

**LICENSING FRAMEWORK
FOR DEPLOYMENT OF BROADBAND WIRELESS ACCESS**

**ANALYSIS OF COMMENTS RECEIVED,
PRELIMINARY CONCLUSIONS AND FURTHER CONSULTATION**

31 AUGUST 2005

INTRODUCTION

There has been growing interest all around the world in the deployment of broadband wireless access (BWA) technologies for telecommunications services. A number of network operators and service providers have also expressed their interest in deploying BWA locally. In response to such enquiries, on 20 December 2004, the Telecommunications Authority (TA) issued a consultation paper on a licensing framework for deployment of BWA technologies (First Consultation Paper). In the First Consultation Paper, the TA discussed the various issues concerning the introduction of BWA services and consulted the industry and interested parties on the regulatory framework for such services.

2. The First Consultation ended on 14 March 2005. A total of 30 submissions were received. They were published on the web site of the Office of the Telecommunications Authority (OFTA) at <http://www.ofta.gov.hk>. The submissions were received from the following parties:

- Dr John Ure (Dr Ure)
- Alcatel China Ltd. (Alcatel)
- Asia Satellite Telecommunications Co. Ltd. (AsiaSat)
- Swire Properties Management Ltd. (Swire)
- Pacific Internet (Hong Kong) Ltd. (PIHK)
- WiMAX Forum

- Cambridge Broadband Ltd. (CB)
- APT Satellite Co. Ltd. (APTSat)
- Towngas Telecommunications Fixed Network Ltd. (TTFN)
- China Resources Peoples Telephone Co. Ltd. (CR Peoples)
- CM TEL (HK) Ltd. (CM TEL)
- Hong Kong Cable Television Ltd. (HKCTV)
- Wharf T & T Ltd. (WT&T)
- Reach Ltd. (REACH)
- Hong Kong Broadband Network Ltd. (HKBN)
- New World Telecommunications Ltd. (NWT)
- Kowloon-Canton Railway Corporation (KCRC)
- TraxComm Ltd. (TraxComm)
- SmarTone Mobile Communications Ltd.,
SmarTone 3G Ltd. and SmarTone Services Ltd. (SmarTone)
- Hong Kong Telecommunications User Group (HKTUG)
- Liberal Party
- e-Kong Group Ltd. (e-Kong)
- PCCW-HKT Telephone Ltd. (PCCW-HKT)
- SMATV Association of Hong Kong (SMATV Assoc)
- Mandarin Communication Ltd. and
SUNDAY 3G (Hong Kong) Ltd. (SUNDAY)
- Hutchison Global Communications Ltd. (HGC)
- Hutchison Telecommunications (Hong Kong) Ltd. (HTHK)
- Legislative Councillor Hon SIN Chung-kai (Hon Sin)
- Hong Kong CSL Ltd. (HKCSL)
- Hong Kong Internet Service Providers Association (HKISPA)

3. The TA duly considered the views and comments made in the submissions. He also reviewed the latest developments of BWA worldwide. In this second consultation paper, the TA proposes a regulatory framework for deployment of BWA technologies.

AN OVERVIEW

4. The deployment of BWA for telecommunications services is gaining momentum and attracting attention from potential network operators and service providers in many countries around the world. However it appears that new investment in emerging technologies in telecommunications is being approached more cautiously by telecommunications operators and investors, than in the recent past. It remains the TA's position that the deployment of BWA or any other new technologies should continue to be a matter for market forces to resolve. One of the roles of the TA is to facilitate the introduction of new technologies and services by making spectrum available and allocating it in a fair, transparent and efficient manner and putting in place the appropriate supporting regulatory framework. This is in line with established policy objectives of promoting the development of telecommunications in Hong Kong, for the long term interests of the consumers, and maximizing benefits to the economy as a whole. The TA's specific proposals for BWA are directed towards those objectives.

DEPLOYMENT OF BWA

5. BWA provides, in its initial phase of deployment, a possible alternative to the conventional wireline technologies (including digital subscriber line (DSL), fibre-to-the-building, etc.) that a fixed carrier may consider adopting for speedy rollout of a broadband network. Such technologies would be particularly useful for fixed carriers to maintain services to existing customers, or to acquire new customers, in areas outside the coverage of its wireline networks after mandatory "Type II interconnection" is phased out in June 2008. The TA is monitoring the development of BWA technologies including those of WiMAX and UMTS TDD, and is aware of their

enhancement capability for full mobility in the future. With the potential for deployment of fully mobile services, there has been growing interest by network operators and service providers to the use of BWA locally. In the First Consultation Paper, the TA invited views on whether BWA should be licensed in Hong Kong and if so, what was the appropriate timing for inviting applications for such licences.

6. All respondents supported the offer of BWA as a licensed service. On the appropriate timing for offer of the BWA spectrum, some respondents (SmarTone, HKCSL, SUNDAY and Hon Sin) were of the opinion that it should not be offered prior to the forthcoming reviews of spectrum policy and fixed-mobile convergence. PCCW expressed a similar view, although it has no objection to its immediate release provided that the spectrum is open for full mobility service provision. On the other hand, a number of respondents (WiMAX Forum, PIHK, CM TEL, HGC, HKTUG) supported early offer of BWA, within this year or next year.

7. Given the impending need triggered by the progressive withdrawal of Type II interconnection links in Hong Kong, the global trend of BWA deployment, and having considered the respondents' views, **the TA is of the view that the offer of BWA spectrum for deployment by the industry should be facilitated as soon as possible, with a view to assignment of the relevant spectrum to successful bidders in 2006.** Although there are proposals that the TA should wait for the results of the spectrum policy and fixed-mobile convergence reviews before allocation of spectrum for BWA services, the TA considers that this is neither necessary nor desirable for two reasons. First, there is some urgency with the offering of the BWA spectrum to the market because of the phasing out of the mandatory Type II interconnection arrangements by end-June 2008 and the expected timing for commercial availability of BWA equipment in the market. Second, the spectrum policy and fixed-mobile convergence reviews are part of the

evolution of the regulatory system affecting all investors in the market and it is not necessary to single out BWA investment for delay until the reviews have been completed.

STANDARD ISSUES

8. In the First Consultation Paper, the TA stated that consistent with technology neutrality principles, it was not intended to mandate specific technology or technologies to be used in the delivery of BWA services in Hong Kong. Views from the industry on this proposal were sought and in addition, views were invited as to whether the relevant equipment market being supplied by one or only a few manufacturers should be a valid regulatory concern from a competition perspective.

9. All respondents except one (Alcatel) generally supported the principle of technology neutrality as proposed by the TA for the delivery of BWA services. Concerning the competition status of equipment market, a number of respondents (WiMAX Forum, NWT, PCCW, CSL and e-Kong) considered that whether there would be only one or a few manufacturers would not be a regulatory concern, because market forces would eventually adjust any imbalance. One respondent (HKCSL) suggested that, given there was no widely accepted single definition of BWA, the TA should indicate which standards would be eligible as BWA. HKCSL assumed that this was an issue of importance in terms of there being sufficient choice available to end users in the purchase of BWA devices.

10. Consistent with the technology neutrality principle and having considered the respondents' views, **the TA is prepared to allow the deployment of any technology which conforms to recognised open standards, for the delivery of BWA services.** Because BWA devices and

equipment will be supplied competitively and only technology conforming to recognised open standards will be allowed, the TA considers it unlikely that end users will have insufficient choice in the selection of BWA devices.

SPECTRUM ISSUES

Spectrum for BWA in Hong Kong

Background

11. In the First Consultation Paper, the TA proposed the 3.4 – 3.6 GHz band (3.5 GHz band) as a licensed band for BWA deployment in Hong Kong. Specifically, the TA proposed that the 3.5 GHz band might, depending on the actual requirement of BWA, be allocated to BWA on a primary basis¹. The receiving stations of the Fixed Satellite Services (FSS), which are currently operating in the same band, may still be used in this band but on a secondary basis.

12. The majority of respondents (including WiMAX Forum, Alcatel, CB, PIHK, e-Kong, TTFN, CM TEL, TraxComm, PCCW-HKT, WT&T, NWT, HGC, HTHK, CR Peoples and Hon Sin) supported the allocation of this frequency band for BWA, with some of them asking the TA to explore the feasibility of granting the status of co-primary allocation² to both BWA and FSS. A few companies (AsiaSat, APTSat, REACH, SMATV Assoc) raised

¹ Stations of a secondary service:

- (a) shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date;
- (b) cannot claim protection from harmful interference from stations of a primary services to which frequencies are already assigned or may be assigned at a later date; and
- (c) can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.

² By operating on a co-primary basis, FSS and BWA services will share the same spectrum. Before a new station is to be installed, the operator will have to confirm that there will be no interference caused to existing stations.

objection primarily on the grounds of interference caused by BWA to FSS.

Suitability of 3.5 GHz Band for BWA Deployment

13. As mentioned in the First Consultation Paper, in proposing the allocation of the 3.5 GHz band for BWA, the TA had considered other possible bands, including licence-exempt bands (e.g. 2.4 GHz and 5 GHz bands) as well as other licensed bands (e.g. 1.9 GHz, 2.0 GHz, 2.3 GHz etc.). The 3.5 GHz band stands out as the most suitable licensed band for BWA when assessed against a number of objective criteria. The alternative licensed bands have all been deployed or reserved for other telecommunications services. For licence-exempt bands, BWA service providers may consider them not a suitable option because services offered on these frequencies will be operated on an uncoordinated and unprotected basis, making it difficult to guarantee the quality of such services to end users. **Nevertheless the TA is of view that if the market considers using licence-exempt bands is a viable alternative for BWA, consideration will be given to permitting such development under a class/individual licence.**

14. Some respondents (PCCW-HKT, NWT and CB) proposed deployment of frequency bands other than the 3.5 GHz band for BWA, such as the 2.3 GHz band (which is another band other than 3.5 GHz designated by the WiMAX Forum for BWA application), 3.6 – 3.8 GHz and 10.5 GHz band. As mentioned in the First Consultation Paper, frequencies in the 2.3 GHz band are already partly used for other purposes and there is only 63 MHz vacant in a non-contiguous form. Furthermore, this frequency band is planned for 3G TDD expansion in the Mainland China and it is advisable for Hong Kong to reserve this band, even when it is fully vacant in future, for harmonization with the band plan of the Mainland. The allocation of 2.3 GHz band for BWA is therefore possible in the long run but the timing of its release will be subject to further review. For other alternative bands proposed by respondents, OFTA

has considered them and for various reasons, they cannot be assigned for the said BWA applications. For instance, frequencies in the 3.4 – 3.8 GHz band are allocated for FSS. It would be pre-mature at this stage to re-deploy them for BWA applications. Regarding the 10.5 GHz band, frequencies in this band have been assigned for radio-location applications. Similar to the 3.4 – 3.8 GHz band, it would be too early at this stage to consider redeployment of frequencies in the 10.5 GHz band for BWA applications.

15. The TA has also considered the alternative of granting co-primary allocation status to both BWA and FSS. As mentioned in the First Consultation Paper, due to the potentially massive deployment of BWA stations in the territory, co-primary allocation for both FSS and BWA is not feasible in a small and densely populated place like Hong Kong. Based on the technical assessment carried out by OFTA, frequency sharing between FSS and BWA on an “equal basis” is not feasible, even with substantial isolation from site shielding, owing to the potential high density of deployment of BWA.

16. In re-designating the 3.5 GHz band as primary allocation for BWA applications and secondary allocation for the FSS services, the TA has taken into account that there is 600 MHz of spectrum in the 3.6 – 4.2 MHz which continues to be allocated for FSS services on a primary basis. This means that while FSS operators may change the operating frequencies from the 3.5 GHz band to the 3.6 – 4.2 MHz band, there are no suitable alternatives for local BWA operators if spectrum is not made available in the 3.5 GHz band for BWA applications.

The Interference Issue

17. The TA is aware of the concern on potential interference caused by BWA to the receiving stations of FSS operating in the same frequency band. Currently, in Hong Kong, there are four types of receiving stations of the FSS

operating in the 3.5 GHz band, namely, telemetry, tracking, command and monitoring (TTC&M) earth stations, earth stations for fixed carrier services, Satellite Master Antenna Television (SMATV) systems and Television Receive-Only (TVRO) earth stations. The distribution of these receiving stations that would possibly be affected by the proposed 3.5 GHz BWA spectrum deployment is given below:

- (a) two TTC&M stations located in the Tai Po area;
- (b) two earth stations for external fixed services in the Kwai Chung and Tai Po area;
- (c) twenty SMATV systems located in various districts of Hong Kong; and
- (d) an unknown number of TVROs scattered in various districts of Hong Kong.

18. For the TTC&M stations in the Tai Po area, OFTA has conducted a site inspection and a technical analysis of the compatibility between the TTC&M stations and possible BWA stations that may be installed in future in the vicinity. Based on the technical assessment conducted by OFTA, because of the geographic location of the TTC&M stations, the TA considers it unlikely that the BWA installations would cause harmful interference to existing TTC&M stations in the Tai Po area. Nevertheless, the TA would consider imposing a licensing requirement on BWA operators that for BWA stations established in the vicinity of the existing TTC&M stations, they must be designed in such a way that they do not cause harmful interference to the existing TTC&M stations.

19. The earth stations for external fixed service are currently operated by two external fixed carriers. To avoid potential interference from BWA stations, the two external fixed carriers may choose to change the operating frequencies to some other frequencies in 3.6 – 4.2 GHz which will remain to

be allocated to FSS on a primary basis. There should be little technical constraint on the changeover. The impact of the re-classification of the frequency allocation to FSS in the 3.4 - 3.6 GHz from “primary” to “secondary” for the earth station is therefore considered relatively small.

20. As for the SMATV receivers operating in the 3.5 GHz band and deployed in various districts in the territory, based on the information returned by SMATV licensees and the results of OFTA’s survey conducted in July 2005, only twenty SMATV systems would be potentially affected. These constitute around 1% of the overall SMATV systems operating in Hong Kong. Concerning these twenty SMATV systems, the majority of them receive around ten satellite TV channels and only one of the satellite TV channels received would be affected by the potential interference by BWA³. In other words, viewers served by these systems are able to continue to receive TV programmes on other channels without any adverse impact on picture quality etc. More importantly, the programmes affected are “free-to-air⁴” programmes from other territories generally not targeting Hong Kong or local majority. They are broadcast from satellites not registered/licensed in Hong Kong and the programmes are not Hong Kong licensed programmes.

21. Regarding the TVRO systems in the territory, following government’s “open sky” policy, TVRO systems are exempt from telecommunications licensing requirement so OFTA has no statistics about the number of systems/TV channels that could possibly be affected. Since TVRO systems are not common in the urban areas in Hong Kong, it is estimated that the number of parties affected would be relatively small. Similar to the SMATV systems, the TV programmes received are foreign programmes from

³ In terms of households, it is estimated that the number of households connected to these SMATV systems which may be potentially affected constitute less than 0.5% of the total number of households in Hong Kong.

⁴ “free-to-air programmes” means that the programmes are free that the viewers are not required to pay the TV broadcasters for viewing the programmes.

other territories generally not targeting Hong Kong or local majority. They are broadcast from satellites not registered/licensed in Hong Kong and are not Hong Kong licensed programmes.

Designation of 3.5 GHz Band for BWA Deployment

22. The TA emphasizes that the proposed change of frequency allocation to FSS from “primary” to “secondary” is not to withdraw the frequencies to be used for FSS altogether but to require use of the frequencies by FSS not to interfere with BWA services. Protection may also be offered to the existing TTC&M stations in Tai Po. On the other hand, the allocation of spectrum for BWA will facilitate the industry development, with potentially significant contribution to the economy, by the introduction of new telecommunications products and services which may be offered with the advent of the related technologies. Balancing the potential adverse impact on earth stations, SMATV systems and TVROs, and the potential benefits of introduction of BWA services in Hong Kong, **the TA considers it reasonable and proportionate to allocate 3.4 – 3.6 GHz band to be used for BWA services on a primary basis while allowing the frequencies to be used for FSS on a secondary basis.** Furthermore, the TA is prepared to allocate the frequencies for use by other users in future on a secondary basis, as it may soon be possible for other radiocommunications systems to use a particular section of the radio spectrum at the same location and time, with the advent of radiocommunications technologies such as Ultra Wide Band and Cognitive Radio, without unacceptable interference to the services using the spectrum on a primary basis.

23. With the above re-arrangement of the 3.4 – 3.6 GHz band allocation, some end users currently subscribing to FSS operating in this band may possibly be affected to a certain extent after the deployment of BWA systems. The TA would ensure that the concerned licensees (including those of SMATV

systems and external fixed carriers with earth stations possibly affected) are kept informed on this issue so that these licensees may prepare in advance and communicate with their own clients accordingly.

Spectrum Sharing between FDD and TDD

24. In the First Consultation Paper, the TA proposed the use of separate frequency blocks for FDD and TDD in the band plan and geographical separation of FDD and TDD systems where possible to address the issues of interference between the two different modes. The TA also invited views from the industry on any other measures which might address the interference issue.

25. A number of respondents (WiMAX Forum, CM TEL, HKBN and NWT) suggested that the band plan should adopt a flexible approach without specifying FDD or TDD mode. Some respondents (WiMAX Forum, NWT and HKBN) suggested that guard bands might not be necessary because there were alternatives to tackle the interference issue at band edge, such as the adoption of a block edge emission mask.

26. Because technology neutrality is an established government policy, the TA will refrain from specifying the use of specific technology as far as possible. The band plan given in paragraph 21 of the First Consultation paper is only one of the possible arrangements and the TA has indeed no special preference. **The TA is of the view that a band plan without specification of FDD or TDD mode will best meet market needs. Frequency blocks may be used for either TDD or FDD operation, subject to the operator's own commercial and technical considerations.**

27. It is noted that implementation of block edge mask may effectively address interference between adjacent frequency blocks, irrespective of

whether they are TDD or FDD. This will eliminate the need for any guard band, thus improving the efficiency of spectrum usage. **The TA will therefore not fix any guard band but will instead mandate the use of a block edge emission mask in the future licence for BWA operators.** Details of the block edge emission mask are given in Annex I.

28. Because of the proximity with the Mainland China, BWA operators will be subject to the requirement of frequency coordination with the Mainland to prevent any mutual interference across the boundary.

Supply of Spectrum Resources

29. In the First Consultation Paper, the TA mentioned that the frequency spectrum allocated for BWA in the initial phase might be limited and the TA would decide the amount of spectrum to be supplied based on the industry's immediate need. The TA invited views from the industry on the total bandwidth that should be allocated for BWA in the initial phase.

30. The respondents have divided views on bandwidth requirements. Some respondents (TTFN, HKBN) considered the spectrum supply proposed by the TA to be sufficient. HKCTV considered it inadequate while SmarTone considered it excessive. On the timing to offer the spectrum, HKBN suggested all spectrum resource be released as soon as possible, while some others (HGC and HTHK) suggested a phased approach.

31. Having considered the respondents' views and the band plan as set out in paragraph 37 below, **the TA is prepared to allocate 180 MHz spectrum in the 3.5 GHz band for BWA on a primary basis in the forthcoming spectrum allocation exercise. In case the market does not take up all of the spectrum, the frequency blocks which have not been assigned will be put into reserve, and will not be offered again within a certain time frame,**

say before end 2008. The arrangement for the reserved frequency blocks, if any, would be reviewed in due course.

NUMBER OF FREQUENCY BLOCKS TO BE ASSIGNED

32. In the First Consultation Paper, the TA proposed two types of frequency blocks. The first one is a paired band of 14 MHz x 2 per block for WiMAX systems based on IEEE 802.16 or ETSI HiperMAN while the second one is an unpaired band of 20 MHz per block for UMTS TDD. The TA invited views from the industry on the proposed channel bandwidth and total bandwidth for each block.

33. None of the submissions supported the proposed arrangement. Instead, all respondents suggested a single and uniform frequency block size. There are however divergent views among the respondents on the channel bandwidth and the total bandwidth of each frequency block.

34. The TA notes that a channel bandwidth of either 3.5 MHz or 5 MHz may be adopted, depending on the underlying technologies. Channel separation and frequency pairing are also dependent on whether TDD or FDD is to be employed. In deciding the width of each frequency block, while a frequency block of 35 MHz x 2 fits the channel bandwidth of both 3.5 MHz and 5 MHz perfectly, it is considered too large a single block within the 200 MHz band. On balancing the need to accommodate a reasonable number of operators within the available BWA spectrum and the demand for a bandwidth large enough for flexible deployment, a frequency block of 15 MHz x 2 is considered appropriate. This will allow for the operation of either three channels of 5 MHz or four channels of 3.5 MHz, thus providing flexibility for deployment of different technologies. Regarding the question of whether or not frequency blocks would be assigned in pairs, in order to provide for higher

flexibility in the deployment of TDD or FDD by the future operators, **the TA considers that assignment of spectrum in the form of a paired band would be appropriate.**

35. As a result of the above proposal to assign spectrum in pairs with a bandwidth of 15 MHz x 2, it is possible to have a total of 6 frequency blocks of 15 MHz x 2 and a frequency block of 10 MHz x 2 in the proposed 3.5 GHz band.

36. One respondent (TraxComm) proposed that spectrum could be assigned on a regional basis. The TA considers that such an arrangement may impose deployment difficulties and trigger the need for day-to-day coordination among network operators deploying BWA, given the small geographical size of Hong Kong and the inherently wide coverage of a typical BWA cell. **The TA is of the view that a territory-wide frequency assignment is more appropriate in the context of Hong Kong.**

37. Having considered the views of the respondents and the above, **the TA proposes that the band plan for the 3.4 – 3.6 GHz band for public telecommunications services in Hong Kong should be made up of six frequency blocks, each consisting of a 15 MHz x 2 paired band, spanning from 3410 MHz to 3500 MHz and from 3510 MHz to 3600 MHz.**

3.41 GHz					3.50 GHz
3410 – 3425 MHz	3425 – 3440 MHz	3440 – 3455 MHz	3455 – 3470 MHz	3470 – 3485 MHz	3485 – 3500 MHz
Six blocks of 15 MHz x 2					
3.51 GHz					3.60 GHz
3510 – 3525 MHz	3525 – 3540 MHz	3540 – 3555 MHz	3555 – 3570 MHz	3570 – 3585 MHz	3585 – 3600 MHz

Figure 1 - 3.4 – 3.6 GHz Band Plan for BWA Services

The 10 MHz x 2 spectrum spanning from 3400 MHz to 3410 MHz and from 3500 MHz to 3510 MHz will be reserved. The TA may consider allocating the reserved block to services other than public telecommunications services, subject to a separate review.

LICENSING ISSUES

Number of Licences

38. Based on the band plan proposed in paragraph 37 above, a maximum of six territory-wide BWA licences for public telecommunications services can be issued.

Original Proposal and Responses

39. In the First Consultation Paper, the TA proposed that BWA in Hong Kong might initially be offered as a wireless extension of the conventional wireline based fixed network service. Interested parties who are not already

fixed carrier licensees should apply for a fixed carrier licence before they are eligible to bid for the BWA spectrum. The TA also recognized that while the initial focus of BWA is on the fixed services, it may support full mobile services in due course. To differentiate BWA services from a full mobile service, the TA proposed in the First Consultation Paper that the service offered by a fixed carrier licensee would only be allowed to have “limited mobility”. “Limited mobility” was to be interpreted as no cell handoff capability allowed. It was also proposed in the First Consultation Paper that BWA licensees may apply for change of spectrum usage from fixed access applications to full mobile applications, subject to payment of adjusted spectrum usage fee (SUF) commensurate with the mobile usage.

40. A number of respondents (WiMAX Forum, Alcatel, HTHK, CM TEL, TraxComm, HKCTV, HGC, HKBN, NWT and WT&T) supported the proposal of reserving BWA spectrum for fixed services. Some mobile network operators (SmarTone, Sunday and HKCSL) were of the opinion that mobile carriers should also be allowed to use BWA spectrum, while some other respondents (CR Peoples, PIHK, HKISPA and HKTUG) suggested that any service provider should be allowed to do so. Other respondents (e-Kong, Reach, Dr Ure, Hon Sin and the Liberal Party) expressed disagreement with or reservation about the TA’s proposal of reserving the BWA spectrum for fixed services. There were also divided views among the respondents on the TA’s proposal of allowing “limited mobility” only. Some respondents (Swire, WiMAX Forum, TTFN, CM TEL, HKBN and WT&T) agreed with the TA’s proposal, while some others (PIHK, HKISPA, HKCTV and PCCW) suggested full mobility. There was even a suggestion (HTHK) that mobility should not be allowed at all.

Scope of Permitted Services

41. Although BWA is currently deployed primarily for fixed services in the worldwide market, The TA considers that fully mobile BWA services should be offered as soon as the technology and equipment market are mature and cost-effective for such applications.

42. As mentioned in the First Consultation Paper, a primary objective to offer the BWA spectrum for deployment by the industry is to facilitate the progressive withdrawal of Type II interconnection links. To meet this objective, the scope of permitted services under the BWA licence should cover fixed services. On the other hand, taking into account the concerted effort worldwide to further develop BWA to support full mobility on a massive scale comparable to WiFi or 3G, it is envisaged that BWA would be further developed into a full mobility service in the not-too-distant future when technical standards are more well established and terminal equipment is more widely available. With a view to enabling deployment of BWA technologies as substitute for Type II interconnection links whilst removing uncertainty surrounding the deployment of BWA technologies for full mobile services as soon as such capabilities are reasonably available and supported, **the TA proposes that the scope of permitted services of the future BWA licences should be restricted to fixed telecommunications services initially and be expanded to include full mobility services after 1 January 2008. Fixed telecommunications service will include the conventional fixed services and telecommunications service of “limited mobility” nature. “Limited mobility” means no cell handoff capability will be permitted before 1 January 2008.** With the timeframe for permitting fixed to full carrier services clearly stipulated, bidders may bid on the valuation of the right to use the BWA spectrum over a period 15 years, as set out in the paragraphs that follow.

Unified Carrier Licence

43. Fixed-mobile convergence is a growing trend of technological development. As mentioned above, BWA technology is capable of supporting both fixed and mobile services. The TA also proposes that licensees may make use of BWA spectrum to provide both fixed and mobile services starting from 1 January 2008. It is considered unreasonable and inconvenient for a single operator to operate services using BWA spectrum under one fixed carrier licence and one mobile carrier licence. **It is therefore proposed that a new Unified Carrier Licence will be introduced. The validity period of this new licence will be fifteen (15) years, which is the same as that for the existing fixed/mobile carrier licences. Any interested party, including existing fixed/mobile carriers and new entrants, may bid for the BWA spectrum and, if successful, will be licensed under the Unified Carrier Licence which will permit the licensee to provide fixed telecommunications service using the BWA spectrum from the start of the licence and to provide both fixed and mobile telecommunications service starting from 1 January 2008.**

44. A consultation paper on the regulatory regimes for fixed-mobile convergence and the introduction of a new Unified Carrier Licence will be published soon. The industry will be invited to comment on issues, such as conditions, period of validity and fees of the unified licence as well as the conversion from existing licences to the new Unified Carrier Licence.

Assignment of Telecommunications Numbers and Interconnect Regime

45. Because it is proposed to restrict BWA spectrum to fixed telecommunications services before 1 January 2008, **the TA intends to allocate telephone numbers with prefixes of “2” and “3” for telecommunications services using the BWA spectrum, including fixed**

telecommunications services and telecommunications services of limited mobility. The existing interconnection charging regime will apply. The question of whether or not the interconnection charging regime would be reviewed upon the convergence of fixed and mobile services (which is also relevant to the converged BWA services starting from 1 January 2008) will be examined in the consultation on fixed-mobile convergence.

SPECTRUM UTILISATION FEE AND ASSIGNMENT OF SPECTRUM

Imposition of Spectrum Utilisation Fee

46. As stated in the First Consultation Paper, the TA proposes to designate the BWA spectrum in which the use of the spectrum is subject to payment of spectrum utilisation fee (SUF). It is commonly accepted that the use of the frequency spectrum, a scarce public resource, for the provision of public telecommunications services on a commercial basis should be subject to SUF in general.

47. As discussed in paragraph 22 of this consultation paper, the TA is of the view that the 3.4 – 3.6 GHz band should be allocated to BWA on a primary basis and to FSS on a secondary basis. The future BWA operator, in using the 3.4 – 3.6 GHz band, will enjoy the privilege of protection from interference by virtue of its primary allocation status. As such, the BWA operators should be subject to SUF. On the other hand, taken into account that FSS operating in the same band is only accorded the secondary status and cannot claim protection from potential interference caused by BWA, it will not be reasonable to require the use of the 3.4 – 3.6 GHz band by FSS operators to be subject to SUF. **The TA therefore considers that the 3.4 - 3.6 GHz band shall be subject to SUF where it is used for provision of primary services.**

Spectrum Assignment Method

48. In the First Consultation Paper, the TA proposed to assign the BWA spectrum by auction. An auction approach, in general, is considered to be a fair, transparent, objective and economically efficient method of allowing the market to decide who gets to use the spectrum. A number of respondents (PCCW, HGC, HTHK, CR Peoples, Sunday and e-Kong) supported the auction approach. On the other hand, some respondents (HKBN, CM TEL and HKISPA) preferred beauty contest to auction, while some others (PIHK and the Liberal Party) suggested a combination of beauty contest and auction. Some respondents (NWT, WT&T, and HKBN) suggested that as existing and active fixed network operators, they should be given preferential treatment in the BWA spectrum assignment exercise.

49. The TA noted the industry had divergent views on the spectrum assignment method. Having considered the respondents' views, **the TA remains of the view that BWA spectrum should be assigned by a hybrid selection method including elements of pre-qualification and spectrum auction.** Following a brief pre-qualification process which aims to screen out applicants failing to meet certain objective criteria, spectrum should then be allocated by a simultaneous multiple round ascending auction. As spectrum is a public resource, it should be assigned by a fair, transparent and objective means, and market mechanism should be part and parcel of the process to ensure that spectrum assigned will be used in the most economically efficient way. Further details about the hybrid selection approach are covered in the next part of this paper.

Spectrum Utilization Fee Payment Method

50. As stated in the First Consultation Paper, if a market-based approach to the assignment of spectrum by auction is adopted, the levy of an SUF is

effectively determined by market forces. There are however a number of options for determining the incidence and amount of the SUF payment. It was suggested that the SUF for BWA spectrum might be charged annually on a per MHz basis.

51. A number of respondents (CB, CR Peoples, TTFN, HKBN, NWT and the Liberal Party) supported the idea of a per MHz basis. Some respondents (WT&T and Alcatel) suggested no charge at all or that the SUF should be charged as a small administrative fee only (TraxComm). Some other respondents (HGC, Hon Sin) took the view that the issue should be subject to another consultation or to be considered along with the forthcoming unified licensing system.

52. It is clear that for the time being, spectrum remains a finite public resource and therefore the most appropriate means of assigning spectrum is by way of an open auction, the outcome of which determines the payment of SUF. With the amount of the SUF be determined by the market, rather than the Government, the remaining question is therefore what payment method should be adopted.

53. In the First Consultation Paper, the royalty payment option was not considered appropriate for a number of reasons, for example, the potential for over-bidding and the need for complicated and administratively expensive accounting separation requirements. Because no submission supported this option, this consultation paper will focus on whether an up-front payment or a deferred payment option is to be preferred. Basically, the deferred payment option is the same as the up-front option except that cash payments are made by instalments over the period of spectrum usage. Upfront payment may have the disadvantage that a large amount to be paid upfront may place a heavy financial burden on licensees. This may stifle network roll-out and deter entry or leading to the “winner curse”. However, unlike the 3G auctioning exercise

in 2001, when the overall investment market conditions were different, it is expected that in the current climate, bidders in the BWA spectrum auction will be much more cautious. Accordingly the problem of the “winner’s curse” and associated excessive financial costs are much less likely. Furthermore, if the deferred payment method is adopted, the licensee might be required to pay interest for the deferred payment and submit a bond issued by an independent financial institution to guarantee payment. So, in practical terms, the two options are similar but the up-front payment option will be administratively simpler for all parties concerned.

54. Taking into account the respondents’ views and the above considerations, **the TA considers that an up-front lump sum payment basis should be adopted for the SUF for usage of spectrum for BWA.**

Spectrum Usage Period

55. In the First Consultation Paper, the TA proposed a usage period of ten years for successful bidders of BWA spectrum. The actual spectrum usage period would be subject to the validity period of the corresponding carrier licence.

56. There were divided views among the respondents on the appropriate spectrum usage period. CB and NWT supported the proposal of ten years. SmarTone and the Liberal Party considered it too long. HKBN, PCCW and CR Peoples suggested a period of 15 years. Concerning the proposed linkage with the corresponding carrier licence period, there were only two respondents offering comments. WT&T agreed with the proposal while CR Peoples expressed disagreement.

57. Having considered the respondents’ views, **the TA proposes to grant a successful bidder of BWA spectrum a spectrum usage right of 15**

years, which would allow for formulation of a long term business plan for adoption of an emerging technology like BWA, as well as sufficient time for network rollout, service improvement and recouping investment, particularly when there are uncertainties over the migration path from fixed to full mobile services based on the WiMAX technologies. Coincidentally, the proposed 15 years of spectrum usage right period also matches with the licence period of a Unified Carrier Licence.

Surrendering Spectrum

58. In the First Consultation Paper, the TA proposed granting successful bidders of BWA spectrum an option to return any unused BWA spectrum to the Government over the spectrum usage period except for the initial five years. This will allow for more flexibility for a BWA licensee to rollout their network and to adjust their business plan in response to the changing market condition.

59. There was no consensus among respondents on the provision to permit return of unused spectrum. Some (CR Peoples, HKBN, NWT) agreed to TA's proposal. Some (PCCW-HKT and NWT) proposed that spectrum trading is another alternative. A respondent (CB) proposed that BWA spectrum holder should be allowed to return unused spectrum after two years rather than five years. HKBN took the view that BWA spectrum holders should be required to commit to certain business milestones. In case of failure to meet the milestones in the pre-defined period, the spectrum assigned should then be returned to the TA.

60. The proposal to allow return of spectrum is based on the assumption that the SUF could be a large sum and is to be paid by a deferred payment method so as to lessen the burden on the licensee. With an upfront lump sum payment method, the TA does not intend to provide any refund of the upfront SUF already paid. In the future, spectrum trading may be a feasible solution

for disposal of unused spectrum depending on the outcome of the forthcoming spectrum review exercise.

BASIC AUCTION RULES

Hybrid Auction Approach

61. While it is mentioned earlier in this consultation paper that any interested party may apply for BWA spectrum to operate services, to make the auctioning exercise more efficient and to maintain market competition, **the TA proposes a hybrid selection process including elements of pre-qualification and spectrum auction.** The pre-qualification process will screen out applicants who fail to meet a set of objective criteria that will be published by the TA. Only qualified applicants will be allowed to participate in the spectrum auction. These criteria may include:

- (a) the technical and financial viability of the bidder;
- (b) rules on related party applications to avoid collusion and a market structure resulting from the auctioning exercise which would be adverse in competition terms. The pre-qualification process will be brief;
- (c) submission of a specified deposit amount which may be forfeited if the bidder violates the bidding rules or fails to take up the licence after winning the auction;
- (d) submission of an agreement (to be incorporated into the terms of the Unified Carrier Licence if granted) for the offer of public services within 24 months of the grant of the licence.

Simultaneous Multiple Round Ascending Auction

62. **It is also proposed that the auction for the six blocks of frequencies mentioned in paragraph 37 will take place through a simultaneous multiple round ascending (SMRA) auction.** The bidding will be for the upfront one-off payment of SUF that the bidder offers to pay for a specific frequency block. All six blocks will be auctioned at the same time with the price rising on each of them independently in each round and the blocks are not sold until there are no further valid bids on any of the blocks. **Bidders may wish to bid for a specific frequency block so to make adjustments for the technology used and other considerations they may have.** The bidder who offers the highest bid for a specific frequency block will be assigned the relevant frequency block and the amount of SUF payable by the successful bidder will be the highest bid it has offered in the final round of the auction.

63. The auction will be conducted in a transparent manner, subject to minimum constraints (such as those intended to minimise the possibility of collusion). For this auction, **the TA proposes an open auction rather than a dark room auction.** At the end of each round, information about the results of the round will be announced, thus giving the bidders flexibility to react taking into account the latest situation. This increases the likelihood that the frequency blocks are assigned to the bidders who value them the most.

Reserve Price

64. **A reserve price will be set for each block. The Government will announce the reserve price when the TA invites applications for the BWA licences.**

Insufficient Bidders

65. If the number of qualified bidders is six or less, the qualified bidders will be asked to indicate their preferences for the specific frequency blocks. The auction, as described above, will take place when there is more than one qualified bidder for any specific frequency block. The auction process amongst the provisional successful bidders is necessary to resolve the competing demand for a specific frequency block. If there is not more than one qualified bidder for any specific frequency block, no auction will be required. The applicant will be the successful bidder and will be assigned one frequency block after paying a fee equal to the reserve price.

Maximum Number of Frequency Blocks per Bidder

66. To promote competition and prevent the situation where only a few entities gain control over limited spectrum resources, **it is proposed that a bidder will only be allowed to bid for one frequency block (15 MHz x 2) in any round of the auction and if successful, that bidder will be assigned only one frequency block at the end of the auction.** One BWA frequency block of 15 MHz x 2 is considered to be sufficient for territory-wide deployment and thus the restriction imposed is considered a reasonable and proportionate measure to minimise spectrum hoarding and to promote competition in the market.

Related Applicants

67. To qualify for participation in the proposed SMRA, an applicant must satisfy a set of conditions governing related parties⁵. The policy objective behind this is to ensure that the market structure resulting from the

⁵ Related parties means parties with a close relationship by means of a participation, indirect interest, or control.

auctioning exercise is competitive. Effectively, an individual company or group of companies may not acquire more than one BWA spectrum block. The proposed set of conditions is detailed as follows:

- (a) If the common ownership between two or more related applicants is at or above 50% of their shares or voting rights, they will be disqualified in the pre-qualification stage and will not be allowed to participate in the SMRA.

- (b) If other forms of relationship (as specified in the future auction rules, e.g. common ownership in excess of 15%) exist, the parties concerned should endeavour to remove that relationship before submitting applications. If time is insufficient for that to take place prior to the pre-qualification stage, the applicants must disclose their relationship to the TA and undertake to separate in terms agreeable to the TA before the SMRA commences. The TA reserves the right to disqualify any application for participation in the SMRA, should the applicant fail to inform the TA of a relationship or fail to undertake separation.

Joint Bidding

68. Two or more existing licensees may wish to cooperate, in the form of joint venture or other types of agreements, in acquiring BWA spectrum. The TA proposes not to require any joint bidder to seek his consent prior to participation in the auction (i.e. no *ex ante* rule applies). However, licensees are reminded that any such agreement or joint venture, as for other agreements or joint ventures, will be subject to *ex post* regulation under the Ordinance, including section 7K which prohibits anti-competitive conduct, and section 7P which governs any change in a carrier licence.

69. In the case where a joint bidder has won the auction and obtained a BWA licence, but subsequently substantial restriction or lessening of competition in a telecommunications market is established, the TA is empowered to direct the licensee(s) in question to take actions(s) deemed necessary under sections 36B and/or 7P(1)(b) including, *inter alia*, amendment/termination of the agreement/joint venture, as the case warrants.

70. The TA is of the preliminary view that *ex post* regulation of joint bidding activities would be proportionate to the risk of any adverse effect to competition in telecommunications markets. The absence of *ex ante* approval of joint bids would also speed up the pre-qualification process.

AUTHORIZATION UNDER SECTION 14

71. There was a concern raised by some respondents (HKCSL, SmarTone, Swire Properties and KCRC) that installation of BWA radio equipment by fixed network operators should not be universally entitled to free-of-charge access through the provision of section 14(1) of the Telecommunications Ordinance (Cap 106), otherwise there would be unfair competition with mobile network operators who have to acquire sites for base stations on a commercial basis.

72. Under section 14(1), 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). The TA notes the concern raised by the respondents. In exercising the power under section 14(1), account will be taken of whether the installation concerned is placed solely for serving the occupiers

of the building concerned or for providing a service to a public place. **If the installation concerned is 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) will not be applicable.**

ROLL-OUT OBLIGATIONS

73. To ensure the efficient use of the spectrum and minimize the hoarding of frequency, **the TA proposes that the successful bidders will be required, under one of the licence conditions, to start offering public services within 24 months after being awarded the BWA spectrum.**

INVITATION FOR COMMENTS

74. This consultation paper sets out the TA's views and proposals after due consideration of the submissions received in the first consultation. It follows that by this consultation paper, the TA should not be taken to have formed any final views, opinions or decisions on the issues which are still subject to consultation. For the avoidance of doubt, this paper does not purporting to exercise any of the Authority's powers under any of the provisions of the Telecommunications Ordinance or licences in relation to any person directly or indirectly identified in this paper.

75. The TA would like to seek views from the industry and any interested party on the various issues on BWA discussed in this consultation paper. Views and comments should reach OFTA on or before 31 October 2005.

76. The TA reserves the right to publish all views and comments and to disclose the identity of the source. Any part of the submission, 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. Submissions should be addressed to:

Office of the Telecommunications Authority
29/F, Wu Chung House
213 Queen's Road East
Wan Chai
Hong Kong
Attention: Telecommunications Engineer (R21)3
Fax: 2803 5112
Email: bwa@ofta.gov.hk

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

Office of the Telecommunications Authority

31 August 2005

Block Edge Mask in the 3.5 GHz Band

