 1? If not, what is your proposal?

21. There should be some flexibility on the allocation of frequency blocks to operators to meet their commercial needs and specific applications. For example, an operator offering fixed broadband wireless access service may need only 10 MHz bandwidth while other operators providing triple play and mobile services will require more frequency channels and larger bandwidth. Some 30 MHz bandwidth will be needed for an operator to provide a territory-wide and commercially viable mobile BWA services. As discussed in paragraphs 37 - 40, the TA intends to assign BWA spectrum by auction. In the light of the above considerations, **the TA considers that each operator should be allowed to bid for no more than six 5 MHz frequency blocks (i.e. a maximum of 30 MHz bandwidth for each operator)**. With such a spectrum cap and subject to coordination with the Mainland authorities on the use of 2.3 GHz band, there should be sufficient spectrum to license at least three BWA operators in the 2.3 GHz band.

22. The above represents the maximum amount of spectrum (a total of 85 MHz bandwidth) that may be made available in the 2.3 GHz band. **The TA may consider offering initially only part of the spectrum in the 2.3 GHz band for bidding** if the anticipated demand is insufficient to utilize the entire 2.3 GHz band efficiently or if coordination with the Mainland authorities results in part of the 2.3 GHz band in Hong Kong not initially usable due to potential radio interference.

Question (5): Do you agree that a BWA licensee should be assigned no more than six 5 MHz blocks of the BWA spectrum?

Question (6): If the result of the coordination with the Mainland authorities confirms that 85 MHz bandwidth in the 2.3 GHz band can be made available, do you agree that the TA should make available all the 85 MHz bandwidth for BWA service? If not, what is your proposal with reasons?

2.5 GHz Band (2.50 – 2.69 GHz)

23. The outcome of the WRC-07 is still unknown at this stage. It is therefore pre-mature to discuss possible band plans and potential supply of spectrum at this stage. However, if there are any views from interested parties on the potential frequency allocation plan for the 2.5 GHz band, the TA would welcome them in the responses to this Consultation Paper.

Question (7): Do you have any views on the frequency allocation plan for the 2.5 GHz band?

LICENSING ISSUES

24. The Second Consultation Paper raised a number of issues concerning the licensing of BWA services. Some of these issues have subsequently been dealt with in the consultation on “Deregulation for Fixed-Mobile Convergence”. The conclusions have been given in the TA Statement on “Deregulation for Fixed-Mobile Convergence” issued on 27 April 2007 (the FMC Statement). For the other issues which have not been settled in the FMC Statement, and certain new issues identified in this Consultation Paper, the TA invites further comments on the preliminary views and proposals set out in the following part of this Consultation Paper.

Unified Carrier Licence (UCL)

25. In the Second Consultation Paper, the TA proposed that BWA operators would be licensed under the UCL which would permit the licensee to provide both fixed services and mobile services. CR Peoples supported the TA's proposal while NWT considered that the finalisation of the UCL should not delay the issuance of the BWA licences and the existing licence regime could also be used for BWA.

26. In the FMC Statement, the TA has stated that he will recommend to the Secretary for Commerce, Industry and Technology (SCIT) to make the necessary regulation under the Ordinance for the creation of the UCL. Subject to the decisions of the SCIT on the proposed UCL (including the General Conditions, validity period and fee structure), the TA may consider further consultation on the Special Conditions under a UCL at a later stage. It is expected the UCL will be available in mid-2008 and can be used for licensing BWA services. **The TA intends to license BWA services under the UCL.**

Term of Licence

27. The TA proposed in the Second Consultation Paper that the BWA licensees would be granted a spectrum usage right lasting for a period of 15 years. All respondents including WiMAX Forum, NWT, CR Peoples, HKBN and HKISPA supported the proposal.

28. **The TA intends to recommend to the Secretary for Commerce, Industry and Technology that the UCL to be created by regulation under the Ordinance should have a validity period of 15 years.**

Scope of Permitted BWA Services

29. In the First Consultation Paper, the scope of permitted services under the BWA licence was confined to fixed services as the initial BWA services were used as a wireless extension of the conventional wireline based fixed network services. In the light of BWA technological development, the TA further proposed in the Second Consultation Paper that the scope of permitted services should be restricted to fixed telecommunications services initially and be expanded to include full mobility services after 1 January 2008. Fixed telecommunications service would include the conventional fixed services and telecommunications services of “limited mobility” (i.e. “nomadic” or “portable” services with no inter-cell handoff) nature.

30. AT&T agreed with the TA’s proposal. NWT did not object to the TA’s proposal while Motorola, WiMAX Forum, Netfront and HKISPA recommended that BWA operators should be allowed to offer full mobility services. HKBN considered that the BWA spectrum should be reserved for fixed carriers who could make use of the spectrum to offer both fixed and mobile types of services.

31. Since the licensing process will take time to proceed, it is unlikely that BWA licence can be issued before 1 January 2008. Taken into account that the technology will further advance by 2008 and noting that operators may have different preference on the scope of BWA services, the TA is of the preliminary view that use of the BWA spectrum to provide fixed services, mobile services or fixed-mobile convergence services should be allowed. Hence, **the TA will not restrict the types of applications and services that may be provided using the BWA spectrum.**

Question (8): Do you have any comment on the TA's preliminary view that no restrictions should be imposed on the types of applications and services that may be provided using the BWA spectrum?

Standard Issues

32. It was proposed in the Second Consultation Paper that consistent with the technology neutrality principle, any technology which conformed to recognised open standards should be allowed for the delivery of BWA services. The proposal was generally supported by all respondents to the Second Consultation Paper. As such, **the TA maintains the preliminary view that he should not prescribe any particular standard or technology for the BWA deployment, provided that the proposed BWA technology conforms to recognised open standards and is compatible with the use of the radio spectrum allocated for such applications in Hong Kong.**

Question (9): Do you have any further comments on the preliminary view of the TA that he should not prescribe any particular standard or technology for the BWA deployment?

Territory-wide Assignment

33. A respondent to the First Consultation Paper proposed that the BWA spectrum could be assigned on a regional basis as some operators might use the BWA spectrum in certain regions for covering the last mile access. The TA has given his view in the Second Consultation Paper that the assignment of the frequency blocks should be on a territory-wide basis. WiMAX Forum, NWT and CR Peoples responded and agreed with the TA's view. HKISPA further opined that the BWA spectrum should be assigned on a territory-wide basis as the assignment on a regional basis would create a number of problems. The

TA recognises that there will be many technical problems and restrictions with the regional assignment in such a small geographical area of Hong Kong and the inherently wide coverage of a BWA cell. As such, **the TA maintains his preliminary view that the assignment of the frequency blocks for BWA services will be made on a territory-wide basis.**

Question (10): Do you have any further comments on the TA's preliminary view that assignment of the frequency blocks for BWA services should be made on a territory-wide basis?

Roll-out Obligation

34. To ensure the efficient use of spectrum and minimize the hoarding of the spectrum, the TA proposed in the Second Consultation Paper that the BWA licensees should have the obligation to roll out the services within 24 months after the licences were awarded. CR Peoples responded and agreed with the TA's proposal. WiMAX Forum considered that BWA operators should roll out the service as soon as possible after the licences were awarded and suggested that the roll-out period should be shortened to 12 months. NWT proposed a roll-out period of 18 months as it would help to prevent spectrum hoarding by operators who had no genuine intention to roll out, but merely for denying others to use the spectrum. HKBN was of the view that no specific roll-out obligation should be implemented since the licensees would roll out their services if the environmental conditions permitted.

35. Since the BWA spectrum is a limited public resource and there are expectations from the industry and the public that services should be rolled out timely within a reasonable period after the assignment of the spectrum, the TA does not agree with HKBN that no roll-out obligation should be imposed. In order to ensure that BWA operators will roll out the BWA services within a

reasonable time period, performance bond will be required. As BWA operators may need sufficient time to complete the ordering, installation, testing, acquisition of sites and commissioning of the BWA equipment, it is considered that the roll-out requirement should not be too stringent. Furthermore, the roll-out requirement needs not oblige the licensee to roll out a particular type of services, e.g. an operator intending to use the BWA spectrum for “last-mile” connections to fixed customers needs not be obliged to roll out mobile services under the roll-out requirement. In this connection, **the TA maintains his preliminary view that BWA licensees will be required, under the licence, to roll out the services within 24 months from the date when the licence is issued. Performance bond will also be required.**

Question (11): Do you have any further comments on the TA’s preliminary view that BWA licensees will be required, under the licence, to roll out the services within 24 months from the date when the licence is issued and that performance bond will also be required?

Spectrum Utilization Fee for BWA Services

36. According to the Radio Spectrum Policy Framework, Spectrum Utilisation Fee (SUF) will in principle be applicable to all non-Government use of spectrum. At present, the mobile carriers, including the 2G and 3G licensees, are required to pay SUF as they make use of the frequency spectrum, being a scarce public resource, for commercial purpose. In response to the TA’s proposal in the Second Consultation Paper that new BWA licensees should be subject to the payment of SUF for the commercial use of the BWA spectrum assigned, CR Peoples and HKBN responded and agreed with the TA’s proposal. Although the TA has changed the proposed spectrum to be allocated for BWA deployment from the 3.5 GHz band to the 2.3 GHz band or the 2.5 GHz band in this Consultation Paper, this does not affect the reason or rationale behind

the proposed imposition of SUF for use of spectrum for BWA services since the scarce public resource will be deployed for commercial purpose. The TA sees no good reason for him to deviate from the Radio Spectrum Policy Framework announced on 24 April 2007 that **SUF should be imposed on spectrum for commercial use.**

Spectrum Assignment Method

37. One of the guiding principles in spectrum management as specified under the Radio Spectrum Policy Framework is that a market-based approach should be used wherever the TA considers that there are likely to be competing demands from providers of non-Government services, unless there are overriding policy reasons to do otherwise.

38. In the Second Consultation Paper, the TA proposed to assign the BWA spectrum by a hybrid selection method including elements of pre-qualification and spectrum auction. CR Peoples supported the hybrid selection method. NWT did not object to the TA's proposal. HKISPA considered that the spectrum assignment should be made by "beauty contest". HKBN was of the view that auction might not be the most appropriate mechanism for promoting competition in the broadband market in Hong Kong as there were uncertainties in the technical and commercial viability of the BWA technologies. HKBN considered that the BWA licences should be granted to those industry players who could introduce the greatest economic benefit to the community and promote wide range of innovative services to the public on a "selection by merits" basis.

39. As the spectrum for BWA services is likely to attract competitive demands from different service providers, the proposed auctioning approach for the spectrum assignment is in line with the guiding principle for spectrum

management given in the Radio Spectrum Policy Framework. Having considered the HKBN's and HKISP's submissions, the TA is not convinced by the assertion that, compared with market-based method in assigning the spectrum through auctioning, "beauty contest" or "selection by merit" is more appropriate for resolving the competing demands of the frequency spectrum in this exercise.

40. In the light of the above considerations, **the TA maintains his preliminary view given in the Second Consultation Paper that the BWA spectrum should be assigned by a hybrid selection method including a simple pre-qualification and an auction.**

Question (12): Do you agree with the proposed frequency assignment method as stated above?

SUF Payment Method

41. In the First Consultation Paper, the options of the SUF payment including up-front cash payment, deferred cash payment and royalty had been explored. In summary, the up-front cash payment method has the advantage of being simple and easy to administer. However, it places a heavier financial burden on the successful bidder assigned with the spectrum and licensed to provide the service. The deferred cash payment has an advantage over the up-front cash payment in such a way that payment is spread over the licence period. The downside of the deferred cash payment is that the Government does carry a credit risk in the event the licence is surrendered prematurely by the licensee. Royalty does not load the licensee upfront with lump sum payment as they need not be paid until services revenues are actually received by the licensee. Nevertheless, both the Government and the licensee have to bear high administrative costs in implementing complicated accounting

separation to ensure that all relevant revenues are included in the calculation of royalty.

42. In the Second Consultation Paper, the TA proposed that an up-front lump sum payment basis should be adopted for the SUF for usage of spectrum for BWA. CR Peoples shared the same view as the TA's whereas HKBN did not agree with the TA's proposal. HKBN was of the view that the deferred payment of SUF over the period of the spectrum assignment, rather than having an up-front lump sum amount, would enable innovative operators with limited financial resources to enter into the market.

43. If the deferred payment method is adopted, the licensee would still be required to submit a bond issued by an independent financial institution so as to guarantee the SUF payment. In addition, the licensee may be required to pay interest for the deferred payment. The deferred payment method would alleviate some financial burden as compared with the up-front lump sum payment method to the licensees but the administrative cost would still be higher than the lump sum method. Since the up-front payment method is more straight forward, easier and less expensive to administer, **the TA maintains his preliminary view given in the Second Consultation Paper that an up-front lump sum payment basis should be adopted for SUF, the amount of which will be determined through an open auction.**

Question (13): Do you have any further comments on the TA's preliminary view that that an up-front lump sum payment basis should be adopted for SUF, the amount of which will be determined through an open auction?

Interconnection Terms and Conditions

44. In the FMC Statement, the TA has stated that the existing regulatory guidance for Fixed Mobile Interconnection Charge (FMIC) will be withdrawn after a 2-year transition period which will end on 26 April 2009. During the transition period, the existing guidance for FMIC based on the “Mobile Party’s Network Pays” (MPNP) arrangement will still be applicable to the interconnection charge between fixed and mobile operators. The same regulatory arrangement will also be applicable to BWA operators during the transition period. If the TA should be called upon to determine terms and conditions of interconnection between BWA services and other networks and services during the transition period, the TA will determine on a case by case basis whether a particular service operated by a new BWA licensee is primarily a fixed or mobile service.

Open Network Access

45. The 2G and 3G licenses are now required under their respective licences to open at least 30% of their network capacity for access by non-affiliated Mobile Virtual Network Operators or content providers. The terms and conditions for this requirement are referred to as Open Network Access (ONA).

46. With a large number of wireless platforms using spectrum made available and with a high degree of competition in the market nowadays, the TA considers that market forces and economic principles should efficiently serve as the invisible hand in regulating the market. The rationale for using *ex ante* regulation (i.e. regulation before the event) to mandate ONA becomes questionable. If the market fails or if there is a request for regulatory intervention for mobile virtual network operator to interconnect with the BWA

licensees, the TA may consider making a determination on the terms and conditions of an interconnection under section 36A (in which case, the TA will give regard to the factors set out in section 36A(10) including, without limitation, the Government's policy, consumer interests and nature and extent of competition between the parties to the interconnection) and/or making a direction to secure an interconnection under section 36B of the Ordinance. Based on the above consideration, **the TA is of the view that ONA requirement as an ex ante obligation should not be imposed on BWA licensees.**

Question (14): Do you agree that BWA licensees should not be subject to an ex ante ONA requirement?

Assignment of Telecommunications Numbers

47. As service operated by BWA licensees may serve customers who may be fixed in locations at some times and mobile at other times, the TA will invite the Telecommunications Numbering Advisory Committee (NAC)⁸ to review the long-term development of the existing numbering plan and see whether there is a need to allocate new number ranges for FMC services. Any changes on the use of numbers to cater for FMC services will be reflected in the Numbering Plan for Telecommunications Services in Hong Kong ("the Numbering Plan").

Question (15): Do you consider that FMC services should be allocated with new number ranges?

⁸ NAC is an advisory committee to advise the TA on the development, implementation and administration of Hong Kong's telecommunications numbering plan and issues related to it as well as the allocation of numbers in a fair and equitable manner to telecommunications operators and users in Hong Kong.

48. In case there is no new number ranges for FMC services, the TA will allocate fixed numbers (i.e. currently start with prefixes “2” and “3”) and mobile numbers (i.e. currently start with prefixes “6” and “9”) to fixed / “limited mobility” and “full mobility” BWA services respectively. In the Second Consultation Paper, the TA proposed the similar arrangement for fixed / “limited mobility” BWA services and all the respondents agreed with the TA’s proposal.

Question (16): Do you agree that numbers with prefixes “2” and “3” should be allocated to fixed/“limited mobility” BWA services while numbers with prefixes “6” and “9” should be allocated to “full mobility” BWA services?

Number Portability

49. Fixed carrier licensees are required under their respective licences to facilitate operator number portability (ONP)⁹. Similarly, mobile carrier licensees are required under their respective licences to facilitate mobile number portability (MNP). In addition, direction may be issued under section 32F(4) to licensees to comply with number portability requirement as may be set out in any code of practice issued under section 32F(3)(b). At present, fixed carrier licensees are directed to facilitate both ONP and MNP while mobile carrier licensees are directed to facilitate MNP.

50. Since the number portability is crucial for customers to switch their services from one operator to another operator, the TA considers that the number portability requirement should also be imposed on the new BWA licensees who offer services using the telecommunications numbers under the Numbering Plan. In the FMC Statement, the TA has stated that he will

⁹ ONP is equivalent to Fixed Number Portability.

conduct market research to understand the extent of consumer demand for fixed mobile number portability (FMNP) and thus facilitate an assessment of the costs and benefits of FMNP before deciding whether to implement FMNP. **The TA proposes that relevant conditions on number portability be included in the BWA licence and that BWA licensees shall be directed to implement ONP, MNP and FMNP as appropriate.** The TA will keep track of the progress of the FMNP development and will issue a direction on this matter at the time when the BWA licences are awarded or at other more opportune time.

Question (17): Do you agree that BWA licensees should be subject to the requirement of facilitating both ONP and MNP, including the FMNP to be introduced in the future?

Authorisation under Section 14

51. Under section 14(1) of the Ordinance, the TA may authorise a licensee to place and maintain a telecommunications line in, over or upon any land. Under the existing policy, where an installation is a telecommunications line or ancillary equipment of a telecommunications line placed solely for serving the occupiers of the building to which access is sought, the TA may consider granting an authorisation under section 14(1). In the Second Consultation Paper, the TA considered that if the installation concerned was not solely for serving the occupiers of the building concerned, the operators should negotiate commercially with the person having a lawful interest in the land for access to the land and the provision of section 14(1) would not be applicable. All respondents including NWT, CR Peoples and HKBN shared the TA's view. This issue has been dealt with in the FMC Statement. The building access right to be granted to BWA operators under UCL will follow the same principles as applied to the existing fixed network operators and mobile

network operators depending on the nature of the particular installation¹⁰.

Denial of Service to Suspected Stolen Apparatus

52. In response to the concern of the Police on mobile phone theft, there is already a licence condition in the 2G licences requiring the mobile carrier licensees shall, where directed by the TA, refuse to provide service to any person who possesses or uses a mobile handset which is stolen or suspected stolen.

53. To combat the use of stolen apparatus, the TA considers it appropriate to extend the same requirement to the new BWA licensees. A licence condition about denial of service, similar to that incorporated in the mobile carrier licences, be included so that the new BWA licensee will be required to implement the requirement when directed by the TA.

Question (18): Do you agree that BWA licensees should be subject to the requirement of denial of service to suspected stolen apparatus?

TECHNICAL ISSUES

Block Edge Emission Mask in 2.3 GHz Band

54. The use of frequencies in a frequency block may be restricted through the specification of emission masks governing the maximum transmitter power density over a frequency range within and outside the block and the operators

¹⁰ The principles of the building access right applied to operators are given in the paragraph 188 of the FMC Statement. The FMC Statement can be downloaded from OFTA's website at "<http://www.ofa.gov.hk/en/tas/others/ta20070427.pdf>".

will manage the use of frequencies themselves within the limits of the emission masks. To resolve mutual interference between two radio systems operated by different operators in frequency blocks adjacent to each other, a block edge emission mask (the Emission Mask) may be specified to establish clear boundaries between the two operators by restricting the power density level for “out-of-block emissions”.

55. In the Second Consultation Paper, taking into consideration of technology neutrality policy, the TA considered that a channelling plan without specification of Frequency Division Duplex (FDD) or Time Division Duplex (TDD) mode in the 3.5 GHz band would better meet market needs so that the frequency blocks could be freely used by the operators at their own commercial and technical considerations. All the respondents shared the same view with the TA. The TA is of the preliminary view that the frequency blocks in the 2.3 GHz band (and the 2.5 GHz band if ultimately this band is also allocated for BWA services) should be usable for both FDD and TDD mode at the discretion of licensees assigned with the blocks.

56. The Office of Communications (Ofcom) of the UK has recently undertaken intensive studies on adjacent channel interference issues and proposed a number of Emission Masks in the 2.5 GHz band to cater for different combinations of TDD and FDD systems in the same band¹¹. In addition to restrictions on out-of-block emissions, in-band power density restriction is also imposed for TDD applications, the in-band power density of base stations in the lowest 5 MHz range of the allocated frequency block will be restricted to a relatively low level (essentially limiting the lowest 5 MHz to pico-cell operation). Such restriction aims to resolve the problem of receiver

¹¹ A set of masks in 2.5 GHz band is contained in the document entitled “Award of available spectrum: 2500-2690 MHz, 2010-2025 MHz and 2290-2300 MHz” issued by Ofcom on 11 December 2006. The paper can be downloaded from Ofcom’s website at “<http://www.ofcom.org.uk/consult/condocs/2ghzawards/>”.

blockage due to high-level transmission from a radio transmitter of another operator in the close proximity. Ofcom is conducting consultation on, among other things, the proposed Emission Masks which are derived from relevant 3GPP specifications. Given the close resemblance in terms of frequency range and frequency block, one option is to derive the Emission Masks for Hong Kong by drawing reference to the 3GPP's or the UK's emission masks models.

57. In the Second Consultation Paper, the TA proposed mandating the Emission Mask (limiting out-of-block emissions) instead of guard band to resolve adjacent channel interference caused by the BWA deployment by various operators. Both AT&T and CR Peoples supported the use of Emission Mask. WiMAX Forum indicated that the Emission Mask might affect the performance of the outermost channels so operators in adjacent frequency blocks should better be encouraged to coordinate first, while Emission Mask should be applied only when the operators refused to coordinate with each other. Motorola shared the view of WiMAX Forum's that the TA should consider frequency coordinating procedures as an initial measure in mitigating interference before resorting to the use of Emission Mask.

58. Having considered the views from the respondents, **the TA subscribes to the view that a more light-handed approach should be adopted and BWA operators should coordinate among themselves to resolve the adjacent channel interference issues and that the compliance with Emission Masks will be enforced only if the interference issue cannot be resolved through the coordination among the operators concerned. The Emission Masks will be developed by the TA in consultation with the BWA licensees.**

Question (19): Do you agree with the proposed approach as stated in paragraph 58 to resolve adjacent channel interference issues?

Guard Bands and Available Bandwidth for BWA Service in 2.3 GHz Band

59. The 2.20 – 2.29 GHz band immediately below 2.29 GHz is currently allocated for Electronic News Gathering / Outside Broadcast (ENG/OB) links and the 2.400 – 2.4835 GHz band (the 2.4 GHz band) immediately above 2.4 GHz is a licence-exempted band. The 2.4 GHz band is very popular for indoor wireless Local Area Networks (LAN) and Wi-Fi hot-spot services. To avoid mutual interference between BWA services and ENG/OB links, and between BWA services and the uncontrolled and unprotected radio deployments in the 2.4 GHz licence-exempted band, there is a need to make available guard bands between the respective frequency bands. In the RSAC Paper No. 7/2007 entitled “Spectrum Release Plan for 2007/08 - 2009/10”¹², OFTA has assessed that guard bands of 15 MHz (2.290 – 2.305 GHz) at the lower block edge and 10 MHz (2.390 – 2.400 GHz) at the upper block edge may be necessary in order to avoid mutual radio interference between existing services and the future services to be operated in the 2.3 GHz band. Wider guard band is required in the lower edge because the transmit power of ENG/OB is higher as compared with the emission power of wireless LAN. With this arrangement, a total of 85 MHz bandwidth (from 2.305 to 2.390 GHz) will be available for BWA service.

60. The proposed guard band of 15 MHz in the 2.290 – 2.305 GHz range is based on the assumption that no special measures would be taken. However, with the use of certain measures such as high frequency selective equipment, filters, coordinated locations of BWA systems and ENG/OB links,

¹² The RSAC Paper No. 7/2007 entitled “Spectrum Release Plan for 2007/08 – 2009/10” can be downloaded from OFTA’s website at “http://www.ofa.gov.hk/en/ad-comm/rsac/paper/rsac7_2007.pdf”.

it is possible to reduce the width of the guard band at the lower edge of 2.3 GHz band. The frequency range of 2.300 – 2.305 GHz may also be used for BWA service on condition that the use will not cause harmful interference to the ENG/OB link users below 2.29 GHz and that the BWA assignee near the lower edge of the 2.3 GHz band agrees to take necessary technical measures to protect itself from possible interference generated by ENG/OB links. For the 10 MHz guard band in 2.390 – 2.400 GHz range, since wireless LAN systems are widely installed in the territory and there are many owners and operators, it is not possible to take the same approach.

Question (20): Do you agree with the proposed guard bands for the 2.3 GHz band? Do you agree with the arrangement for the spectrum holder at the lower edge of 2.3 GHz band to use the spectrum 2.300 – 2.305 GHz as stated in paragraph 60?

INVITATION OF COMMENTS ON THE ISSUES IN THIS CONSULTATION PAPER

61. This Consultation Paper sets out the TA's preliminary views and proposals after due consideration of the submissions received in the first and second consultations. Any views expressed and proposals made in this Consultation Paper are preliminary for the purpose of discussion and consultation only. Nothing in this Consultation Paper represents or constitutes a determination, direction or decision made by the TA. Nothing in this paper should be construed as indicating that the TA has finalised any opinion or decision on these issues.

62. The TA would like to seek views from the industry and any interested party on the issues discussed in this Consultation Paper. Views and comments

should reach OFTA **on or before 11 July 2007**.

63. The TA reserves the right to publish all views and comments and to disclose the identity of the source. Any part of the submissions, which is considered commercially confidential, should be clearly marked. The TA would take such markings into account in making his decision as to whether to disclose such information or not. Submission should be addressed to:

Office of the Telecommunications Authority
29/F, Wu Chung House
213 Queen's Road East
Wan Chai, Hong Kong
Attention: Senior Telecommunications Engineer (R11)
Fax: 28035112
Email: bwa3con@ofta.gov.hk

An electronic copy of the submission should be provided by email to the address indicated above.

INVITATION OF EXPRESSION OF INTEREST TO INVEST IN BWA SERVICES

64. Interested parties who have the intention to invest in services operating in the spectrum concerned are requested to express their intention to the TA, separately from the submissions in response to this Consultation Paper, and such expression of interest will be treated on a confidential basis. In the expression of interest, they should indicate the preferred frequency bands, the approximate bandwidth requirements (how many blocks, width of each blocks). Such expression of interest to invest will be made on a non-committal basis.

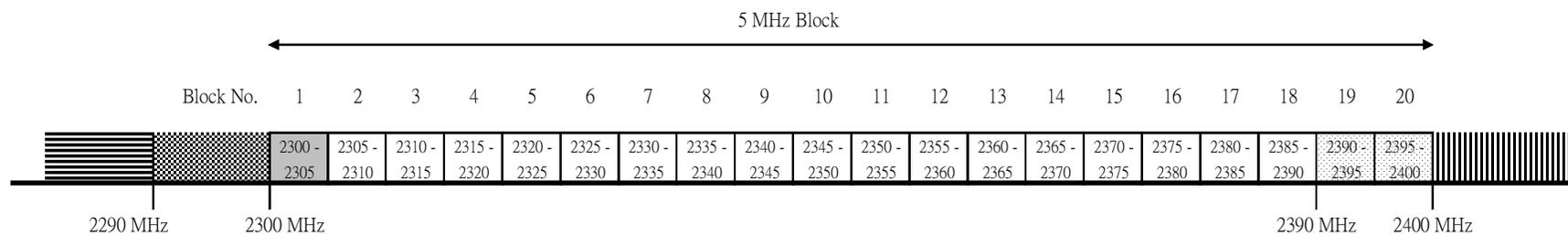
Expression of interest should reach OFTA **by the same deadline specified for the submissions in response to this paper** and marked clearly “Confidential - Expression of Interest”.

Office of the Telecommunications Authority

11 May 2007

Annex 1

Proposed Allocation Plan in the 2.3 GHz Band



-  Block No. 2 - 18
Proposed Frequency Blocks for BWA deployment
-  Block No. 1
The use of Block No. 1 will be subject to the measures taken by the holder of Block No. 2 to resolve the interference issue.
-  Block No. 19 - 20
Proposed Guard Band between BWA and Licence-exempted Applications
-  Proposed Guard Band between ENG/OB Links and BWA
-  ENG/OB Links
-  Licence-exempted Applications