

For Information**Legislative Council
Information Technology and Broadcasting Panel****Assignment of the Unused Spectrum
in the 800 - 900 MHz and 1700 - 1900 MHz Bands
to the Second Generation Mobile Networks****Introduction**

The Office of the Telecommunications Authority (OFTA) has recently received applications from the operators of second generation (2G) mobile services, including Public Mobile Radiotelephone Services (PMRS) and Personal Communications Services (PCS), requesting the Telecommunications Authority (TA) to assign to them spectrum that is currently unused in the 2G bands (called the unused 2G spectrum below). The operators submit that the assigned spectrum has already been fully utilized in the networks and it would be difficult for them to further re-use the assigned spectrum. As a result, the network capacity would not be able to support the increased traffic demand arising from the emergence of higher speed data services without sacrificing the service quality.

2. After careful consideration, the TA has agreed to assign the unused 2G spectrum to the existing 2G operators. A TA statement setting out the detailed decisions is attached at Annex. This paper aims to give Members a brief account of the issue.

Benefits of Allocating Additional 2G Unused Spectrum

3. Under the Telecommunications Ordinance, the TA has a statutory duty to promote the efficient allocation and use of the radio spectrum as a public resource of Hong Kong. Currently, Hong Kong CSL Limited, Hutchison Telephone Company Limited and SmarTone Mobile Communications Limited are each assigned with 7.5 MHz x 2 for PMRS based on the GSM standard and 10 MHz x 2 for PCS, while Mandarin Communications Limited (Sunday), New World PCS Limited and Peoples Telephone Company Limited are each assigned with 10 MHz x 2 for PCS.

4. The TA notes that because of the increased usage of mobile services which include voice and data services such as Short Message Services, as well as the emergence of high-speed 2.5G services, the existing 2G operators are experiencing congestion. This would affect the quality of services (e.g. more frequent drop calls and poor reception). To allocate unused 2G spectrum to the 2G operators will enable the operators to enhance service quality to customers, and better support ever-increasing applications of advanced data and multimedia services. This, in turn, will benefit consumers and support the developments of our mobile and applications industries.

Method of Allocation

5. Currently, there are some unused 2G spectrum in the 800 - 900 MHz suitable for PMRS based on the GSM standard, and in 1800 - 1900 MHz for PCS. The unused spectrum is only of use to the existing 2G operators and does not have other potential users (e.g. because they are scattered and cannot be grouped into a block). For the existing 2G licences, all of them will expire in 2005/06. There is only a relatively short period of time of around three years left. Noting the benefits to the consumers as mentioned in paragraph 4 above, the TA therefore considers it appropriate to assign these unused 2G spectrum to the existing 2G operators as a stop-gap measure before the industry consultation on future arrangement on allocation of 2G licences is conducted in 2004/2005.

6. To promote efficient allocation and use of spectrum, and to ensure that the unused spectrum would be allocated in a fair and equitable manner, the TA has decided that:-

- (a) The unused spectrum in the 800 - 900 MHz band, divided into three equal paired frequency blocks of 0.8 MHz x 2, should be assigned to the three operators of PMRS networks based on GSM standard by drawing lots.
- (b) The unused spectrum in the 1700 - 1900 MHz band, divided into six equal paired frequency blocks of 1.6 MHz x 2, should be assigned to the six operators of PCS networks. Given that the operators have reached consensus on their preferred frequency blocks, the unused spectrum should be assigned in accordance

with their preferences.

- (c) In order to be eligible for the assignment of the unused spectrum in the 1700 – 1900 MHZ band, operators of PCS networks should meet the criteria on minimum utilization of their existing networks. This is to ensure efficient usage of the spectrum..
- (d) As the primary objective of the unused spectrum should be to relieve the traffic loading of the 2G networks, the TA will impose a licence condition that the additional spectrum to be assigned should not be deployed for the provision of 3G mobile services.

Industry Consultation

7. The TA has consulted all the six 2G operators before arriving at the above decisions. All of them except one operator support TA's proposal. Having duly considered the operators views, the TA sets out this decision and the rationales in the TA Statement.

Way Forward

8. The TA has today invited 2G mobile network operators to apply for the additional spectrum. OFTA will assign the spectrum subject to the operators meeting the assignment criteria on minimum utilisation of their existing networks.

Office of the Telecommunications Authority
25 April 2002

**Assignment of the Unused Spectrum
in the 800 - 900 MHz and 1700 - 1900 MHz Bands
to the Operators of PMRS and PCS Mobile Networks**

**Statement of the Telecommunications Authority
1 March 2002**

Introduction

The Office of the Telecommunications Authority (OFTA) has recently received applications from the operators of second generation (2G) mobile services, including Public Mobile Radiotelephone Services (PMRS) and Personal Communications Services (PCS), requesting the Telecommunications Authority (TA) to assign to them spectrum which is currently unused in the bands for 2G services. The reason for the request is that the assigned spectrum (i.e. 7.5 MHz x 2 for PMRS based on the GSM standard and 10 MHz x 2 for PCS) has already been fully utilized in the networks and it would be difficult for them to further re-use the assigned carriers particularly in the Golden Bowl areas. As a result, the network capacity would not be able to cope with the increased traffic demand arising from higher speed data services without sacrificing the service quality.

2. Currently, Hong Kong CSL Limited, Hutchison Telephone Company Limited and SmarTone Mobile Communications Limited are each assigned with 7.5 MHz x 2 for PMRS based on the GSM standard and 10 MHz x 2 for PCS, while Mandarin Communications Limited (Sunday), New World PCS Limited and Peoples Telephone Company Limited are each assigned with 10 MHz x 2 for PCS.

Unused Spectrum available for Assignment

3. In the 800 - 900 MHz band (i.e. 890 - 915 MHz paired with 935 - 960 MHz) for GSM systems, there are three unused slots of total bandwidth of 2.5 MHz x 2. The exact locations of these slots are:

- 1.0 MHz x 2 at 902.3 - 903.3 MHz paired with 947.3 - 948.3 MHz;
 - 0.9 MHz x 2 at 940.0 - 904.9 MHz paired with 949.0 - 949.9 MHz;
- and

- 0.6 MHz x 2 at 905.1 - 905.7 MHz paired with 950.1 - 950.7 MHz.

4. In the 1700 - 1900 MHz band (i.e. 1710.1 - 1785.0 MHz paired with 1805.1 - 1880.0 MHz) for PCS systems, there are currently two paired bands of unassigned spectrum as shown below:-

- 10 MHz x 2 in 1710.1 - 1720.1 MHz paired with 1805.1 - 1815.1 MHz. This spectrum is currently vacant; and
- 4.9 MHz x 2 in 1780.1 - 1785.0 MHz paired with 1875.1 - 1880.0 MHz. This portion of spectrum has been reserved for special purposes and therefore is not available for assignment.

The TA's Proposal

5. In order to ensure that the unused spectrum would be assigned in a fair and equitable manner, the TA has proposed that the unused spectrum should be divided into 3 equal portions (0.8 MHz x 2) for PMRS and 6 equal portions (1.6 MHz x 2) for PCS. Details about the division of unused spectrum into frequency blocks are shown below:

800 - 900 MHz GSM Band

X/X'	902.3 – 903.1 MHz / 947.3 - 948.1 MHz
Y/Y'	904.1 – 904.9 MHz / 949.1 - 949.9 MHz
Z/Z'	903.1 – 903.3 MHz / 948.1 - 948.3 MHz and 905.1 – 905.7 MHz / 950.1 - 950.7 MHz

1.7 - 1.9 GHz PCS Band

A/A'	1710.5 – 1712.1 MHz / 1805.5 – 1807.1 MHz
B/B'	1712.1 – 1713.7 MHz / 1807.1 – 1808.7 MHz
C/C'	1713.7 – 1715.3 MHz / 1808.7 – 1810.3 MHz
D/D'	1715.3 – 1716.9 MHz / 1810.3 – 1811.9 MHz
E/E'	1716.9 – 1718.5 MHz / 1811.9 – 1813.5 MHz
F/F'	1718.5 – 1720.1 MHz / 1813.5 – 1815.1 MHz

6. The TA has further proposed that these frequency blocks should be assigned in the following manner:

- Each PMRS operator would be assigned with 0.8 MHz x 2 in the 800-900 MHz GSM Band by drawing lots.
- Each PCS operator meeting a set of eligible criteria would be assigned

with 1.6 MHz x 2 in the 1800-1900 MHz PCS band by drawing lots.

Industry Consultation and the TA's Considerations

7. The TA has consulted all the six 2G mobile network operators on the proposed assignment of unused spectrum for PMRS and PCS. All of them except one operator supported the proposed assignment of unused spectrum. In addition, all the mobile network operators have submitted their comments to the TA for consideration. These comments and the TA's considerations are given below.

Interference in 800-900 MHz PMRS Band

8. One mobile network operator indicated that radio interference due to the operation of illegal cordless telephones exists in the unused portion of the PMRS band which is being considered for additional assignment and requested OFTA to clear the interference problem before assigning the spectrum to the operators. The operator was also concerned that in the deployment of the unused spectrum, there may be increased level of adjacent channel interference caused to operators. Another operator did not anticipate such problems and was confident that the additional spectrum to be allocated can be used without any technical problem by employing techniques such as frequency hopping.

9. In regard to the problem of radio interference caused by the operation of illegal cordless telephones in the PMRS band, OFTA notes that two operators had different views on the severity of the interference and the impact on the PMRS operation. OFTA's own assessment is that the interference is localized. OFTA has been tracking down illegal cordless phones in use causing interference. It would be a waste of resources if the spectrum which would be usable at most locations most of the time were left idle until all the illegal cordless telephones operating in the band were stamped out. OFTA has also regularly carried out enforcement actions including inspection, patrolling and raiding operations against the sale of the illegal phones. For example, in the past three months (November 2001 to January 2002), OFTA conducted three raiding operations against the sale of illegal cordless phones. OFTA will continue to take necessary enforcement actions against this type of illegal cordless telephones.

10. As regards the problem of adjacent channel interference, OFTA does not agree that the assignment of the unused spectrum would cause any new type of adjacent channel interference that does not currently exist under the current frequency plans for PMRS. There is a practice for years in the mobile industry that the operators concerned would co-ordinate with each other to overcome such problem by adopting a mutually acceptable technical solution. The TA does not see that adjacent channel interference is a hindering factor affecting the assignment of unused PMRS spectrum.

Provision of 3G Services

11. One operator expressed that its application in 2000 for additional 2G spectrum based on its demonstrated need was turned down as OFTA considered that the assignment of unused 2G spectrum at that time would have impact on the implementation of the 3G licensing framework. This operator therefore questioned why the spectrum was to be allocated now.

12. The TA considers that following the issue of four 3G mobile service licences in 2001 and the decision of not allocating additional spectrum for 3G services until an industry consultation to be conducted in 2005, the allocation of the unused 2G spectrum now would not have the impact as in 2000 on the design and implementation of the 3G licensing framework. It should be noted that the Information Memorandum issued in July 2001 for the invitation of applications for 3G network licences has already made clear the TA's intention of assigning the unused 2G spectrum to existing 2G operators in the near future (section 2.1.2.3 of the Information Memorandum). What was not yet decided in 2000 was settled in 2001 in the finalization of the 3G licensing framework. Furthermore, as no additional licences for cellular services would be issued before the consultation in 2005, the 2G spectrum which is left unused for the time being would be idle (and therefore wasted) if not assigned to the existing operators. The unused spectrum should be better utilized if it is assigned to the 2G operators, until the expiry of their current licences, to cope with the traffic demand.

13. The operator was also of the view that, with the assignment of the unused spectrum, the PCS operators would each have 11.6 MHz x 2 while the PMRS operators would each have 8.3 MHz x 2 for GSM systems. Under this circumstance, the PCS operators would have more flexibility to manipulate the

2G traffic into the additional spectrum thus releasing existing spectrum for 3G services. The TA does not agree to this argument as each of the three PMRS operators is also a PCS operator. Furthermore, the PCS and PMRS operators are already assigned with different amount of spectrum even without the assignment of additional unused spectrum.

14. Under the technology-neutral regime adopted by the TA, the existing 2G operators are free to use any technology, regardless of whether it is 2G or 3G, in the spectrum under the 2G licences (section 2.1.2.2 of the Information Memorandum). However, the TA considers that the primary objective of assigning unused spectrum is to relieve the traffic loading of 2G networks and to facilitate the efficient introduction of new higher speed (2.5G) data services. It is expected that re-farming of such additional spectrum for 3G should be subject to a separate consultation exercise when the TA formulates the policy for the allocation of all the 2G licences after their expiry. In this connection, the TA would impose as a condition of assignment that the additional spectrum to be allocated should not be used to provide 3G services. In this context, “3G services” would be defined as services operating at a minimum of 144 kbits per second for an individual customer, being the speed at which information is transferred across the air interface from the base station to the customers’ apparatus connected to the network of the operator and *vice versa*.

Method of Assignment

15. Except one operator, all five mobile network operators agreed to the TA’s intention that the unused spectrum should be assigned to them as soon as possible. In addition, they preferred that the operators could be allowed to choose their preferred frequency blocks in order to optimize the spectral efficiency in their networks. If a mutual agreement could not be reached among all the operators, the operators agreed that the unused spectrum could be assigned by drawing lots.

16. One operator considered that the unused spectrum should be assigned on a demonstrated need basis instead of equal assignment to all operators at the same time. The operator further considered that the amount of spectrum to be allocated should be based on the level of traffic congestion of individual networks. However the TA considers that the assignment of equal amount of spectrum to individual PMRS in the GSM band, and also equal amount of

spectrum to individual systems in the PCS band, is a standing policy to maintain a level playing field for the operators. Therefore, the TA is of the view that assigning equal amount of additional spectrum to individual systems in the two bands is appropriate. However, the utilization of the existing assignments in the PCS band has to meet certain minimum criteria before the operator is entitled to receive the additional assignment. As regards the choice of frequency blocks, the TA has no objection to the operators' request for their preferred frequency blocks if there is mutual agreement among all the operators. In this respect the TA has noted that there was a mutual agreement among the PCS operators and the allocation will be:

Operators	Frequency Blocks
Hong Kong CSL Limited	F/F'
Hutchison Telephone Company Limited	A/A'
Peoples Telephone Company Limited	E/E'
New World PCS Limited	C/C'
SmarTone Mobile Communications Limited	B/B'
Mandarin Communications Limited (Sunday)	D/D'

17. The TA also considers that given there is no mutual agreement among the PMRS operators, the three paired frequency blocks will be allocated by drawing lots.

Eligibility Criteria for PCS Spectrum

18. The TA has proposed that, in order to be eligible for the assignment of the 1.6 MHz x 2 spectrum for PCS, the operators should meet criterion in (a) and also either the criterion in (b) or (c) as shown below:

- (a) The operator should re-use the assigned frequency carriers for more than 32 times. With the assigned 10 MHz x 2 spectrum, the operator should have installed at least 1 600 carriers in their networks;
- (b) The operator applying for additional spectrum has already reached a customer base of 290 000; or
- (c) The operator applying for the 1.6 MHz x 2 spectrum has achieved a

spectral efficiency of 2.3 Erlangs / MHz / km² in the Golden Bowl with Hong Kong Grid co-ordinates: Northing from 815 000m to 822 850m and Easting from 830 400m to 843 300m.

19. One operator considered that the proposed thresholds given in the criteria, which have been used previously for the allocation of PCS spectrum, are far too low with regard to the current network environment. However the TA considers assigning the unused spectrum should be assigned as soon as possible in order to bring benefit to the customers. To achieve this objective, the eligibility should not be set at an unnecessary high level. Having considered the previous criteria adopted for the assignment of reserved spectrum to the PCS operators, the TA is of the view that a similar set of criteria should be applied to the assignment of unused spectrum. In response to one operator's comment that adopting a carrier re-use factor of 32 as a criterion would be unfair to those operators who have achieved a much higher re-use factor, the TA considers that the re-use factor of 32 is in line with the previous criteria and assigning unused spectrum would also bring more value to those networks which had achieved a higher carrier re-use factor.

The TA's Decision

20. Having considered the comments from the industry, the TA *decides* that:

- The unused spectrum in the 800 – 900 MHz GSM band, divided into three equal paired frequency blocks X/X', Y/Y' and Z/Z' as described in paragraph 5 above, should be assigned to the three operators of PMRS networks by drawing lots.
- The unused spectrum in the 1700 – 1900 MHz PCS band, divided into six equal paired frequency blocks A/A' to F/F' as described in paragraph 5 above, should be assigned to the six operators of PCS networks. Given the operators have reached consensus on their preferred frequency blocks, the unused spectrum should be assigned in accordance with their preference as described in paragraph 16 above.
- In order to be eligible for the assignment of the unused spectrum in the PCS band, the network of the PCS operator should meet the criteria as

stipulated in paragraph 18 above. Each PCS operator should submit the information as shown in the annex of this Statement to OFTA for consideration.

- The assigned spectrum, X/X' to Z/Z' in the GSM band and A/A' to F/F' in the PCS band, should not be deployed for the provision of 3G mobile services.

21. The 2G mobile network operators are invited to apply for the unused spectrum on or before 8 March 2002.

Office of the Telecommunications Authority
1 March 2002

Information to be provided for application of PCS Spectrum

A PCS operator who wishes to apply for the additional 1.6 MHz x 2 spectrum is required to submit an application to the TA together with the following information:

- In meeting the basic criterion 18(a) above-

a list of cell site locations (including macrocells and microcells) showing the total number of carriers used in the network, the number of sectors used at each site; the number of carriers installed at each sector and the Absolute Radio Frequency Channel Numbers used at each sector;

- In meeting the criterion 18(b) above-

total number of active subscribers in the network;

- In meeting the criterion 18(c) above-

a list of cell sites in the Golden Bowl (with their locations specified in Hong Kong Grid coordinates) and the aggregated average busy hour traffic of each site.