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## **Report of the OFTA IMT-2000 Focus Group**

### **Introduction**

International Mobile Telecommunication-2000 (IMT-2000) is an initiative of the International Telecommunication Union (ITU). In the World Radiocommunication Conference 1992 of ITU, radio spectrum 1885 - 2025 MHz and 2110 - 2200 MHz were allocated for IMT-2000. IMT-2000 standards are also being developed by the ITU for the third generation (3G) mobile systems. 3G systems differentiate from the first generation analog systems and second generation digital systems mainly in their capability to provide, in addition to voice and data communication services, high speed data services including interactive data services and multi-media services.

2. Standardization works of IMT-2000 are carried out by Task Group 8/1 (TG 8/1) of the ITU. The Task Group is charged with the main responsibilities of developing radio interface standards and identifying additional spectrum requirement for IMT-2000. According to the schedule of the TG 8/1, the drafting of radio specifications for IMT-2000 will be completed by the end of 1999.

3. With a mobile user population exceeding 3 millions in Hong Kong, the Office of the Telecommunications Authority (OFTA) is committed to introducing the latest technology enabling customers to have access to the full range of mobile services. To prepare for the introduction of 3G systems, the OFTA IMT-2000 Focus Group was established in September 1998 to collect the views from relevant parties in respect of service provisioning, technical standards and spectrum requirement. Local mobile and fixed network operators, equipment manufacturers, industrial/professional associations, Consumer Council, overseas standards setting bodies and network operators have joined the Focus Group. Members of the OFTA IMT-2000 Focus Group are given in Annex 1.

### **Scope and Work of the Focus Group**

4. The primary objective of the Focus Group is to collect members' views on technical matters relating to the introduction of 3G mobile services to Hong Kong. These include the compatibility and transitional arrangement between existing second generation mobile systems and the 3G systems, the development of technical standards and the spectrum required for 3G systems. Other issues relating to market competition, number of 3G mobile service licences to be issued and the licensing timetable are outside the scope of the Focus Group. The Terms of Reference of the Focus Group are given in Annex 2.

5. The Focus Group has held five meetings since September 98. The minutes of these meetings are attached as Annex 3.

6. In order to keep abreast of the latest development of 3G mobile services, presentations were made by Focus Group members at each of the Focus Group meetings. Seven presentations were given by:

- a) Ericsson Limited.
- b) Motorola International Incorporation.
- c) NEC Corporation.
- d) Nokia (Hong Kong) Limited.
- e) Northern Telecom (Asia) Limited.
- f) Samsung Electronics (Hong Kong) Company Limited.
- g) SmarTone Mobile Communications Limited.

Copies of their presentation materials are given in Annex 4.

### **Summary of facts and findings**

7. The working method of the Focus Group has encouraged members' active contributions on 3G mobile systems development. Members' contributions could broadly be classified into two categories: facts/findings and views/recommendations. The section on facts/findings covers the latest 3G development in the manufacturing industries, overseas administrations and network operators in term of technical standards, spectrum requirements and products. The section on views/recommendations includes members' ideas and suggestions on how 3G mobile services should be introduced to Hong Kong.

8. All contributions from the Focus Group members are summarized in the table attached as Annex 5. The following paragraphs highlight some of the important aspects.

- a) **Drivers for 3G services.** Voice telephony services are the major service components of existing mobile services. With the advent of information technology leading to the evolution of our society into the information era, the need for data communications services is expected to increase at explosive rate. The key driver for 3G services would therefore be their capability in the provision of high-speed data services. The full range of services including voice communication service, packet data service and real-time multi-media services. In addition, for countries like Japan experiencing capacity shortage problem in their existing mobile systems, 3G systems not only provide the additional capacity but also the flexibility in evolving the systems to meet the future need of their society. From the business users' perspective, the increasing trend of global mobility to carry out business activities requires individuals to be communicated with their business partners or offices anywhere and anytime, international roaming

in incumbent second generation mobile systems has demonstrated this importance. Thus, seamless global roaming with transparent service delivery is one of the key elements in IMT-2000 vision to address this growing demand.

- b) **Fixed wireless access, FWA.** The ITU considers that the capability of IMT-2000 in supporting FWA services is an essential need for developing countries. In developed countries, this capability could supplement the capacity of local loops of fixed network and could also be utilized to introduce competition to the fixed network. In this respect, the Focus Group considers that IMT-2000 systems, with suitable modifications to signalling, could be deployed for FWA. The TS-SCDMA developed by China would be one of the potential candidates for FWA application in the ITU defined IMT-2000 spectrum. Applications of FWA included voice telephony, ISDN and voice band data services.
- c) **Satellite operations.** The IMT-2000 spectrum has reserved 60 MHz for mobile satellite services (MSS). Satellite services have the advantage of providing service to wider areas, such as remote rural areas, which might not be covered efficiently by terrestrial systems in an economic manner. On the other hand, terrestrial system might be deployed to extend the coverage of satellite systems. Although the satellite and terrestrial components of IMT-2000 are considered as complementary to each other, it should be noted that satellite services are restricted by technical constraints in both link budget and bandwidth due to the inherent nature of satellite communications.
- d) **2G to 3G system migration.** Focus Group members from the manufacturing industry confirm their commitment in ensuring smooth migration from 2G to 3G systems. With the enormous investment in 2G systems, it is considered essential that replacing existing network elements should be minimized as far as practicable. The migration should therefore adopt the phased approach. 2G systems should be enhanced to provide high-speed data service as an intermediate step towards their evolution to 3G systems. By introducing appropriate interfacing equipment, the enhanced 2G system could eventually be migrated to 3G system. In addition, employment of multi-mode/multi-band terminals would facilitate users during the migration process.
- e) **Co-siting of radio base stations for GSM1800 and IMT-2000 systems.** In view of the close operating frequency bands, the Focus Group is interested to know the effect of co-siting of the radio base stations of these systems. Members from the manufacturing industry consider that co-siting is feasible and expressed that they have performed simulation test to confirm such technical feasibility. In addition, due to the similar path loss

pattern for systems operating in 1800 MHz and 2000 MHz, Focus Group members consider that such co-siting is feasible.

- f) **Field trial.** GSM equipment vendors - Ericsson, Nokia and Nortel Networks, have launched a number of field trials in Canada, China, France, Japan, UK and Europe. Nortel Networks also demonstrated 3G radio technology in North America and announced a trail in Australia based on cdma2000 with Telstra in Year 2000. In May 99, a WCDMA field trial conducted jointly by SmarTone Mobile Communications Limited and Ericsson Limited in Hong Kong was also approved by OFTA. Results of the field trial would be published in due course.
- g) **Progress of licensing in other countries.** In the UK, the Department of Trade and Industry has decided to offer five 3G licences by means of auction: A licence with largest spectrum allocation (2 x 15 MHz paired spectrum plus 5 MHz unpaired spectrum) to a new entrant. Three of the other four licences will be given 2 x 10 MHz paired spectrum plus 5 MHz unpaired spectrum and one licence with 2 x 15 MHz paired spectrum.

In Finland, four licences for the provision of countrywide coverage were issued in 18 March 1999. Successful applicants were *Radiolinja*, owned principally by Helsingin Puhelinyhtiö, *Sonera* with state majority ownership, *Suomen Kolmegee* formed by a Swedish and some regional telecommunications companies, and *Telia Mobile* of Swedish ownership. Given the standards of IMT-2000 are being developed by the ITU, the 3G licences of Finland have not included a decision on the technology to be adopted. The Finnish administration anticipates that 3G mobile services would be launched by the 1st of January 2002, the latest.

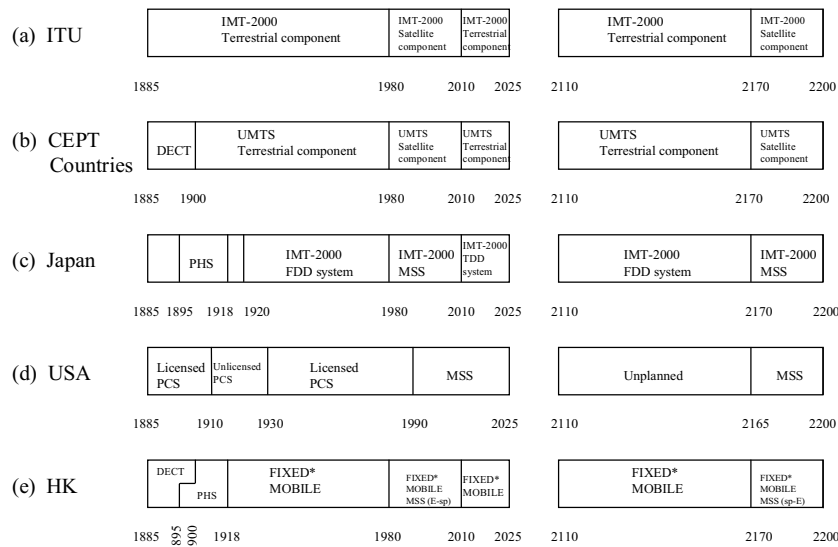
In Japan, the Ministry of Posts and Telecommunications issued the "The Basic Guideline for Introducing the Third Generation Mobile Communications System (IMT-2000)" in July 98 inviting comments on specific issues including launch time, spectrum allocation per operator and number of licences to be issued. The Basic Guideline has proposed that the number of 3G mobile service operators should be less than three. It is expected that a final decision on the policy of 3G service would be made by middle of 1999.

- h) **Numbering.** ITU-T Recommendations on intersystem numbering plans are used by existing mobile systems as the basis for IMSI (International Mobile Station Identity) to provide national/international roaming services. The ITU considers that number plan standardization for 3G systems should take into account existing numbering arrangement to facilitate system migration and evolution.

- i) **Radio interface.** Sixteen candidates of Radio Transmission Technologies (RTTs) for IMT-2000, 10 for the terrestrial component and 6 for the satellite component were submitted to the ITU. The 15<sup>th</sup> TG 8/1 meeting, held in Jersey in November 98, agreed that all the submitted RTTs would meet the minimum performance capabilities. These RTTs were allowed to progress to the next evaluation and consensus building phase of selection of RTTs. A brief description of these RTTs is given in Annex 6.

At the 16<sup>th</sup> TG 8/1 meeting held in Brazil in March 1999, the ITU adopted an approach of “a single flexible standard” with multiple access methods which include CDMA, TDMA and a combination of CDMA/TDMA. A new Working Group 5 of the TG 8/1 was formed to prepare ITU Recommendations on the radio specification based on the agreed approach. The TG8/1 plans to finalize the recommendations on radio specifications at the 18<sup>th</sup> TG 8/1 meeting to be held in Helsinki in November 1999.

- j) **Total Spectrum requirement.** The total frequency spectrum reserved for IMT-2000 systems by ITU, Europe, Japan, USA and Hong Kong are shown below:



\* existing fixed links including MMDS to be removed by end May 2001.

- k) **Additional IMT-2000 spectrum requirement.** The UMTS Forum recommended in its Report No. 6 issued in February 1999 that an additional 187 MHz is required for terrestrial UMTS services by 2010 to meet the requirement of the EU.

The 16<sup>th</sup> TG 8/1 meeting approved a recommendation of advocating additional terrestrial spectrum requirement of 160 MHz and a total mobile satellite service (MSS) requirement of 2 x 67 MHz by year 2010. Candidate bands for the additional spectrum are being examined and have not yet been finalized. TG 8/1 would submit their views on additional spectrum requirement to the Conference Preparatory Meeting (CPM) of the WRC-2000 to be held in November 1999.

- 1) **Spectrum allocation per operator.** In Japan, the "Basic guideline for introducing 3G mobile communications systems" issued by MPT has proposed that IMT-2000 bands should be divided into three equivalent frequency blocks of 2 x 20 MHz paired spectrum. Each paired spectrum (2 x 20 MHz) would be allocated to one operator in one business area.

In Europe, the UMTS Forum Report No. 5 on "Minimum Spectrum demand per public terrestrial UMTS operator in the initial phase" has considered various spectrum allocations scenarios in terms of frequency re-use, system capacity and service limitation. The Forum has recommended 2 x 15 MHz (paired frequency blocks) and 5 MHz unpaired frequency block as the preferred minimum spectrum requirement for public UMTS operator in the initial phase (year 2005). The allocation of unpaired spectrum is intended to handle asymmetric traffic in an optimized way. The allocation of 2 x 15 MHz per operator equals to three 5 MHz carriers. This is required for full service provision with deployment flexibility, including the use of microcells in three cell-layers, which is necessary for the delivery of 2 Mbps services.

The Focus Group has noted the Adachi model for the calculation of system capacity with different operating bandwidth for direct spread CDMA system. (Reference: F. Adachi et al., "Coherent Multicode DS-SS-CDMA Mobile Radio Access," IEICE Trans., Commun., Vol. E79-B, No. 9 pp. 1324, Sept. 1996.) According to the model, an allocation of 2 x 20 MHz bandwidth is required to support a data rate of 2 Mbps for multi-users.

The Focus Group has also examined the spectrum requirements from the angle of frequency re-use, data rate, types of services, system capacity and spectral efficiency. A table summarizing the technical limitations for the cases of 2 x 5 MHz, 2 x 10 MHz, 2 x 15 MHz and 2 x 20 MHz is attached at Annex 7.

### **Summary of views and recommendations**

9. The following paragraphs highlight the views and recommendations collected by the Focus Group. Views and recommendations expressed by individual members are recorded in the right hand column of Annex 5.

- a) **Satellite operations.** Noting the complementary nature of the IMT-2000 satellite service to terrestrial service in term of coverage areas, majority members considered that the IMT-2000 MSS bands should be reserved as far as practicable for those emerging mobile satellite services. It is also considered that the current IMT-2000 MSS allocation is sufficient in providing these services.
- b) **2G to 3G systems migration.** Majority members from the GSM manufacturing industry are of the view that smooth migration should follow the GSM - UMTS migration path. The evolution of GSM would provide a standardized platform and interface for IP packet data services supporting the Internet services. The core network elements of GSM could be migrated to UMTS by introducing an interworking interface between GSM and WCDMA systems.

**Hutchison** considers that evolution of cdmaOne would provide a standardized platform and interface for IP packet data services supporting the Internet services. The core network elements of cdmaOne could be migrated to cdma2000 by introducing an interworking interface between cdmaOne and cdma2000 systems.

- c) **Trials.** Some members are of the view that the result of field trials should be shared among the Focus Group. It is considered that the field trials could provide useful information on spectral efficiency and service limitation of 3G systems. The results of these trials, however, should only be used with caution, as they might not be directly applicable to typical systems due to the relatively small number of users and types of services involved.
- d) **Numbering.** One member has proposed to use the leading digit "0" to 3G mobile services. This is intended to be user-friendly and is adopted by overseas administration in England (0385-xxxxxxx, 0802-xxxxxxx, 0836-xxxxxxx), France (07/09-xxxxxx), Germany (017-xxxxxxx), Japan (090-xxxx-xxxx[Cellular], 070-5/6xx-xxxx[PHS]), Denmark (040-xxxxxx), Sweden (070-xxxxxxx), Norway (090-xxxxxxx) and Australia (041-xxxxxxx) for mobile service. This proposal, however, is not compatible with the Hong Kong Numbering Plan because the whole number level with leading digit "0" has been allocated and reserved for international network access, not for mobile services. Some members prefer to continue with the current numbering arrangements for 2G systems.
- e) **Number portability.** It is noted that 2G and 3G operators might share the same or use different number ranges. Majority members are of the

view that the present rules on numbers - requirements in number portability and number ranges for mobile services could also apply for 3G systems in Hong Kong. Members from the manufacturing industry have confirmed that this is technically achievable.

- f) **Multiple 3G-standards network.** One member does not support multiple standards network because of the technical complexity and equipment cost required for multi-mode handsets.

**SmarTone** advocates a technology neutral approach to 3G standards in the interest of consumer choice and innovation, subject to adequate safeguard against inter-operability. For the benefit of customers, a minimum number of standards should be introduced to achieve economy of scale and should be balanced against the benefits of introducing other technologies.

**Cable & Wireless HKT CSL** considers that multiple 3G standards would increase the technical complexity, including spectrum coordination with mainland China at border areas and the potential requirement of guard bands within IMT-2000 spectrum.

**Hutchison** considers that technology neutral approach to 3G standards should be adopted in interest of consumer choice and competition.

- g) **Guard Bands.** Majority members consider that no guard bands are required between two different wideband systems operating in the IMT-2000 paired band with similar duplex directions. The operation of TDMA and CDMA technologies in adjacent bands, however, would require further investigation. On the other hand, guard bands might be required for WCDMA/cdma2000 systems or FDD/TDD transmission modes working close to each other.

**SmarTone** reports that, according to ETSI SMG2 UMTS-L1 Tdoc 101/98, a capacity loss of 5-10% could be possible for the worst case located base station in the case of co-existing with uncoordinated UTRA FDD systems. In the case of co-existence with narrow band systems, the impact of interference from GSM (single slot terminal) to UTRA and vice versa, has not been noticed in the joint trial conducted by SmarTone and Ericsson in Hong Kong, where test calls have been made at a close distance of 3m from the base station.

**Ericsson** considers that, based on certain assumptions and theoretical calculations, the minimum carrier spacing is 5 MHz for uncoordinated cell layers and 4.4 or 4.6 MHz for coordinated layers. These figures apply to both FDD and TDD modes. For mixing TDD and FDD modes, it depends

on terminal filter arrangement and acceptable blocking level. The acceptable carrier spacing is currently under investigation in Europe.

- h) **Dual-mode handset.** Dual mode handset of 2G and 3G offers the flexibility of implementing wide area 3G coverage on a stage by stage basis. From the customer perspective, many 3G services are compatible or similar to those services provided by existing systems. Customers would therefore favour the use of dual mode handsets in order to enjoy both types of services. In addition, the demand for high-speed data in the initial launch phase would likely be concentrated in selected areas only and hence the provision of dual-mode handsets could offer flexibility to users in selecting the required services.

In Hong Kong, there are three dual-band GSM networks operating at 900 MHz and 1800 MHz spectrum. Depending on the applications and market development, there might be a driving market force demanding for the introduction of dual mode handsets.

One member considers that wide area deployment of 3G system should use single mode handsets because dual mode handset would provide less profit to handset supplier.

- i) **Total spectrum requirement.** Majority members are of the view that spectrum allocated by the ITU for IMT-2000 should be used for 3G in Hong Kong. Any existing allocations for other purposes should be relocated for the introduction of 3G systems.
- j) **Spectrum co-ordination with China.** Some members are concerned about potential conflicts in the allocation of transmit/receive frequency blocks between Hong Kong and mainland China. This may happen if the transmit frequency block in Hong Kong is used as receive frequency block, or vice versa, in mainland China. They recommend that the allocation of spectrum in Hong Kong should be compatible with that of mainland China as far as possible with a view to minimizing interference.

**Cable & Wireless HKT CSL** considers that different spectrum plans of neighbouring territories might result in system incompatibility. Cable & Wireless HKT CSL is of the view that the compatibility of 3G systems across neighbouring territories should be examined.

**SmarTone** considers that, for better global roaming capabilities and a wider choice of compatible products, best effort should be spent on enforcing consistency with the IMT2000 frequency plan of the ITU, China and other major countries. On this ground, it is recommended to follow

the ITU allocation, which matches that of China and would be preferred by most Asian countries.

- k) **Spectrum allocation per operator.** It is noted that 3G system may operate on 2 x 5 MHz. But some services which require high-speed data transmission such as video telephony, video on demand, etc. will not be available simultaneously. In an indoor environment, the provision of 2 Mbps service with 2 x 5 MHz allocation could generally support only one high-speed data user on a per cell basis provided that the user is not in soft handover.

The allocation of 2 x 10 MHz to one network could only supports 2 layer hierarchical cell structures, while allocation of 2 x 15 MHz spectrum allows implementation of multiple hierarchical cell structures providing maximum flexibility to cater for different services. Majority members support the UMTS Forum recommendation of allocating 3 FDD plus 1 TDD carriers is the minimum spectrum per operator for starting a reasonable business with 3G system. (That is, 2 x 15 MHz (paired frequency blocks for FDD) plus 5 MHz (unpaired frequency block for TDD) as the preferred minimum spectrum requirement per operator.)

**Nortel Networks** is of the view that, considering the recommendation from the UMTS Forum, the preferred minimum spectrum requirement per operator for new entrant is 2 x 15 MHz paired plus 5 MHz unpaired spectrum at the initial phase.

**SmarTone** considers that the allocation of 3G spectrum must ensure the operator can optimally deploy a hierarchical cell structure. With 5 MHz carrier using FDD mode, the minimum spectrum required for hierarchical cell structures is:

Macro cellular layer	:	2 x 5 MHz	(paired spectrum)
Micro cellular layer	:	2 x 5 MHz	(paired spectrum)
Pico cellular layer	:	2 x 5 MHz	(paired spectrum)
Total	:	2 x 15 MHz	(paired spectrum)

**SmarTone** also considers that given the 5 MHz granularity of the UMTS channel, the distribution of traffic across the cell layers can greatly affect the operator's total spectrum needs depending on the traffic forecast based on service type, geographical area and degree of mobility. For data services, which are expected to be highly asymmetric in nature, the unpaired spectrum is considered to be far more efficient. For this reason the provision of an unpaired 5 MHz carrier to provide coverage and capacity for high traffic density is also considered essential.

**SmarTone** further considers that, taking into account the heavy loading in the microcell layer and the need to support high bit-rate multimedia services, at least 2 carriers are required. In this respect, reservation of 2 x 5 MHz (for microcell) is considered necessary to cater for services and capacity requirements. The total spectrum requirements would be 2 x 15 MHz paired spectrum plus 2 x 5 MHz paired spectrum (reserved) plus 5 MHz unpaired spectrum. In addition, it is better that the 2 x 15 MHz (paired) allocation is within a contiguous block, so that the center carrier in any allocation will be protected from adjacent channel interference.

- 1) **Unpaired frequency block.** The unpaired frequency block is intended to support TDD high-speed, asymmetric data and low mobility applications such as wireless Internet access. Some members consider that unpaired frequency block for TDD applications could be assigned to operators on a need basis or when requested by operators.

Another approach regarding the allocation of spectrum for TDD use is proposed by one member. The request is to consider the possibility of allowing TDD operation within the UMTS 2 x 60 MHz FDD frequency bands. While the actual types of future 3G services are still unknown, there might be possibility of having more asymmetrical TDD services than FDD services. The proposed TDD operation in FDD bands could provide operators with more flexibility in provision of services and hence TDD development should be further monitored for the primary benefit of efficient spectrum utilization. If this approach is adopted, it should be based on non-proprietary standards and solutions. In addition to the technical feasibility of allocating TDD blocks in the FDD bands, commercial availability of terminals supporting the proposed allocation is essential. It is noted that the development in TDD terminal is slow compared with those of FDD.

**Ericsson** considers that, in view of the standardization of TDD for the unpaired band is about a year behind that of FDD for the paired bands and product prospect are uncertain at the moment, it can be argued that allocation of the unpaired bands may take a lower priority than the paired band, until the applications and relationship with FDD become clearer.

**Ericsson** further considers that spectrum efficiency is not achieved unless carrier spacing is more than 5 MHz. In the future, with more advanced filter technology, it may be possible to mix FDD and TDD more freely. CEPT allows such mixing but says that it is presently not technically feasible.

- m) **Allocation of frequency blocks.** The WCDMA standard will use uplink at the ITU IMT-2000 lower band and downlink in the upper band. These frequency bands allocations are opposite to the spectrum plan of the US.

**Ericsson** considers that if OFTA is going to adopt part of the US allocation plan for both the European WCDMA and the US cdma2000 system, consideration should be given to the possibility of uplink and downlink crash.

**SmarTone** recommends to follow the ITU allocation, which matches that of China and would be preferred by most Asian countries. It also provides a close match to the European and Japanese plans, except for the DECT and PHS portions. The existing use of DECT and PHS private phones in Hong Kong would be phased out eventually as IMT2000 system evolves. In any case, OFTA should consult terminal and equipment vendors to ensure that there will be sufficient terminal support for the proposed allocations.

**Motorola** considers that Hong Kong could consider adopting part of the US allocation plan for both the European UMTS and the US cdma2000 system, which could possibly accommodate 3 to 4 operators.

**Cable & Wireless HKT CSL** does not support co-existence of UMTS and cdma2000 on the HK spectrum plan because standard products from two different technologies (UMTS & cdma2000) are basically riding on different regional spectrum plan and operating on different radio parameters (i.e. duplex spacing: 80/190 MHz for cdma2000/UMTS respectively). As the Hong Kong spectrum plan is aligning with ITU plan, which is different from US FCC plan, potential interference problem may happen if both technologies are adopted and placed side-by-side on the HK spectrum plan.

## **Conclusions**

10. Based on the views and recommendations expressed by members, the following conclusions may be drawn:

- a) High speed data and multi-media services are the key drivers for 3G services;
- b) IMT-2000 systems could be deployed for fixed wireless applications;
- c) The satellite component of IMT-2000 would be complementary to terrestrial services in remote and scarcely populated areas;

- d) Co-siting of 2G and 3G systems is technically feasible from the electromagnetic compatibility point of view;
- e) Number portability could be implemented on 3G systems;
- f) Multiple 3G standards networks might increase the technical complexity (including spectrum coordination with mainland China at border areas and the potential requirement of guard bands). One member considers that the technical complexity of having different 3G standards would be overcome as harmonization of standards develops, but other members forecasted that this might not happen in the immediate future;
- g) Multi-mode handsets could offer flexibility to both the operators and the customers;
- h) It is preferable to co-ordinate the 3G spectrum with mainland China to avoid possible interference;
- i) The total spectrum of 230 MHz as identified in WRC 92 should be made available for IMT-2000;
- j) A minimum 2 x 15 MHz FDD plus 5 MHz TDD spectrum allocation per operator is preferred;
- k) Harmonization between TDD and FDD operation and flexible use of TDD and FDD techniques should be further considered, with the aim of improving the efficient use of spectrum; and
- l) WCDMA standard uses uplink at the ITU IMT-2000 lower band. This frequency band allocation is opposite to the spectrum plan of the US. If part of the US allocation plan is adopted to accommodate both the European WCDMA and the US cdma2000 system, guard bands might be required.

### **Way forward**

11. The work of the Focus Group has focused on the gathering of updated information on technical matters relating to the introduction of 3G service to Hong Kong. The Focus Group did not touch on the regulatory aspect regarding the introduction of 3G services. In this connection, it is proposed that a separate exercise should be conducted to collect views of the general public and the industry on issues not addressed by the Focus Group.

**Office of the Telecommunications Authority**  
**September 1999**

**Members List of the OFTA IMT-2000 Focus Group**

Mr. K.S. WONG	OFTA (Chairman)
Mr. S.M. KWAN	OFTA
Mr. P.H. MA	OFTA (Secretary)
Mr. Hidetoshi Saito	ARIB
Mr. Shinya Suzuki	Consulate-General of Japan
Mr. Brian CHENG	Consumer Council
Mr. Tetsuyoshi Takenaka	DDI Corporation
Mr. W.K. LEE	Ericsson Limited
Mr. Masahide Kubo	Fujitsu Limited
Mr. Adam WONG	Cable & Wireless HKT CSL
Mr. Norman LAU	Cable & Wireless HKT CSL
Mr. L.K. LO	Cable & Wireless HKT Telephone Limited
Mr. Raymond W.F. CHAN	Hong Kong Institute of Engineers
Mr. Thomson HO	Hong Kong Telecom Users Group
Mr. Edmond SIN	Hutchison Telecommunications Limited
Mr. Cliff WOO	Hutchison Telecommunications Limited
Dr. Henry WONG	Mandarin Communications Limited
Mr. K.T. WONG	Motorola (China) Electronics Limited
Dr. Ching CHUANG	Motorola International Inc.
Mr. Eiji Kito	NEC Corporation
Dr. Qing-An ZENG	NEC Corporation
Mr. Simon SEOW	NEC Hong Kong Limited
Mr. Kevin KWAN	New T&T Hong Kong Limited
Mr. Bill YEUNG	New T&T Hong Kong Limited
Mr. Aaron LUI	New World Telephone
Mr. Ivan LEUNG	New World Telephone
Mr. Jeffrey CHAN	Nokia (H.K.) Limited
Ms. Asha Hemrajani	Nokia (H.K.) Limited
Mr. Alex WONG	Nortel Networks (Asia) Limited
Mr. Emmanuel Sauquet	Nortel Networks (Asia) Limited
Dr. Kohei Satoh	NTT Mobile Communications Network Inc.
Mr. Charles Henshaw	Peoples Telephone Company Limited
Mr. Freddy WOO	Shun Hing Technology Company Limited
Mr. Stephen CHAU	SmarTone Mobile Communications Limited
Mr. Andrew CHAN	SmarTone Mobile Communications Limited
Mr. Bill CHOI	Samsung Electronics (HK) Company Limited
Miss Yan CHENG	Samsung Electronics (HK) Company Limited
Mr. Jarle Mortensen	Siemens Limited
Mr. Stephen YEUNG	Telecom Association of Hong Kong

**Terms of Reference**

- a) to collect views from members on
- general issues - definition of service
    - compatibility and transitional matters
    - timing for individual steps leading up to provision of service
  - standard issues
    - technology neutral approach
    - rules on numbers
    - availability of regional/international standards
    - availability of products
  - radio spectrum issues
    - total spectrum requirement
    - spectrum requirement for one operator
- b) to prepare a report on the views collected by middle of 1999.

**Minutes of First IMT-2000 Focus Group Meeting  
held at 2:30 p.m., 24 September 1998  
at the Conference Room  
of the Office of Telecommunications Authority (OFTA)**

## Present:

Mr. K.S. WONG	OFTA	- Chairman
Mr. S.M. KWAN	OFTA	
Mr. Warren KWOK	OFTA	
Mr. P.H. MA	OFTA	- Secretary
Mr. Hidetoshi Saito	ARIB	
Mr. Brian CHENG	Consumer Council	
Mr. Tetsuyoshi Takenaka	DDI Corporation	
Mr. Peter Mason	Ericsson Limited	
Mr. Takenaka Sadao	Fujitsu Limited	
Mr. Raymond W.F. CHAN	Hong Kong Institute of Engineers	
Mr. T.K. IM	Hong Kong Telecom Users Group	
Mr. C.M. TANG	Hong Kong Telephone Co. Ltd.	
Mr. Vincent MA	Hong Kong Telephone Co. Ltd.	
Mr. Adam WONG	Hongkong Telecom CSL	
Mr. Edmund SIN	Hutchison Telecommunications Limited	
Dr. Henry WONG	Mandarin Communications Limited	
Mr. K.T. WONG	Motorola (China) Electronics Limited	
Dr. Ching CHUANG	Motorola International Inc.	
Dr. Qing-AnZeng	NEC Corporation	
Mr. Simon SEOW	NEC Hong Kong Limited	
Mr. Kevin KWAN	New T&T Hong Kong Limited	
Mr. Albert SIU	New World Telephone	
Mr. Timo Poikolainen	Nokia (H.K.) Limited	
Mr. Vincent CHENG	Nokia (H.K.) Limited	
Dr. Kohei Satoh	NTT Mobile Communications Network Inc.	
Mr. Patrick POON	Peoples Telephone Company Limited	
Mr. Stephen CHAU	Smartone Mobile Communications Ltd.	
Mr. Hubert NG	Telecom Association of Hong Kong	
Mr. Shinya Suzuki	Consulate-General of Japan	

The Chairman, Mr. K.S. WONG, welcomed members to the first IMT-2000 Focus Group Meeting. He said that OFTA was considering the introduction of IMT-2000 service, or commonly regarded as the third generation mobile service, to Hong Kong. He added that the purpose of the Focus Group was to collect views from interested parties on IMT-2000.

## Terms of Reference

2. Mr. WONG then explained the Terms of Reference of the Focus Group referring to Paper FGM-4 "Brief Note on General Regulatory Issues on Introduction of IMT-2000". He said that he would like to collect views on the service nature, transitional arrangement and steps leading to the service launch. Paper FGM-3 "Development of Standardization of 3rd Generation Mobile System" gave a short brief on standards. He said that TG 8/1 of ITU planned to finalize the standards for IMT-2000 by end of year 1999. He added that the original goal of developing a single air interface standard was probably not achievable. TG 8/1 agreed to adopt the "Family of Systems" concept. He highlighted paragraphs 13 to 16 of Paper FGM-3 regarding field trials of IMT-2000 systems in various Asian countries and invited contribution and update on this aspect. He also invited contributions and views on the availability of IMT-2000 products. Referring to Paper FGM-2 "Radio Spectrum Issues on IMT-2000", Mr. WONG said that the World Administrative Radio Conference of 1992 (WARC-92) had allocated 230 MHz of spectrum for IMT-2000 (then known as the Future Public Land Mobile Telecommunications Service, FPLMTS), with a segment of frequency allocated for satellite operations. Annex 1 of the paper indicated IMT-2000 spectrum allocation in ITU, Europe, USA, Japan and Hong Kong. He said that current frequency assignments in the IMT-2000 bands in Hong Kong would be cleared by year 2001. He added that, in terms of radio spectrum, the challenges for Hong Kong was to determine the minimum spectrum required for individual system and the total spectrum required for IMT-2000 service. He invited contributions and views on relevant issues.

3. Mr. Patrick POON said that the radio spectrum of 60 MHz could only accommodate three systems, each operator having 20 MHz. It would not be enough for the six PCS operators in Hong Kong. Mr. WONG said that one of the challenges for the Focus Group was to consider the minimum spectrum for each system. The eligibility for licensing was a separate matter and would not be considered by the Focus Group.

4. Mr. Adam WONG said that the IMT-2000 system trials and licensing in Japan gave some information on the minimum spectrum required with different services requirement. At this stage, it was too early to comment on the minimum spectrum for each operator and the social benefit versus business benefit for Hong Kong without knowing further detail. Mr. K.T. WONG said that Hong Kong could consider adopting part of the US allocation plan for both the European UMTS and the US CDMA 2000 system which could possibly accommodate 3 to 4 operators. Mr. WONG supplemented that proposal for additional spectrum allocation for IMT-2000 was raised in WARC-97 and the proposal would probably be discussed in the next WARC in year 2000.

## Working Method

5. Mr. WONG referred to Paper FGM-1 "Proposed Working Method for the IMT-2000 Focus Group". He said that three Focus Group meetings would be held. If

necessary, more meetings could be arranged. Members would be invited to make presentation to the Focus Group in two parts: the first part to compare their notes and findings on IMT-2000 service and the second part to give their views and recommendations, preferably with supporting reasons. He added that their views and recommendations could be updated before May 1999. He requested members to contact the Secretary, Mr. P.H. MA for arrangement of presentations.

6. Mr. WONG said that OFTA had a number of advisory committees to tackle different issues - the Radio Spectrum Advisory Committee, the Technical Standards Advisory Committee, the Telecommunications Number Advisory Committee, and the Users and Consumers Advisory Committee. He remarked that the idea was to have discussions first in the Focus Group. When firmed views were collected, they would be referred to the appropriate advisory committees for further considerations.

7. In reply to Mr. K.T. WONG, Mr. WONG said that minutes of the Focus Group meeting would be prepared and circulated to all present.

8. In response to Mr. T.K. IM's query, Mr. WONG said that the Group would complete its task by middle of 1999. Mr. T.K. IM hoped that the Focus Group should continue its function prior to the availability of IMT-2000 products, probably by year 2003. Mr. WONG explained that our task was to prepare a report reflecting views collected by next year. The need to continue further work might be considered later.

#### Presentations

9. Dr. Ching CHUANG of Motorola gave a presentation to the Focus Group. He introduced ITU's vision of IMT-2000, migration of second generation (2G) system to third generation (3G) system, the air interface comparison for IS-136++ (TIA), WCDMA (ETSI), W-CDMA (ARIB) and CDMAone (TIA, ARIB), spectrum options and ITU's family of systems concept.

10. Dr. Ching CHUANG said that Motorola would provide 3G system solution for both existing 2G mobile system operators and new 3G mobile system operators. He said that 3G and 2G systems were optimized for high-speed packet data services and low speed circuit data services respectively and there were multiple ways to achieve international roaming in resolving the difference in systems and frequency bands.

11. Mr. Adam WONG enquired the technical advantages of employing different chip rates by different systems. Dr. Ching CHUANG said that the difference in technical advantage was minimal. Dr. Ching CHUANG said that increasing the chip rate would widen the spectrum and might create interference to adjacent bands. He added that IS 95 did not require any guard bands between CDMA systems. Increasing the chip rate might require a guard band to avoid potential interference. However, Mr. Tetsuyoshi Takenaka mentioned they've gone through the study and found that the performance was more or less the same for different W-CDMA systems.

12. Dr. Kohei Satoh referred to the transparency on "Air Interface Comparison" of Motorola's presentation and said that Japan had already proposed to ITU the W-CDMA standard only. The CDMAone was only discussed between TTA and ARIB on air interface and between TTC and US standardization body on network standards.

13. Mr. Patrick POON asked Dr. Ching CHUANG the feasibility of co-siting PCS and IMT-2000 base stations. Dr. Ching CHUANG confirmed such co-siting was technically possible.

14. Mr. Tetsuyoshi Takenaka said that ARIB had studied the chip rates 3.6864 Mcps and 4.096 Mcps in terms of their performance, capacity and spectrum issues including guard bands and concluded that there was no difference in performance between these two chip rates.

15. Mr. Timo Poikolainen of Nokia gave a presentation to the Focus Group. He said that there were over 100 million GSM users, increasing at a rate of 3 million each month. It was also estimated that Internet users would reach 500 million by year 2002. He said that these two developments together created the business case for 3G mobile service development.

16. Mr. Timo Poikolainen said that, from the user's point of view, technology came down to ease of use in terms of international roaming, coverage and quality of service. He said that 3G mobile system would support image processing service allowing life-like transmission of video images. He said that international roaming would be secured by inter-working units between different technology and core networks. He added that terminal equipment such as dual mode terminals supporting both 2G and 3G mobile systems were very important to users.

17. Mr. Timo Poikolainen responded to an earlier question from Mr. Patrick POON and confirmed that co-locating PCS and 3G base stations was feasible. He said that Nokia had performed simulation tests which showed that indoor coverage by outdoor base stations had a service probability of over 80% and this probability would improve in multiple cells environment.

18. Mr. Timo Poikolainen said that Nokia would launch trial of their 3G mobile network early next year in their Finland R&D Center, followed by a second trial network in Japan. He said that Japan planned to freeze the 3G mobile system radio standards by middle of next year and ETSI by end of next year. He said that, once the standards were frozen the manufacturers could produce prototype commercial networks in the market place.

19. Mr. T.K. IM asked what the real drivers for the 3G mobile services were. Mr. Timo Poikolainen replied that the key drivers were high capacity voice services and,

in particular for Hong Kong, data services. The data services for end users were, for example, high quality Internet access and imaging.

20. Mr. T.K. IM further asked if there were any other technical or commercial issues which would slow down 3G mobile system implementation. Mr. WONG said that standardization was critical. He was of the opinion that since there would not be a single technical standard, those commonly adopted standards would be implemented at a faster pace because of commercial incentives.

21. Mr. Patrick POON asked if it was true or just a rumour that USA would not license IMT-2000 until year 2000. Mr. Timo Poikolainen said that he had no knowledge of the situation in the USA. But he said that Finland planned to issue licence within this year while UK and Sweden was also preparing to issue licence.

22. Mr. Raymond W.F. CHAN asked whether there was any multiple standard network, as in the case of a multiple mode handsets. Mr. Timo Poikolainen said that network standards were specified by standardization bodies and he did not see the trend of multiple standard networks. Dr. Ching CHUANG supplemented that even with different network standards, the family of systems concept would permit users to use roaming services to access different networks.

23. Mr. Adam WONG asked about the spectrum allocation to each operator and the number of licences in the UK and Sweden. Mr. Timo Poikolainen said that he did not have the updated information but he would contribute to the Focus Group on this item when more information was available.

(Post meeting note: Mr. Timo Poikolainen informed the Secretary on 30 September 1998 that licensing was still on-going in Europe and no country had made any decisions yet. In the UK, it was likely that 4 licenses would be issued in summer 1999 and 15 MHz would be allocated to each operator. In Finland, the existing mobile operators were likely to be allowed to offer 3G services with 15 MHz for each. In Sweden, it was likely that four licenses would be granted to existing operators in summer 1999.)

24. Mr. Peter Mason gave a presentation to the Focus Group. He said that the main driver for 3G mobile system was the convergence of telecommunications, computer and media industries. He said that the 3G mobile system would support a full range of services from voice services, packet data services up to wideband real-time multi-media services.

25. Mr. Peter Mason described technological developments on evolution of 2G mobile system to 3G mobile system. These developments include Customized application for mobile enhanced logic (CAMEL), high speed circuit switched data (HSCSD), general packet radio services (GPRS) and enhanced data rate (EDGE). He further described the key features and technical characteristics of WCDMA and the "marrying" of GSM/WCDMA networks.

26. Mr. Peter Mason concluded his presentation by raising a number of issues for further discussion by the Focus Group relating to launching of IMT-2000 service in Hong Kong. These issues included spectrum allocation for IMT-2000, spectrum for each operator, licence fee, use of unpaired bands, time frame and technology.

27. Mr. Adam WONG asked the rationales behind that the development of every vendors have similar plans aiming at the smooth migration of 2G mobile systems to 3G mobile systems. Mr. Peter Mason replied that enhanced data rate through EDGE technology could offer smooth migration to make initial launch. Mr. Timo Poikolainen supplemented that EDGE and GPRS technologies would support evolution toward higher data rate for operators with or without a 3G system operating licence. Dr. Ching CHUANG added that it was also preferable to minimize the replacement of network equipment during the evolution of 2G mobile systems to 3G mobile systems.

28. Mr. Adam WONG was of the view that the technical and licensing arrangements for IMT-2000 in other countries such as Singapore, Japan, UK and Sweden, should be collected and might become reference for Hong Kong.

29. Mr. T.K. IM asked the connection between the 3G mobile system developments and satellite communication systems. Mr. WONG said that there was a frequency slot in the ITU IMT-2000 spectrum reserved for satellite application.

30. Mr. Stephen CHAU said that, in addition to the air interface, consideration should also be given to the limitation in transmission bandwidth of the backbone network. Mr. C.M. TANG replied that Hong Kong Telephone Company Limited could provide T1 and ATM broadband service to support the backbone network of IMT-2000.

31. Mr. Peter Mason said that quick availability and economical high capacity communication links were needed to support 3G mobile systems. He further asked OFTA the feasibility for the mobile operator to provide transmission facilities for their backbone networks. Mr. WONG said that some mobile operators had already used 23 GHz microwave links and links at 29 GHz and 40 GHz could also be considered.

32. Mr. Patrick POON asked when IMT-2000 should be introduced. Mr. WONG said that this was one of the area requiring inputs from members of the Focus Group. He requested members to submit their views to the Focus Group.

33. Mr. Adam WONG was of the opinion that the IMT-2000 spectrum allocation plan of mainland China should also be taken into consideration. Mr. Stephen CHAU said that he was also worried about potential conflicts in the allocation of transmit/receive frequency blocks between Hong Kong and Mainland China. Mr. Adam WONG further suggested that the IMT-2000 spectrum should be compatible with that of mainland China with a view to minimizing interference in the border area. In such case,

the Radio Regulatory Department of the Ministry of Information Industry should be consulted.

34. Mr. WONG appealed to members of the Focus Group to make presentations at next meetings.

35. He also requested presenters to send soft-copies of their presentations to the Secretary of the Focus Group at the following e-mail address: [imt2000fg@ofta.gov.hk](mailto:imt2000fg@ofta.gov.hk).

36. There being no other business, the meeting closed at 5:00 p.m. Details about the Second IMT-2000 Focus Group Meeting were:

Date: 10 December 1998 (Thursday)  
Time: 2:30 p.m.  
Venue: OFTA Conference Room  
29/F Wu Chung House  
213 Queen's Road East  
Wanchai  
Hong Kong

Office of the Telecommunications Authority  
December 1998

**Minutes of the Second IMT-2000 Focus Group Meeting  
held at 14:30 hours on 10 December 1998  
at the Conference Room  
of the Office of the Telecommunications Authority**

Present:

Mr. S.M. KWAN	OFTA	- Chairman
Mr. Warren KWOK	OFTA	
Mr. P.H. MA	OFTA	- Secretary
Mr. Brian CHENG	Consumer Council	
Mr. Peter Mason	Ericsson Limited	
Mr. Masahide Kubo	Fujitsu Limited	
Mr. Raymond W.F. CHAN	Hong Kong Institute of Engineers	
Mr. Thomson HO	Hong Kong Telecom Users Group	
Mr. Adam WONG	Hongkong Telecom CSL	
Mr. Edmund SIN	Hutchison Telecommunications Limited	
Dr. Henry WONG	Mandarin Communications Limited	
Mr. K.T. WONG	Motorola (China) Electronics Limited	
Dr. Ching CHUANG	Motorola International Inc.	
Mr. Eiji Kito	NEC Corporation	
Mr. Simon SEOW	NEC Hong Kong Limited	
Mr. Kevin KWAN	New T&T Hong Kong Limited	
Mr. Ivan LEUNG	New World Telephone	
Miss Ira Keskitalo	Nokia (H.K.) Limited	
Miss Asha A. Hemrajani	Nokia (H.K.) Limited	
Mr. Jeffrey CHAN	Nokia (H.K.) Limited	
Mr. Patrick POON	Peoples Telephone Company Limited	
Mr. Bill CHOI	Samsung Electronics (HK) Company Limited	
Miss Yan CHENG	Samsung Electronics (HK) Company Limited	
Mr. Freddy WOO	Shun Hing Technology Company Limited	
Mr. K.F. WONG	Shun Hing Technology Company Limited	
Mr. Stephen CHAU	Smartone Mobile Communications Ltd.	
Mr. Stephen YEUNG	Telecom Association of Hong Kong	
Mr. Shinya Suzuki	Consulate-General of Japan	

Absent with apologies:

Mr. K.S. WONG	OFTA
Mr. Hidetoshi Saito	ARIB
Mr. Tetsuyoshi Takenaka	DDI Corporation
Mr. C.M. TANG	Hong Kong Telephone Co. Ltd.
Mr. Vincent MA	Hong Kong Telephone Co. Ltd.
Dr. Kohei Satoh	NTT Mobile Communications Network Inc.

## Introduction

1. The stand-in Chairman, Mr. S.M. KWAN, welcomed members to attend the Second IMT-2000 Focus Group Meeting. He said that Mr. K.S. WONG, Chairman of the First IMT-2000 Focus Group Meeting, could not attend this meeting because of his engagement in another urgent meeting. In this connection, he would like to render, on behalf of Mr. WONG, his apology to members.

2. Mr. KWAN said that he would like to welcome Shun Hing Technology Company Limited and Samsung Electronics (HK) Company Limited, who had joined the IMT-2000 Focus Group. He further said that OFTA had invited Samsung Electronics (HK) Limited and NEC Corporation to present their views and visions on IMT-2000 technology and development in this meeting.

## Confirmation of the Minutes of the First Focus Group Meeting

3. Mr. P.H. MA said that the following proposed amendments to the draft minutes of the First Focus Group Meeting were received-

- Proposed amendment by Motorola (China) Electronics Ltd.

## General

Mr. K.T. WONG proposed to amend the designation of Mr. Ching CHUANG" to "Dr. Ching CHUANG".

## Paragraph 4

~~Mr. Ching CHUANG~~ Mr. K.T. WONG said that Hong Kong could consider adopting part of the US allocation plan for both the European UMTS and US CDMA 2000 system which could possibly accommodate 3 to 4 operators.

- Proposed amendment by Hong Kong Telecom CSL Ltd.

## Paragraph 4

Mr. Adam WONG said that the IMT-2000 system trials and licensing in Japan gave some information on the minimum spectrum required ~~by~~ with different services systems requirements. At this stage, it was too early to comment on the minimum spectrum for each operator and the social benefit versus business benefit for Hong Kong without knowing further detail. Mr. Ching CHUANG said that Hong Kong could consider adopting part of the US allocation plan for both the European UMTS and the US CDMA 2000 system which could possibly accommodate 3 to 4 operators. Mr. WONG supplemented that proposal for additional spectrum allocation for IMT-2000 was raised in WARC-97 and the

proposal would probably be discussed in the next WARC in year 2000. Kong could consider adopting part of the US allocation plan for both the European UMTS and the US CDMA 2000 system which could possibly accommodate 3 to 4 operators. Mr. WONG supplemented that proposal for additional spectrum allocation for IMT-2000 was raised in WARC-97 and the proposal would probably be discussed in the next WARC in year 2000.

#### Paragraph 11

Mr. Adam WONG ~~asked~~ enquired the technical advantages of employing different chip rates by different systems. Mr. Ching CHUANG said that the difference in technical advantage was minimal. Mr. Ching CHUANG said that increasing the chip rate would widen the spectrum and might create interference to adjacent bands. He added that IS 95 did not require any guard bands between CDMA systems. Increasing the chip rate might require a guard band to avoid potential interference. However, the rep. from Japan(?) mentioned they've gone through the study and found that the performance is more or less the same for different W-CDMA systems.

#### Paragraph 27

Mr. Adam WONG asked the rationales behind that the development of every vendors have similar plans aiming at the ~~raised whether there was a need for~~ smooth migration of 2G mobile systems to 3G mobile systems. Mr. Peter Mason replied that enhanced data rate through EDGE technology could offer smooth migration to make initial launch. Mr. Timo Poikolainen supplemented that EDGE and GPRS technologies would support evolution toward higher data rate for operators with or without a 3G system operating licence. Mr. Ching CHUANG added that it was also preferable to minimize the replacement of network equipment during the evolution of 2G mobile systems to 3G mobile systems.

#### Paragraph 33

Mr. Adam WONG was of the opinion that the IMT-2000 spectrum allocation plan of mainland China should also be taken into consideration. Mr. Stephen CHAU said that he was also worried about potential conflicts in the allocation of transmit/receive frequency blocks between Hong Kong and Mainland China. Mr. Adam WONG further ~~considered~~ suggested that the IMT-2000 spectrum should be compatible with that of mainland China with a view to minimizing interference in the border area, as far as possible. In such case, the National Radio Administrative Bureau should be consulted.

4. Mr. P.H. MA said that, in addition to the proposed amendment to the designation of Dr. Ching CHUANG, the designation of Dr. Henry WONG of Mandarin

Communications Limited, Dr. Kohei Satoh of NTT Mobile Communications Network Inc. and Dr. Ching-An ZENG of NEC Corporation would also be amended accordingly.

5. Regarding the proposed amendment by Hong Kong Telecom CSL to paragraph 11, Mr. P.H. MA confirmed that the representative from Japan was Mr. Tetsuyoshi Takenaka of DDI Corporation.

6. Regarding the proposed amendment by Hong Kong Telecom CSL to paragraph 33, Mr. K.T. WONG supplemented that the Chinese authority responsible for radio spectrum management should be the Radio Regulatory Department of the Ministry of Information Industries. Mr. Adam WONG agreed.

7. The above proposed amendments were confirmed and the minutes of the First Focus Group Meeting would be amended accordingly.

#### Summary of Facts and Views

8. A table summarizing members' views and findings and updated information from other sources was distributed for members' information and comment. Mr. KWAN said that the table summarized the views and findings from members on technical and regulatory aspects that were pertinent to the terms of reference of the IMT-2000 Focus Group.

9. Mr. KWAN said that OFTA would update the table from time to time. He welcomed members to submit their written comments and OFTA would consolidate the relevant information into the table for other members' reference. These information would also be useful for OFTA in the preparation of the final report of the IMT-2000 Focus Group.

#### Presentation by NEC

10. Mr. Eiji Kito said that IMT-2000 should support multimedia services and system equipped with large system capacity, flexible user speed, wired-line quality, low cost and be adaptable to future evolution. The MSC and GMSC would employ ATM switch to interwork with WCDMA in radio access part. With ATM element in the GMSC, built-in IP routing protocol and IP-based service could be realized in a mobile environment.

11. Mr. Eiji Kito said that initial deployment of 3G service in limited urban area using dual mode handsets were commonly discussed. However, it was strongly recommended that wide area deployment of 3G service using single mode handsets should be adopted. He was of the view that dual mode handsets would provide less profit to handset supplier and would not introduce competition among handset suppliers. He concluded the presentation by highlighting the IMT-2000 implementation schedule in

Japan. It was anticipated that the commercial in-service date of IMT-2000 was in year 2001.

12. Mr. KWAN commented that there might be a market demand for dual mode handset because of the time needed to complete the migration from 2G to 3G. Mr. Eiji Kito said that the production of single mode handset was cheaper than that of dual-mode handset since the latter required extra components.

13. Mr. Patrick POON was interested to know when would 3G products of NEC be available. Mr. Eiji Kito said that products were still under development and there was not yet a time table for commercial product launch.

14. Some members asked the name of abbreviations used in the presentation such as CLAD, RSPCs. Mr. Eiji Kito agreed to provide a list of legends to the Secretary after the meeting.

#### Presentation by Samsung

15. Mr. Bill CHOI gave a presentation on Samsung's progress and development on 3G. He said that multiple systems including cdma2000+ANSI-41 and WCDMA+GSM could be deployed as IMT-2000 network. The existing CMDA network would be evolved into cdma2000 1x systems in the interim. He anticipated that 3G system would be available in the market as early as year 2001.

16. Mr. Bill CHOI said that Samsung had participated in the 3G PP1 and 3G PP2 projects. The 3G PP1 project was initiated to develop the IMT-2000 specifications based on WCDMA and evolved GSM network with participation of worldwide standard bodies including ARIB/TTC, ETSI, T1 and TTA. He added that air interface and network interface specifications would be developed during the 1st half of 1999 and the second half of 1999 respectively. For 3G PP2, also with the participation of worldwide standard bodies, the scope of the project was to develop IMT-2000 specifications based on cdma2000 and ANSI-41.

17. In introducing a cdmaOne roadmap, Mr. Bill CHOI said that the evolving IS-95B standard could support 115.2 kps data with improved Soft Hand Over (SHO) and location service. By 1999, IS95-B would be further developed to the cdma2000 1x technology which would double the capacity for voice service and backward compatible with IS-95 family of technologies. In year 2002, cdma2000 would be developed with full IMT-2000 functionality and high speed data service of up to 2 Mbps. Mr. Bill CHOI said that cdma2000 and WCDMA could be operated in either 2 X 15 MHz or 2 x 20 MHz bandwidth.

18. Mr. KWAN asked the commercial launch date of the cdma 2000 1x system. Mr. Bill CHOI said that major vendors intended to launch cdma 2000 1x commercial systems during mid-1999.

19. In reply to a question raised by Miss Asha A. Hemrajani, Mr. Bill CHOI replied that the maximum data speed of cdma2000 1x was 144 kps.

20. Mr. Patrick POON asked the performance difference in 2x15 MHz and 2x20 MHz bandwidth operations. Mr. Bill CHOI said that it was difficult to make a direct comparison as the technological developments were still in progress.

21. Mr. W.F. CHAN asked what was the economic rationale of introducing the cdma2000 1x interim standards and whether there were any killer applications associated with the 1x technology. Mr. Bill CHOI said that the main advantage of 1x system was that operators could double the capacity for voice service.

22. Mr. KWAN thanked NEC and Samsung for their presentations. He said that members were welcome to contact OFTA if they wish to make presentations to the meeting.

#### Discussion on IMT-2000 issues

23. Mr. KWAN invited discussion on IMT-2000 and specific issues related to this Focus Group. Miss Ira Keskitalo commented that as there was a large number of GSM networks worldwide, from an operational viewpoint, dual mode operation would save investment and the adoption of new service could be realized from day one. From the customer perspective, many services in 3G were compatible or similar to those of 2G. Customers would therefore favour the use of dual mode handsets.

24. Mr. Peter Mason fully supported the view of Nokia in the advantages of employing dual mode handsets in 2G to 3G migration. In addition, he said that the cost of providing a country-wide coverage was huge. Wide area coverage and roaming capability could only be economically implemented on a stage by stage basis. Some operators may prefer to implement wide area coverage on a stage by stage basis. Dual mode handsets would therefore be useful towards the implementation of country-wide 3G coverage

25. Mr. Stephen CHAU believed that as some mobile operators in Hong Kong operated in both the 900 MHz and 1.8 GHz spectrum, depending on the applications and market development, there might be a suitable driving market force for the introduction of dual mode handsets.

26. Dr. Ching CHUANG said in the initial launch phase, the demand for high speed data would likely be concentrated in selected areas only and hence the provision of dual-mode handsets target for voice service would be meet the demand of end users.

27. In response to a point made by Mr. Bill CHOI earlier in his presentation, Mr. Peter Mason confirmed that Ericsson had issued a press announcing a proposal to

harmonise different wideband CDMA standards, based on a reduction of chip rate to 3.84 Mcps.

A.O.B

28. Mr. KWAN said that there would be two more meetings before finalizing the Focus Group report. The next meeting would also make available time slots for industry presentations and he hoped that the views and information collected could contribute to the introduction of IMT-2000 in Hong Kong. He welcome members to submit their views and comments on a broad range of issues and OFTA would incorporate their submission in the final Focus Group report.

29. In order to provide members of the public and interested parties with updated information on the work of the IMT-2000 Focus Group, Mr. KWAN proposed to post all the relevant information, including minutes of the Focus Group Meetings and members' presentations, on OFTA Internet homepage. All present members supported the proposal.

Date of Next Meeting

30. There being no other business, the meeting closed at 4:30 p.m. Details about the Third IMT-2000 Focus Group Meeting were:

Date: 4 March 1999 (Thursday)  
Time: 2:30 p.m.  
Venue: OFTA Conference Room  
29/F Wu Chung House  
213 Queen's Road East  
Wanchai  
Hong Kong

Office of the Telecommunications Authority  
12 January 1999

**Minutes of the Third IMT-2000 Focus Group Meeting  
held at 14:30 hours on 14 March 1999  
at the Conference Room  
of the Office of the Telecommunications Authority**

Present:

Mr. K.S. WONG	OFTA	- Chairman
Mr. S.M. KWAN	OFTA	
Mr. P.H. MA	OFTA	- Secretary
Mr. Brian CHENG	Consumer Council	
Mr. Peter Mason	Ericsson Limited	
Mr. Masahide Kubo	Fujitsu Limited	
Mr. Raymond W.F. CHAN	Hong Kong Institute of Engineers	
Mr. Adam WONG	Hongkong Telecom CSL	
Mr. Edmund SIN	Hutchison Telecommunications Limited	
Dr. Henry WONG	Mandarin Communications Limited	
Mr. K.T. WONG	Motorola (China) Electronics Limited	
Dr. Ching CHUANG	Motorola International Inc.	
Mr. Qing-An ZENG	NEC Corporation	
Mr. Bill YEUNG	New T&T Hong Kong Limited	
Mr. Ivan LEUNG	New World Telephone	
Mr. Jeffrey CHAN	Nokia (H.K) Limited	
Mr. Alex YEUNG	Nokia (H.K.) Limited	
Mr. Junko Kato	NTT Mobile Communications Network Inc.	
Mr. Charles Henshaw	Peoples Telephone Company Limited	
Mr. Freddy WOO	Shun Hing Technology Company Limited	
Mr. K.F. WONG	Shun Hing Technology Company Limited	
Mr. Jarle Mortensen	Siemens Limited	
Mr. Stephen CHAU	Smartone Mobile Communications Ltd.	
Mr. Andrew CHAN	Smartone Mobile Communications Ltd.	
Mr. Stephen YEUNG	Telecom Association of Hong Kong	
Mr. Shinya Suzuki	Consulate-General of Japan	

Absent with apologies:

Mr. Hidetoshi Saito	ARIB
Mr. Tetsuyoshi Takenaka	DDI Corporation
Mr. C.M. TANG	Hong Kong Telephone Co. Ltd.
Mr. Thomson HO	Hong Kong Telecom Users Group
Mr. Simon SEOW	NEC Hong Kong Limited
Miss Yan CHENG	Samsung Electronics (HK) Company Limited

## Confirmation of the Minutes of the Second Focus Group Meeting

1. The minutes of the meeting held on 10 December 1998 were confirmed subject to the following amendments:

### **Para. 24**

24. Mr. Peter Mason fully supported the view of Nokia in the advantages of employing dual mode handsets in 2G to 3G migration. In addition, he said that the cost of providing a country-wide coverage was huge. ~~Wide area coverage and roaming capability could only be economically implemented on a stage by stage basis.~~ Some operators may prefer to implement wide area coverage on a stage by stage basis. Dual mode handsets would therefore be useful towards the implementation of country-wide 3G coverage.

### **Para. 27**

27. In response to a point made by Mr. Bill CHOI earlier in his presentation, Mr. Peter Mason confirmed that Ericsson had issued a press release ~~to harmonize different CDMA standards by adopting a chip rate of 3.84 Mcps~~ announcing a proposal to harmonise different WCDMA standards, based on a reduction of chip rate to 3.84 Mcps.

2. In response to Dr. Ching CHUANG, Mr. Peter Mason confirmed that WCDMA standards in paragraph 27 referred to wideband CDMA standards. The above clarification would be incorporated into the confirmed minutes.

## Summary of Facts and Views

3. Mr. K.S. WONG noticed there was not much discussion on whether 3G would be one candidate of wireless local loop application and invited comments from members. Mr. K.T. WONG said that, for information purpose to the Focus Group, the TD-SCDMA developed by China had the possibility for both mobile and wireless local loop applications which will operate within the ITU defined IMT-2000 spectrum.

4. Regarding compatibility and transitional matters, Mr. K.S. WONG said that technical difficulties in the migration of existing 2G to 3G and the compatibility of new 3G with existing 2G systems should both be considered. He added that Peoples Telephone had made a submission to the Focus Group supporting the co-siting of IMT-2000 systems with GSM 1800 systems. He encouraged members to submit views on this matter.

5. Mr. Jeffrey CHAN said that Nokia would have another 3G experimental system in Beijing employing WCDMA at around mid-99. Mr. Stephen YEUNG said that

Ericsson also had a field trial system in Beijing. Mr. Peter Mason added that Ericsson had six wideband CDMA trials in Japan, China and Europe.

6. On standards issue, it was noted that ITU scheduled to adopt IMT-2000 standards by the end of 1999. Mr. K.S. WONG envisaged that the standard/s to be adopted might take different forms: a single standard, one platform with variants or different standards. Peoples Telephone had made a submission to the Focus Group that Peoples Telephone did not support multiple standards network because of increased technical complexity and equipment cost required for multi-mode handsets. He encouraged members to submit further comments on this item.

7. Mr. Peter Mason said that Ericsson had issued a proposal in late February proposing a single IMT-2000 global standard with 4 operational modes: FDD direct spread, FDD multi-carrier, TDD and EDGE. He would forward a copy of the proposal to the Focus Group and update this development in due course.

8. On numbering issues, Mr. K.S. WONG wondered whether the industries would prefer to follow the present arrangement with regard to portable numbers, prefix, etc. He requested members to submit their views on the adoption of similar approach.

9. Regarding the minimum spectrum per operator, Mr. Adam WONG said that in Europe such as Finland and UK the spectrum per operator was either 15 MHz or 20 MHz in pair or/and unpair bands with the reason that the 3G services demand such spectrum rather than technical constraints. He said that, in addition to technical constraints, the spectrum required was closely related to the scope of service brought by 3G. He wondered whether the Focus Group should also address the spectrum requirements from the angle of 3G-services.

10. Mr. K.S. WONG said that the task of the Focus Group was to determine the technical limitations with regard to spectrum. Competition issues would be dealt with later. He further explained that the Focus Group should study the limitations from the angles of frequency re-use, roaming arrangement and spectral efficiency.

11. In terms of frequency re-use, Mr. Jeffrey CHAN, Mr. Peter Mason and Dr. Ching CHUANG considered that 5 MHz was adequate for one system. Mr. Charles Henshaw said that the UMTS Forum had considered various scenarios in terms of frequency re-use and service limitation and he would forward related information to the Focus Group for consideration. Mr. K.S. WONG requested Mr. Jeffrey CHAN, Mr. Peter Mason, Dr. Ching CHUANG and others to submit further detail to support the 5 MHz configuration.

12. Regarding the roaming arrangement, Mr. Adam WONG said that cross-area radio planning was essential in ensuring compatible operations among systems operating in neighbouring territories. In response to Mr. K.T. WONG's comment on the uncertainty in the future frequency plan of China, Mr. Adam WONG said that different

applications operating in the same frequency band at neighbouring territories might result in systems incompatibility resulting interference. He was of the view that compatibility of 3G systems across neighbouring territories should only be considered upon finalization of the frequency plan in China. Mr. K.S. WONG requested members to provide further input on this limitation.

13. On spectral efficiency, Mr. Stephen CHAU said that service provision and expansion capability should also be considered. He proposed that the Focus Group should explore the relationship between capacity and service/application and considered the UMTS Forum recommendation was a good reference point to start with. Mr. Adam WONG agreed.

14. Mr. K.S. WONG said that one way to tackle this issue was to consider the data rate, the service provision and capacity against various spectrum, say, 5, 10, 15 or 20 MHz to be assigned per operator. He requested members to study and provide further inputs along this method.

15. Mr. Stephen CHAU proposed the equipment supplier to share the result of their field trials in terms of the spectral efficiency and service limitation. Mr. Jeffrey CHAN said that Nokia would consider the request internally before agreeing to contributing these results to the Focus Group. Mr. Peter Mason said that the result of these trials might not be directly applicable due to the relatively small number of users and types of services involved. Mr. K.S. WONG welcomed members' submissions both from the field trials and theoretical calculations.

16. Mr. K.S. WONG urged members to submit their views and recommendations in order to ensure timely production of the Focus Group final report by June 1999.

#### Presentation by Smartone

17. Mr. Andrew CHAN gave a presentation covering Smartone's achievements with 2G system, their outlook and goals of mobile communication, their views and key factors for successful 3G implementation in Hong Kong. He said that 2G to 3G migration should be seamless and it was preferable to preserve existing GSM equipment investment. Regarding standards, Smartone supported an open platform for more choices and unified standards for global roaming. He further advised that the success of 3G would depend on the co-operation among regulator in ensuring fair competition, vendors in delivering new equipment and operators in providing innovative solutions.

18. Mr. Adam WONG agreed that co-operation among regulator, operators, vendors and customers was important because 3G involved a new dimension in competition in service provision which was not available in the 2G environment.

19. Mr. K.T. WONG said that in addition to individual users, the Focus Group should also address the need of user groups such as police, schools, etc. Mr. K.S. WONG said that the final report of the Focus Group would identify issues which might be further discussed in OFTA's four Advisory Committees.

Format of the final report

20. Mr. K.S. WONG introduced Paper FGM-5 on the format of the final Focus Group report. There were no immediate comments from members. Mr. K.S. WONG said that the draft report would be circulated by e-mail for members' comment.

Date of Next Meeting

21. There being no other business, the meeting closed at 5:00 p.m. The Fourth IMT-2000 Focus Group Meeting would be held in the first half of May 99. Exact date to be determined in due course.

Office of the Telecommunications Authority  
March 1999

**Minutes of the Fourth IMT-2000 Focus Group Meeting**  
**held at 14:30 hours on 6 May 1999**  
**at the Conference Room**  
**of the Office of the Telecommunications Authority**

Present:

Mr. K.S. WONG	OFTA	- Chairman
Mr. S.M. KWAN	OFTA	
Mr. P.H. MA	OFTA	- Secretary
Mr. Brian CHENG	Consumer Council	
Mr. Tetsuyoshi Takenaka	DDI Corporation	
Mr. W.K. LEE	Ericsson Limited	
Mr. Masahide Kubo	Fujitsu Limited	
Mr. Adam WONG	Hongkong Telecom CSL	
Mr. Norman LAU	Hongkong Telecom CSL	
Mr. L.K. LO	Hong Kong Telephone Company Limited	
Mr. Cliff WOO	Hutchison Telecommunications Limited	
Dr. Henry WONG	Mandarin Communications Limited	
Mr. K.T. WONG	Motorola (China) Electronics Limited	
Dr. Ching CHUANG	Motorola International Inc.	
Mr. M. Yamato	NEC Hong Kong Limited	
Mr. Bill YEUNG	New T&T Hong Kong Limited	
Mr. Aaron LUI	New World Telephone	
Mr. Jeffrey CHAN	Nokia (H.K.) Limited	
Ms. Asha Hemrajani	Nokia (H.K.) Limited	
Mr. Emmanuel Sauquet	Northern Telecom (Asia) Limited	
Mr. Edmund LEE	Northern Telecom (Asia) Limited	
Mr. Junko Kato	NTT Mobile Communications Network Inc.	
Mr. Freddy WOO	Shun Hing Technology Company Limited	
Mr. Stephen CHAU	Smartone Mobile Communications Limited	
Mr. Andrew CHAN	Smartone Mobile Communications Limited	
Mr. Shinya Suzuki	Consulate-General of Japan	

Absent with apologies:

Mr. Hidetoshi Saito	ARIB
Mr. Raymond W.F. CHAN	Hong Kong Institute of Engineers
Mr. Thomson HO	Hong Kong Telecom Users Group
Dr. Qing-An ZENG	NEC Corporation
Mr. Charles Henshaw	Peoples Telephone Company Limited
Miss Yan CHENG	Samsung Electronics (HK) Company Limited
Mr. Jarle Mortensen	Siemens Limited
Mr. Stephen YEUNG	Telecom Association of Hong Kong

## Confirmation of the Minutes of the Third Focus Group Meeting

1. The minutes of the meeting held on 6 March 1999 were confirmed subject to the following amendments:

### **Para. 5**

5. Mr. Jeffrey CHAN said that Nokia ~~had one additional field trial system in Beijing in mid-99 employing wideband CDMA~~ would have another 3G experimental system in Beijing employing WCDMA at around mid-99. Mr. Stephen YEUNG said that Ericsson also had a field trail system in Beijing. Mr. Peter Mason added that Ericsson had six wideband CDMA trials in Japan, China and Europe.

### **Para. 9**

9. Regarding the minimum spectrum per operator, Mr. Adam WONG said that in Europe such as Finland and UK the spectrum per operator was either 15 MHz or 20 MHz in pair or/and unpair bands with the reason that the 3G services demand such spectrum rather than technical constraints. He said that, in addition to technical constraints, the spectrum required was closely related to the scope of service brought by 3G. He wondered whether the Focus Group should also address the spectrum issue requirements from the angle of 3G-services competition.

### **Para. 12**

12. Regarding the roaming arrangement, Mr. Adam WONG said that cross-area radio planning was essential in ensuring compatible operations among systems operating in neighbouring territories. In response to Mr. K.T. WONG's comment on the uncertainty in the future frequency plan of China, Mr. Adam WONG said that different applications operating in the same frequency band at neighbouring territories might result in systems incompatibility resulting interference. He was of the view that compatibility of 3G systems across neighbouring territories should only be considered upon finalization of the frequency plan in China. Mr. K.S. WONG requested members to provide further input on this limitation.

## Presentation by Northern Telecom

2. Mr. Emmanuel Sauquet of Northern Telecom (Asia) Limited (Nortel) gave a presentation on their vision on 3G development. He said that 3G services offer speed up to 2 Mbps and services at 384 kbps will be the most popular ones.

3. Mr. Emmanuel Sauquet pointed out that the evolution of 2G to 3G networks should be based on cost effective solutions and should maximize the potential of the existing GSM/DCS networks. He also explained the timeline, spectrum plan and air interface standards of 3G systems development.

4. Mr. Emmanuel Sauquet said that 3G would bridge the wireless and the wire-line telecommunications networks. Internet mobility and fully integrated multi-media services could be realized by interconnecting different access platforms (GSM, GPRS, CDMA, etc.) to the same IP-backbone.

#### Summary of Facts and Views

5. Mr. K.S.WONG said that the IMT-2000 Focus Group had received contributions from Fujitsu Limited (Fujitsu), Hongkong Telecom CSL (CSL) and Nokia (H.K.) Limited (Nokia).

6. On fixed wireless access (FWA), Mr. Masahide Kubo said that FWA would provide efficient and low-cost access networks in developing countries. The use of FWA as countermeasures for depopulated areas and as a tool for competition in fixed network was also examined in some developed countries. With modification to the signalling of IMT-2000 system, FWA could provide voice telephony, ISDN and voice band data services.

7. On satellite application, Nokia was of the view that current and future satellite services would be useful in places where traditional cellular services, including UMTS, were not available. Nokia further considered that IMT-2000 MSS bands should be reserved for those emerging MSS services and was of the view that the current IMT-2000 MSS allocation was sufficient in providing these services.

8. On 2G to 3G system migrations, Nokia's submission considered that smooth migration should follow the GSM-GPRS-UMTS migration path. The GPRS would provide a standardized platform and interface for IP packet data services supporting the Internet services. Core network elements of GSM and GPRS could be migrated to UMTS by introducing an interworking interface between GSM and WCDMA systems.

9. On numbering issue, Fujitsu proposed assigning leading digit "0" numbers to 3G mobile services. Mr. S.M. KWAN explained that the current practice in Hong Kong was to allocate number block of 100,000 numbers with leading digit "9" to mobile operators for onward assignment of 8 digits number to users. Recently, a new number level with leading digit "6" had been opened for future expansion of mobile services. He considered that the new number level would provide sufficient numbering capacity for the future development of mobile services, including IMT-2000 services, in Hong Kong.

10. Mr. Masahide Kubo explained that the proposal of assigning leading digit "0" to mobile services was to provide a more user-friendly numbering plan for mobile services. Mr. K.S. WONG welcomed Mr. Masahide Kubo's suggestion and would consider his proposal. He added that the whole number level with leading digit "0" in the Hong Kong Numbering Plan was allocated and reserved for international networks access, not for mobile services.

11. On number portability, Nokia believed that 2G and 3G operators might share the same or use different number ranges and considered that number portability between 2G and 3G could follow the basic GSM portability principles. Mr. K.S. WONG said, and all members agreed, that number portability should be implemented in 3G systems in Hong Kong. Given Hong Kong had adopted the Intelligent Network and Distributed Database approach for number portability of 2G systems, he further requested members' input on whether there were any technical barriers in the implementation of number portability of 3G systems and their compatibility with 2G systems.

12. On air interface standards, Mr. K.S. WONG said that ITU had adopted "a single flexible standard" with multiple access methods which included CDMA, TDMA and a combination of CDMA/TDMA (all potentially in combination with SDMA) at the 16<sup>th</sup> TG 8/1 meeting held in Brazil. He further said that a new Working Group 5 of the TG 8/1 was formed to prepare ITU Recommendation on the radio specification of the adopted standard. He said that ITU scheduled to finalize the Recommendation on radio specification in the 18<sup>th</sup> TG 8/1 meeting to be held in Helsinki on November 1999.

13. Mr. K.S. WONG said that the ITU adopted standard would allow coexistence and interoperability between 2G and 3G systems. He requested members' input on the technical limitations on the coexistence and interoperability of systems employing different air interface standards operating in the IMT-2000 spectrum.

14. On spectrum requirement, Mr. K.S. WONG said that the 16<sup>th</sup> TG 8/1 meeting had approved the additional terrestrial spectrum requirement of 160 MHz and the total MSS requirement of 2x67 MHz by year 2010. Candidate bands for the additional spectrum were being examined and had not yet been finalized. TG 8/1 would submit their views on additional spectrum requirement to the Conference Preparatory Meeting (CPM) of the WRC-2000 to be held on November 1999 in Geneva. In addition to the ITU TG 8/1, it was believed that individual members of the ITU would also submit their comments to the CPM.

15. Mr. Adam WONG said that allocation of additional spectrum would affect the number of IMT-2000 licences to be issued in Hong Kong and asked whether this subject would be included in the public consultation on the introduction of IMT-2000 to Hong Kong. Mr. K.S. WONG responded that OFTA would closely monitor the development of additional spectrum requirement in the WRC-2000. If the timing of WRC-2000's decision could cope with time frame of OFTA's consultation, the issue of

whether allocating additional spectrum for additional licences might be considered for incorporation in the public consultation exercise.

16. On the issue of multi-standards network, Nokia was of the view that no guard bands would be required between two different wideband systems operating in the IMT-2000 paired band with similar duplex directions. The operation of TDMA and CDMA technologies in adjacent bands, however, would require further investigation. Mr. Adam WONG said that guard band might be required for WCDMA/cdma2000 systems or FDD/TDD transmission modes working close to each other.

17. Dr. Ching CHUANG said that no guard band would be required for in-band migration of cdmaOne to cdma2000 system. He considered that guard band might be required for narrowband and wideband technologies operated in adjacent bands. He pointed out that interference would exist between cdma2000 base-transmit to WCDMA base-recv and WCDMA mobile-transmit to cdma2000 mobile-recv. He further said that with the provision of proper filter, the width of guard band could be reduced. Ms. Asha Hemrajani clarified Nokia's view that guard band would not be required only between wideband systems with similar duplex direction and not working in the current spectrum with existing systems.

18. Mr. K.S. WONG requested the manufacturers to comment on the guard band issue for 2G and 3G systems of different air interface standards working in adjacent bands. Mr. Emmanuel Sauquet said that Nortel had done some research in this area and would be pleased to share their findings in the next meeting.

19. On spectrum requirement per operator, Fujitsu submitted the Adachi model to calculate the system capacity with different operating bandwidth for direct spread CDMA system. Fujitsu was of the view that at least 20 MHz x 2 bandwidth was required to support a maximum data rate of 2 Mbit/sec.

20. In response to Dr. Ching CHUANG, Mr. Masahide Kubo confirmed that a system with 5 MHz x 2 spectrum could support a maximum data rate of 598 Kbit/sec, providing three 230 Kbit/sec data services, one 154 Kbit/sec packet data service and 37.16 Erlang voice service simultaneously.

21. In response to Ms. Asha Hemrajani, Mr. Masahide Kubo confirmed that the maximum data rate at Table 1 of their submission was the summation of the data rates for 64 Kbit/sec data, 154 Kbit/sec packet data and the data rate for voice services. He also confirmed that 20% transmission overhead and Eb/Io (bit energy/interference) of 3 dB were adopted.

22. Mr. Adam WONG said that Fujitsu's submission showed that 3G system would require 20 MHz x 2 spectrum to support 2 Mbit/sec services for multi-users. He said that spectrum allocation of 20 MHz x 2 should be considered in the licensing of 3G system in Hong Kong.

23. Ms. Asha Hemrajani said that Nokia supported the UMTS recommendation of allocating 15 MHz x 2 FDD plus 5 MHz TDD spectrum as the preferred minimum requirement per operator for the year 2002–2005. The allocation of 15 MHz x 2 spectrum for 3 FDD carriers allowed implementation of hierarchical cell structures providing maximum flexibility to cater for different services.

24. Mr. K.S. WONG asked Nokia for clarification about their input regarding the provision of 2 Mbit/sec services with 5 MHz x 2 allocation. Mr. Emmanuel Sauquet informed the meeting that Nortel's research showed that the practical data rate with 5 MHz x 2 spectrum was 384 Kbit/sec but could support a maximum data rate of 2 Mbit/sec for one user per cell.

25. Ms. Asha Hemrajani said that in an indoor environment, each cell could support one 2 Mbit/sec high-speed data user provided that the user is not in soft handover. Mr. Masahide Kubo referred to Fujitsu's submission and supplemented that, with an operating bandwidth of 20 MHz x 2, the system would be able to support multi-users of 2 Mbit/sec services.

26. Mr. Adam WONG said that 5 MHz x 2 was technically feasible for 3G system but feedback from vendors and field tests showed that it would not support a viable business case. He supported Nokia's view that 3 FDD plus 1 TDD carriers was the minimum spectrum per operator for starting a reasonable business with 3G system. Mr. K.S. WONG observed from CSL's submission that there were limitations to high-speed data services with 5 MHz x 2 spectrum. He added that the Focus Group would like to consider, as the first step, the technical limitation to spectrum per operator. Other factors including service limitation, spectral efficiency and competition would also be considered on a step by step basis.

27. Dr. Ching CHUANG presented Motorola's view on the relationship between various operating bandwidth and the applications that were supported by enhanced 2G and 3G systems. He explained that 3G system with 5 MHz and 15 MHz operating bandwidth would support high quality video services with a data rate of 384 Kbit/sec and 2 Mbit/sec respectively. Enhanced 2G system with GPRS would support lower quality video services with 144 Kbit/sec.

28. On unpaired block allocation, Fujitsu was of the view that unpaired band was intended to support TDD high-speed, asymmetric data and low mobility applications such as wireless Internet access. Nokia was of the view that TDD spectrum could be assigned to operators on a need basis or when requested by operators.

29. On spectrum planning, the spectrum plan submitted by Nokia showed the proposed uplink and downlink allocation for the Hong Kong, which was equivalent to the allocation of the UMTS and Japan, but opposite to the allocation in the United States. Ms. Asha Hemrajani clarified that their spectrum plan was not Nokia's proposal on

uplink/downlink allocation but showed their assumption on the spectrum allocation of Hong Kong.

30. Mr. Adam WONG said that, in Hong Kong, the block for TDD operation was allocated to DECT and PHS systems. He was of the view that OFTA could, based on usage of DECT and PHS equipment in Hong Kong, re-allocating this frequency block for 3G TDD use. Mr. K.S.WONG clarified that OFTA did not have the usage statistic of DECT and PHS equipment as they were exempted from licensing. He requested members to comment on the proposal.

31. Mr. Adam WONG further requested OFTA to consider the possibility of allowing TDD operation within UMTS 60 MHz x 2 FDD frequency bands. He explained that the types of future 3G services were still unknown and hence there might be the possibility of having more asymmetrical TDD services than FDD services. The proposed TDD operation in FDD bands would provide operators with more TDD spectrum and the flexibility in provision of services.

32. Mr. Norman LAU explained CSL's proposed TDD spectrum allocation to the Focus Group. He suggested that 10 MHz at the top of each of the upper and lower IMT-2000 FDD bands could be allocated for TDD operation. A 5 MHz guard band between the TDD and FDD blocks might be required. He added that the width of guard band could be varied depending on the types of systems operating adjacent to the guard bands.

33. Mr. Stephen CHAU said that, in addition to the technical feasibility of allocating TDD blocks in the FDD bands, commercial availability of terminals supporting the proposed allocation was essential. He said that the development in TDD terminal was slow compared with that of FDD terminals. Therefore, he considered that additional TDD blocks could be identified in the additional spectrum in the 2 GHz band to cope with the development of TDD terminals. Mr. K.S. WONG requested for members' input on the availability of equipment supporting the proposed "TDD operation within the FDD bands".

34. Mr. Adam WONG clarified that CSL's proposal was intended to provide flexibility to OFTA and the future operators for considering the licensing and operation of 3G services and was not CSL's view on the spectrum allocation to 3G operators. He stressed that if this approach was adopted, it should be based on non-proprietary standards and solutions. Mr. K.S. WONG agreed and said that if CSL's proposed operating mode would be adopted by the ITU, there should be an open ITU standard.

35. Mr. K.S. WONG recalled that, in earlier Focus Group meeting, members had inquired about the IMT-2000 spectrum plan of China. He tabled a spectrum plan showing the reserved IMT-2000 frequency bands of China, which was extracted from the Asia-Pacific Mobile Communications Symposium held in September 1998 in Hong Kong for members' general reference.

36. Mr. K. S. WONG requested members' further contributions on those items highlighted "request for input" in the summary table (Table FGM-3). These items included 2G to 3G migrations, numbering portability, multiple air-interface standards, spectrum per operator in terms of frequency re-use, roaming arrangement, spectral efficiency and service limitation, and the following spectrum related issues:

- (a) How to divide the IMT-2000 spectrum into frequency blocks for different allocations;
- (b) Allocation of uplink and downlink frequency blocks;
- (c) Requirement on guard band;
- (d) Requirement on unpaired blocks and their compatibility with existing services such as DECT and PHS; and
- (e) Impact of multiple air-interface standards on spectrum plan.

37. Mr. K.S. WONG requested members to submit their contributions in a month's time to ensure timely completion of the IMT-2000 Final Report by end of June 1999.

A.O.B.

38. Mr. K.S. WONG said that 17<sup>th</sup> and 18<sup>th</sup> TG 8/1 meetings would be held in end May and October 1999 at Beijing and Helsinki respectively. If members would like to attend these meetings, he requested interested members to contact OFTA at their earlier convenience for necessary arrangements.

Date of Next Meeting

39. There being no other business, the meeting closed at 5:00 p.m. The Fifth IMT-2000 Focus Group Meeting would be held by end of June 1999. Exact date to be determined in due course.

Office of the Telecommunications Authority  
June 1999

**Minutes of the Fifth IMT-2000 Focus Group Meeting  
held at 14:30 hours on 16 July 1999  
at the Conference Room  
of the Office of the Telecommunications Authority**

Present:

The Chairman	OFTA	- Chairman
Mr. S.M. KWAN	OFTA	
Mr. P.H. MA	OFTA	- Secretary
Ms. Anita TSANG	Consumer Council	
Mr. Raymond W.F. CHAN	Hong Kong Institute of Engineers	
Mr. W.K. LEE	Ericsson Limited	
Dr. Ken ZHANG	Ericsson Limited	
Mr. Kenneth LAW	Fujitsu Limited	
Mr. Adam WONG	Cable & Wireless HKT CSL	
Mr. Norman LAU	Cable & Wireless HKT CSL	
Mr. L.K. LO	Cable & Wireless HKT Telephone Ltd	
Mr. Jimmy WONG	Hutchison Telecommunications Limited	
Mr. Angus YU	Hutchison Telecommunications Limited	
Dr. Henry WONG	Mandarin Communications Limited	
Mr. Kenjiro Maetan	NEC Corporation	
Dr. Qing-An ZENG	NEC Corporation	
Mr. Simon Seow	NEC Hong Kong Limited	
Mr. Kevin KWAN	New T&T Hong Kong Limited	
Mr. Ivan LEUNG	New World Telephone	
Mr. Alex YEUNG	Nokia (H.K.) Limited	
Mr. Jeffrey CHAN	Nokia (H.K.) Limited	
Mr. Alex WONG	Nortel Networks (Asia) Limited	
Mr. Freddy WOO	Shun Hing Technology Company Limited	
Mr. K.F. WONG	Shun Hing Technology Company Limited	
Mr. Stephen CHAU	Smartone Mobile Communications Limited	
Ms. Katherine KWAN	Smartone Mobile Communications Limited	
Mr. Stephen YEUNG	Telecom Association of Hong Kong	

Absent with apologies:

Mr. Hidetoshi Saito	ARIB
Mr. Shinya Suzuki	Consulate-General of Japan
Mr. Tetsuyoshi Takenaka	DDI Corporation
Mr. Thomson HO	Hong Kong Telecom Users Group
Mr. Charles Henshaw	Peoples Telephone Company Limited
Mr. Junko Kato	NTT Mobile Communications Network Inc.
Miss Yan CHENG	Samsung Electronics (HK) Company Limited
Mr. Jarle Mortensen	Siemens Limited
Mr. K.T. WONG	Motorola (China) Electronics Limited
Dr. Ching CHUANG	Motorola International Inc.

## Confirmation of the Minutes of the Fourth Focus Group Meeting

1. The minutes of the meeting held on 6 March 1999 were confirmed subject to the following amendments:

- **by Northern Telecom (Asia) Limited**

### paragraph 2

2. Mr. Emmanuel Sauquet of Northern Telecom (Asia) Limited (Nortel) gave a presentation on their vision on 3G development. He said that 3G services offer speed up to 2 MBPS and services at 384 kbps will be the most popular ones. ~~demanded high speed data transmission rate of 2 Mbit/sec and anticipated that the equipment cost in terms of bit/sec would be lowered by at least an order of magnitude by the year 2005.~~

### paragraph 3

3. Mr. Emmanuel Sauquet pointed out that the evolution of 2G to 3G networks should be based on cost effective solutions and should maximize the potential of the existing ~~TDMA, GSM/DCS~~ networks. He also explained the timeline, spectrum plan and air interface standards of 3G systems development.

### paragraph 4

4. Mr. Emmanuel Sauquet said that 3G would bridge the wireless and the wire-line telecommunications networks. Internet mobility and fully integrated multi-media services could be realized by interconnecting different access platforms (GSM, GPRS, CDMA, etc.) to the same IP-backbone-service platforms via routers to the IP backbone.

- **by Nokia (HK) limited**

### Paragraph 7

7. On satellite application, Nokia was of the view that current and future satellite services would be useful in places where traditional cellular services, including UMTS, were not available. Nokia further considered that IMT-2000 MSS bands should be reserved for those emerging MSS services and was of the view that the current IMT-2000 MSS allocation was sufficient in providing these services. ~~Ms. Asha Hemrajani supplemented that the objective of Nokia's submission was to encourage the introduction of MSS services and considered that MSS bands might also be used for other non-satellite services.~~

### Paragraph 11

11. On number portability, Nokia believed that 2G and 3G operators might share the same or use different number ranges and considered that number portability between 2G and 3G ~~should~~ could follow the basic GSM portability

principles. The Chairman said, and all members agreed, that number portability should be implemented in 3G systems in Hong Kong. Given Hong Kong had adopted the Intelligent Network and Distributed Database approach for number portability of 2G systems, he further requested members' input on whether there were any technical barriers in the implementation of number portability of 3G systems and their compatibility with 2G systems.

**Paragraph 23**

23. Ms. Asha Hemrajani said that Nokia supported the UMTS recommendation of allocating 15 MHz x 2 FDD plus 5 MHz TDD spectrum as the preferred minimum requirement per operator for the year 2002–2005. The allocation of 15 MHz x 2 spectrum for 3 FDD carriers allowed implementation of hierarchical cell structures providing maximum flexibility to cater for different services.

**Paragraph 25**

25. Ms. Asha Hemrajani said that in an indoor environment, each cell could support one 2 Mbit/sec high-speed data user provided that the user is not in soft handover. ~~She added that the provision of 2 Mbit/sec service with 5 MHz x 2 allocation would depend on different environment, but the system could generally support one high-speed data user on a per-cell basis.~~ Mr. Masahide Kubo referred to Fujitsu's submission and supplemented that, with an operating bandwidth of 20 MHz x 2, the system would be able to support multi-users of 2 Mbit/sec services.

**Paragraph 28**

28. On unpaired block allocation, Fujitsu was of the view that unpaired band was intended to support TDD high-speed, asymmetric data and low mobility applications such as wireless Internet access. Nokia was of the view that ~~if frequency sharing between 3G and PHS was incompatible, the remaining spectrum (i.e. 1910–1920 and 2010–2025 MHz) TDD spectrum~~ could be assigned to operators on a need basis or when requested by operators.

2. The Chairman said that the objective of this last Focus Group meeting was to finalize the content of the draft Report of the OFTA IMT-2000 Focus Group (the report). The Chairman added that the Focus Group had received written contributions from Ericsson Limited, Cable & Wireless HKT CSL, New World Telephone, and SmarTone Mobile Communications Limited. These contributions had been included in the second draft Report for discussion. Comments in a delayed contribution from Nortel Networks (Asia) Limited were also tabled for consideration.

3. The Chairman said that he would go through the second draft report by paragraphs for discussions and comments. The report would record comments as majority views of members if no consensus was reached on certain particular item. Members could also use either their names or the general term "members" to represent the views of their organization. The following comments were noted.

4. On paragraph 8 (a), Mr. Adam WONG said that the proposed new text was to highlight the importance of seamless global roaming capability of 3G service to the business users. That was agreed.
5. On paragraph 8 (c), the Chairman confirmed that the IMT-2000 spectrum reserved for mobile satellite service was 60 MHz. The report would be amended accordingly.
6. On paragraph 8 (f), Mr. Alex WONG said that Nortel Networks had carried out a number of 3G field trials in Canada, France and UK. He said that Nortel Networks had also demonstrated 3G radio technology in the US and had announced a trial with Telstra in Australia based on cdma2000 standard in year 2000.
7. On paragraph 8 (g), it was mentioned that, UK would reserve a licence with the largest spectrum to a new entrant and allow the subscribers of the new entrant to roam with the existing second generation networks. Mr. Adam WONG said that these issues were related to market competition and licensing and were not within the Terms of Reference of the Focus Group. It was agreed that relevant content would be deleted from this paragraph.
8. On paragraph 8 (h), it was agreed to remove the views of members on the requirement of number portability and number ranges to paragraph 9 (e) of the report.
9. On paragraph 8(l), Dr. Ken ZHANG said that three 5 MHz carriers were required to ensure flexible deployment of macro-cells in a three cell-layers structure for the delivery of 2 Mbps services. It was agreed that Ericsson's proposed new text would be included in the final draft report.
10. On paragraph 9 (b), Dr. Ken ZHANG said that the phase "GSM-GPRS-UMTS" did not clearly describe the evolution of GSM to UMTS. Intermediate stages in the migration path, such as EDGE, were not mentioned. He suggested to delete the term "GPRS" in order to provide a more general description of the evolution process. That was agreed.
11. On paragraph 9 (e), it was agreed to replace the word "should" by "could".
12. On paragraph 9 (f), Mr. Stephen CHAU supported the technology neutral approach to 3G standards. For the benefit of customers, a minimum number of 3G standards should be introduced to achieve the economy of scale. Dr. Ken ZHANG said that Ericsson could support different 3G standards. He added that the operators should consider the availability of products when launching their services.
13. Mr. Jimmy WONG said that Hutchison supported the technology neutral approach and considered that multiple 3G standards should be allowed to suit particular

need of the market and to provide market competition. Mr. Adam WONG commented that the connection between multiple 3G standards and market competition should not be addressed in the Focus Group. He said that multiple standards might need guard band (which was not spectrum efficient) and more coordination with mainland China.

14. On paragraph 9 (g), Mr. Stephen CHAU reported their findings on the capacity loss of co-existing two UTRA systems. According to the ETSI SMG2 UMTS-L1 Tdoc 101/98, there would be capacity loss of 5 to 10 % in the case of co-existing with uncoordinated UTRA FDD systems if no guard bands were provided. For co-existing narrow band GSM with WCDMA system, Mr. Stephen CHAU added that their field trial showed there was no interference between these two systems.

15. On paragraph 9 (j), the Chairman proposed to remove the comments from Ericsson, Cable & Wireless HKT CSL, Motorola and Smartone, which were related to spectrum plan and uplink/downlink allocation, to the new sub-paragraph 9 (m).

16. On spectrum planning, Mr. Adam WONG said that the Focus Group was a technical forum and should decide whether Hong Kong should adopt the ITU IMT-2000 spectrum plan, maximize spectrum efficiency by avoiding the need for guard bands and coordinate with mainland China on IMT-2000 spectrum plan.

17. On paragraph 9 (k), Mr. Stephen CHAU said that a minimum spectrum allocation of 2 x 15 MHz paired spectrum (i.e. three 5 MHz carriers) was essential for hierarchical cell structure, which was essential to cater for network capacity and spectrum efficiency. He also suggested to reserving 2 x 5 MHz for future growth and the uncertainty in guard band requirement, and allocating 5 MHz unpaired spectrum for asymmetric data services.

18. Considering the development of TDD applications and the recommendation of UMTS Forum Report No. 5, Mr. Alex WONG proposed that the preferred minimum spectrum 2 x 15 MHz paired plus 5 MHz unpaired spectrum should be available for new entrant at the initial phase of IMT-2000.

19. On paragraph 9 (l), the Chairman said that Ericsson and Nortel Networks' submissions on their views about development of TDD applications would be included in the report.

20. On paragraph 9 (m), the Chairman said that there were two ways to assign the spectrum: designate particular sections of the 2 x 60 MHz IMT-2000 terrestrial components for uplinks and downlinks; or to allow reverse uplinks and downlinks to co-exist. Guard bands might be needed in the latter case. He reminded that the latter case was not spectrum efficient and might effectively reduce the number of 3G operators.

21. Mr. S.M. KWAN said that WARC-92 did not specifically allocate the frequency blocks for uplink/downlink in the IMT-2000 bands. It would be the

responsibility of individual administrations to decide the appropriate frequency blocks allocation. He said that the technology neutral approach would permit different IMT-2000 technologies to be operated in Hong Kong. The spectrum compatibility of these technologies required further study.

22. Dr. Ken ZHANG said that, from the technically point of view, it would be preferable to use the lower band for terminal uplink to cater for efficient transmission from handset. Mr. Stephen CHAU supplemented that WCDMA used the lower frequency band for handset uplink. This was in conflict with the cdma2000 standard, which used upper frequency band for handset uplink.

23. On paragraph 10 (e), Mr. Adam WONG said that the original statement "number portability should be implemented" could be interpreted as a policy statement. It was agreed to replace the word "should" by "could".

24. On paragraph 10 (f), Mr. Jimmy WONG said that Hutchison supported co-existence of different networks using different 3G standards. He considered that multiple 3G standards would not have an impact on equipment cost because advances in manufacturing technology would reduce the equipment cost drastically. Mr. Stephen CHAU considered that, given the additional design and manufacturing cost, multi-mode 3G equipment would be comparably more expensive than its single mode counterpart. Eventually, the cost for 3G equipment would be market driven.

25. On paragraph 10 (k), Dr. Ken ZHANG said that it was technically premature to consider TDD operation within FDD bands. Further studies on harmonization of TDD and FDD operations should be considered. Mr. Alex WONG further proposed that flexible use of TDD and FDD techniques should also be considered. It was agreed that their views would be included in the final draft report.

26. There being no other business, the meeting closed at 5:00 p.m. The Chairman took the opportunity to thank all members for their valuable contributions to the Focus Group.

**Presentation materials**

The presentation materials are attached. For electronic version of this report, the presentation materials are attached as ZIP file (present.zip).

**Summary of findings and views**

Terms of Reference Items	Specific points discussed	Facts and Findings	Views and Recommendations
<p><b>General issues</b></p> <ul style="list-style-type: none"> <li>Definition of service</li> </ul>	<ul style="list-style-type: none"> <li>Drivers for 3G mobile system</li> </ul>	<p><b>Ericsson (1)</b> 3G system would support a full range of services from voice, packet data to wideband real-time multi-media services.</p> <p><b>Nokia (1)</b> 3G mobile system would support image-processing service allowing life-like transmission of video images with international roaming capability.</p> <p><b>NEC (2)</b> 3G system would support multimedia services and would be equipped with large system capacity, offer flexible user speed, wired-line quality, low cost and be adaptable to future evolution. 3G system would support mobile multimedia services to the mass market regardless of location, network or terminal used.</p> <p><b>NWT (5)</b> 3G system would support mobile multimedia services to the mass market regardless of location, network or terminal used.</p>	
	<ul style="list-style-type: none"> <li>Candidate for wireless local loop (fixed wireless access, FWA)</li> </ul>	<p><b>Motorola (3)</b> The TD-SCDMA developed by China has the possibility for wireless local loop application operating within the ITU defined IMT-2000 spectrum.</p> <p><b>Fujitsu (4)</b> With modification to the signalling of IMT-2000 system, FWA could provide voice telephony, ISDN and voice band data services.</p>	<p><b>Fujitsu (4)</b> FWA would provide efficient and low-cost access networks in developing countries. The use of FWA as countermeasures for depopulated areas and as a tool for competition in fixed network is also examined in some developed countries.</p>
	<ul style="list-style-type: none"> <li>Satellite operations</li> </ul>	<p><b>Nokia (4)</b> Current and future satellite services would be useful in places where traditional cellular services, including UMTS, are not available.</p>	<p><b>Nokia (4)</b> IMT-2000 MSS bands should be reserved for those emerging MSS services and the current IMT-2000 MSS allocation is sufficient in providing these services.</p>

<ul style="list-style-type: none"> <li>compatibility and transitional matters</li> </ul>	<ul style="list-style-type: none"> <li>2G to 3G migration</li> </ul>	<p><b>Ericsson (1)</b> Key features and technical characteristics of WCDMA are harmonized with GSM enabling the "marrying" of GSM/WCDMA networks. Technologies aiding 2G/3G evolution include customized application for mobile enhanced logic (CAMEL), high speed circuit switched data (HSCSD), general packet radio services (GPRS) and enhanced data rate (EDGE), which could offer smooth migration to make initial launch.</p> <p><b>Motorola (1)</b> Motorola would provide 3G system solution for both existing 2G mobile system operators and new 3G mobile system operators. 3G and 2G systems are optimized for high speed packet data services and low speed circuit data services respectively There are multiple ways to achieve international roaming in resolving the difference in systems and frequency bands-spectrum and air-interface technology harmonization, family of systems concept and multi-band/multi-mode terminals. It is preferable to minimize the replacement of network equipment during the evolution of 2G mobile systems to 3G mobile systems.</p> <p><b>Nokia (1)</b> EDGE and GPRS technologies would support evolution toward higher data rate for operators with or without a 3G system operating licence.</p> <p><b>Nortel Networks (4)</b> Evolution of 2G to 3G networks should be based on cost effective solutions and should maximize the potential of the existing TDMA networks. 3G would bridge the wireless and the wire-line telecommunications networks. Internet mobility and fully integrated multi-media services could be realized by interconnecting different service platforms via routers to the IP backbone.</p>	<p><b>Nokia (4)</b> Smooth migration should follow the GSM-GPRS-UMTS migration path. The GPRS would provide a standardized platform and interface for IP packet data services supporting the Internet services. Core network elements of GSM and GPRS could be migrated to UMTS by introducing an interface between GSM and WCDMA systems.</p> <p><b>NWT (5)</b> The implementation of GPRS technology, which introduces the packet switched services into 2G network, is an important step for the smooth evolution of GSM to UMTS.</p> <p><b>Hutchison (5)</b> The evolution of cdmaOne would provide a standardized platform and interface for IP packet data services supporting the Internet services. The core network elements of cdmaOne could be migrated to cdma2000 by introducing an interworking interface between cdmaOne and cdma2000 systems.</p>
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	<ul style="list-style-type: none"> <li>co-siting GSM-1800 and IMT-2000 base stations</li> </ul>	<p><b>Motorola (1)</b> Co-siting is technically possible.</p> <p><b>Nokia (1)</b> Nokia has performed simulation tests which showed that indoor coverage by outdoor base stations has a service probability of over 80% and this probability would improve in multiple cells environment.</p> <p><b>Peoples(2)</b> Peoples accept the possibility of co-siting IMT-2000 base stations with GSM 1800 base stations in view of their similar path loss pattern.</p>	
<ul style="list-style-type: none"> <li>timing for individual steps leading up to provision of service</li> </ul>	<ul style="list-style-type: none"> <li>trials</li> </ul>	<p><b>Nokia (1)</b> Nokia would launch trial 3G mobile network early next year in their Finland R&amp;D Center, followed by a second trial network in Japan. Following Japan's plan to freeze the 3G mobile system radio standards by middle of next year and ETSI by end of next year, the manufacturers could produce prototype commercial networks in the market place.</p> <p><b>Nokia (3)</b> Nokia would have one additional field trial system in Beijing in mid-99 employing W CDMA.</p> <p><b>Ericsson (3)</b> Ericsson has six WCDMA trials in Japan, China and Europe.</p> <p><b>SmarTone (4)</b> A WCDMA field trial is jointly conducted by SmarTone and Ericsson in Hong Kong starting June 99.</p> <p><b>SmarTone (5)</b> The impact of interference from GSM (single slot terminal) to UTRA and vice versa, has not been noticed in the joint trial conducted by SmarTone and Ericsson in Hong Kong, where test calls have been made at a close distance of 3m from the base station.</p> <p><b>Nortel Networks (5)</b> Nortel Networks has launched a number of field trials in Canada, France and UK. Nortel Networks also demonstrated 3G radio technology in North America and announced a trail in Australia based on cdma2000 with Telstra in Year 2000.</p>	<p><b>SmarTone (3)</b> Proposes that the equipment supplier to share the result of their field trials in terms of the spectral efficiency and service limitation.</p> <p><b>Ericsson (3)</b> Ericsson considers that the result of these trials might not be directly applicable due to the relatively small number of users and types of services involved.</p> <p><b>NWT (5)</b> New World PCS is very keen to carry out a field trial in Hong Kong and planning is in progress.</p>

	<ul style="list-style-type: none"> <li>• progress in other countries</li> </ul>	<p><b>Nokia (1)</b> Licensing continues in Europe and no country has made any decisions yet. In the UK, it is likely that 4 licences would be issued in summer 1999, 15 MHz for each operator. In Finland, the existing mobile operators are likely to be licensed early 1999 with 15 MHz allocation per operator. In Sweden, it is likely that four licenses would be granted to existing operators in summer 1999.</p> <p><b>Information from other sources (2)</b> According to the press release of DTI of UK dated 9 Feb 99, DTI has called off the plan to issue 3G mobile licences by auction in June this year. Instead the auction will be held in second half of financial year 1999-2000 upon completion of UK government's consultations on offering as many as five 3G licences.</p>	<p><b>HKTCSL (1)</b> Technical and licensing arrangements for IMT-2000 in other countries such as Singapore, Japan, UK and Sweden, should be collected and might become reference for Hong Kong.</p>
<p><b>Standards issues</b></p> <ul style="list-style-type: none"> <li>• technology neutral</li> </ul>		<p><b>Information from other sources (2)</b> The Basic Guideline for introducing 3G mobile communications systems issued by MPT of Japan states that the technical conditions should be subject to the standard of the ITU and also reported by the TTC in Japan.</p>	<p><b>SmarTone (5)</b> Advocates a technology neutral approach to 3G standards in the interest of consumer choice and innovation, subject to adequate safeguard against inter-operability. For the benefit of customers, a minimum number of standards should be introduced to achieve economy of scale and should be balanced against the benefits of introducing other technologies.</p> <p><b>Hutchison (5)</b> Considers that technology neutral approach to 3G standards should be adopted in interest of consumer choice and competition.</p>
<ul style="list-style-type: none"> <li>• any rule on numbers</li> </ul>			<p><b>Fujitsu (4)</b> In order to provide a user-friendly numbering plan, it is proposed that numbers with leading digit "0" numbers should be assigned to 3G mobile services. (OFTA: The whole number level with leading digit "0" in the Hong Kong Numbering Plan is allocated and reserved for international networks access, not for mobile services.)</p> <p><b>Nokia (4)</b> 2G and 3G operators might share the same or use different number ranges and considers that number portability between 2G and 3G should follow the basic GSM portability principles.</p> <p><b>NWT (5)</b> In order to facilitate the current 2G mobile user to migrate to 3G mobile services, it is considers that the same numbering range should be employed for 2G and 3G networks.</p>

<ul style="list-style-type: none"><li>• availability of regional/international standards</li></ul>	<ul style="list-style-type: none"><li>• chip rate</li></ul>	<p><b>DDI (1)</b> ARIB has studied the chip rates 3.6864 Mcps and 4.096 Mcps in terms of their performance, capacity and spectrum issues including guard bands and concludes that there is no difference in performance between these two chip rates.</p> <p><b>Motorola (1)</b> The technical advantage between these two chip rates is minimal as increasing the chip rate would widen the spectrum and might create interference to adjacent bands. IS 95 does not require any guard bands between CDMA systems. Increasing the chip rate might require a guard band to avoid potential interference.</p> <p><b>Ericsson (2)</b> Ericsson has issued a press release on 8 Dec 98 announcing a proposal to harmonize different CDMA standards based on a reduction of chip rate to 3.84 Mcps.</p>	
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	<ul style="list-style-type: none"> <li>air interface</li> </ul>	<p><b>NTT (1)</b>  Japan has only proposed the WCDMA to the ITU. cdmaOne is only discussed between TTA and ARIB on air interface and between TTC and US standardization body on network standards.</p> <p><b>Motorola (1)</b>  Provides the following update on standardization progress:  <u>Korea</u> :ETRI Consortium, NTT W-CDMA or IS-95 derivative, K-MAP network evolution  <u>Japan</u> : W-DMA and cdma2000 in ARIB and MPT, discussions ongoing for common physical layer  <u>Europe</u> : UMTS in ETSI, complementary to GSM networks separate operator &amp; service provider, air Interface Compromise: WCDMA for FDD &amp; TD-CDMA for TDD.  <u>Americas, Asia Pac</u> : cdma2000 (evolution of IS-95/ ANSI-41 ) in CDG and TTA -Compatible with cdmaOne, UWC-136 (evolutions of IS-136/ANSI-41), UMTS for GSM 1900</p> <p><b>Ericsson (1)</b>  Provides the characteristics of ESTI WCDMA: Wideband Direct Sequence CDMA, 4.096 Mcps chip rate (expandable to 8.192/16.384 Mcps), asynchronous base stations supported, variable spreading and multi-code operation, coherent in both up and down link, optimized packet access on common or dedicated channel.</p> <p><b>Information from other sources (1)</b>  According to an ITU press release on 14 October 98 titled "The ITU takes mobile into the third millenium" the following RTT candidates were submitted by the 30 June 98 deadlines:</p> <ol style="list-style-type: none"> <li>DECT: Digital Enhanced Cordless Telecommunications <ul style="list-style-type: none"> <li>(environment: indoor, pedestrian)</li> <li>Source: ETSI</li> </ul> </li> <li>UWC-136: Universal Wireless Communications <ul style="list-style-type: none"> <li>(environment: indoor, pedestrian, vehicular)</li> <li>Source: USA</li> </ul> </li> <li>WIMS W-CDMA: Wireless Multi-media &amp; Messaging Services Wideband CDMA <ul style="list-style-type: none"> <li>environment: indoor, pedestrian, vehicular)</li> <li>Source: USA</li> </ul> </li> </ol>	
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		<p>4. TD-SCDMA: Time Division Synchronous CDMA</p> <ul style="list-style-type: none"> <li>• (environment: indoor, pedestrian, vehicular)</li> <li>• Source: China</li> </ul> <p>5. W-CDMA: Wideband CDMA</p> <ul style="list-style-type: none"> <li>• (environment: indoor, pedestrian, vehicular)</li> <li>• Source: Japan</li> </ul> <p>6. CDMA II: Asynchronous DS-SS-CDMA</p> <ul style="list-style-type: none"> <li>• (environment: indoor, pedestrian, vehicular)</li> <li>• Source: South Korea</li> </ul> <p>7. UTRA: UMTS Terrestrial Radio System</p> <ul style="list-style-type: none"> <li>• (environment: indoor, pedestrian, vehicular)</li> <li>• Source: ETSI</li> </ul> <p>8. NA:W-CDMA: North American Wideband CDMA</p> <ul style="list-style-type: none"> <li>• (environment: indoor, pedestrian, vehicular)</li> <li>• Source: USA</li> </ul> <p>9. CDMA-2000: Wideband CDMA (IS-95)</p> <ul style="list-style-type: none"> <li>• (environment: indoor, pedestrian, vehicular)</li> <li>• Source: USA</li> </ul> <p>10. CDMA-I: Multi-band synchronous DS-SS-CDMA</p> <ul style="list-style-type: none"> <li>• (environment: indoor, pedestrian, vehicular)</li> <li>• Source: South Korea</li> </ul> <p>11. SAT-CDMA: Satellite-based CDMA system</p> <ul style="list-style-type: none"> <li>• (environment: satellite)</li> <li>• Source: South Korea</li> </ul> <p>12. SW-CDMA: Satellite-based CDMA</p> <ul style="list-style-type: none"> <li>• (environment: satellite)</li> <li>• Source: European Space Agency</li> </ul> <p>13. SW-CTDMA: Satellite-based Wideband CDMA</p> <ul style="list-style-type: none"> <li>• (environment: satellite)</li> <li>• Source: European Space Agency</li> </ul> <p>14. ICO RTT: ICO-developed satellite system</p> <ul style="list-style-type: none"> <li>• (environment: satellite)</li> <li>• Source: ICO</li> </ul> <p>15. Horizons: Immarsat-developed satellite system</p> <ul style="list-style-type: none"> <li>• (environment: satellite)</li> <li>• Source: Immarsat</li> </ul>	
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		<p><b>Samsung (2)</b> Samsung has participated in the 3GPP1 and 3GPP2. The 3GPP1 project is initiated to develop the IMT-2000 specifications based on WCDMA and evolved GSM network with participation of worldwide standard bodies including ARIB/TTC, ETSI, T1 and TTA. Air interface and network interface specifications would be developed during the 1st half of 1999 and the second half of 1999 respectively. For 3GPP2, also with the participation of worldwide standard bodies, the scope of the project is to develop IMT-2000 specifications based on cdma2000 and ANSI-41.</p> <p><b>Information from other sources (2)</b> TG8/1 of ITU schedules to approve Recommendation IMT.KEY (which defines the key characteristics of the radio interfaces for IMT-2000) in the coming 16th meeting of TG8/1 in Brazil during 8-19 Mar 99.</p> <p><b>Information from other sources(3)</b> The TG 8/1 meeting held in Brazil on March 99 approved that the key characteristics of IMT-2000-2000 comprising a flexible IMT-2000 standard including CDMA, TDMA or a combination of these two technologies.</p> <p><b>Information from other sources (3)</b> WIMS W-CDMA and NA:W-CDMA merged to form the WP-CDMA jointly submitted by TIA TR46.1 and T1 T1P1.5. Iridium submitted a RTT proposal, INX-Iridium Next Generation for the IMT-2000 satellite environment.</p> <p><b>Ericsson (3)</b> Ericsson has issued a proposal in late February 99 proposing a single IMT-2000 global standard with 4 operational modes: FDD direct spread, FDD multi-carrier, TDD and EDGE.</p> <p><b>Information from other sources (4)</b> ITU has adopted “a single flexible standard” with multiple access methods which include CDMA, TDMA and a combination of CDMA/TDMA (all potentially in combination with SDMA) at the 16<sup>th</sup> TG 8/1 meeting held in Brazil. A new Working Group 5 of the TG 8/1 is formed to prepare ITU Recommendation on the radio specification of the adopted standard. ITU schedules to finalize the Recommendation on radio specification in the 18<sup>th</sup> TG 8/1 meeting to be held in Helsinki on November 1999.</p>	
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	<ul style="list-style-type: none"> <li>multiple standards network</li> </ul>	<p><b>Nokia (1)</b> Network standards are specified by standardization bodies and does not see the trend of multiple standard networks.</p> <p><b>Motorola (1)</b> Even with different network standards, the family of systems concept would permit users to use roaming services to access different networks.</p>	<p><b>Peoples (2)</b> Does not support multiple standards network because of increased technical complexity and equipment cost required for multi-mode handsets.</p> <p><b>SmarTone (3)</b> SmarTone supported an open platform for more choices and unified standards for global roaming.</p> <p><b>Nokia (4)</b> Nokia is of the view that no guard bands would be required between two different wideband systems operating in the IMT-2000 paired band with similar duplex directions. The operation of TDMA and CDMA technologies in adjacent bands, however, would require further investigation.</p> <p><b>HKTCSL (4)</b> Guard band might be required for WCDMA/cdma2000 systems or FDD/TDD transmission modes working close to each other.</p> <p><b>Motorola (4)</b> No guard band would be required for in-band migration of cdmaOne to cdma2000 system. He considered that guard band might be required for narrow band and wideband technologies operated in adjacent bands. With the provision of proper filter, the width of guard band could be reduced.</p> <p><b>SmarTone (5)</b> For the benefit of customers, a minimum number of standards should be introduced to achieve economy of scale and should be balanced against the benefits of introducing other technologies.</p> <p><b>HKTCSL (5)</b> Multiple 3G standards would increase the technical complexity, including spectrum coordination with mainland China at border areas and the potential requirement of guard bands within IMT-2000 spectrum.</p>
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<ul style="list-style-type: none"> <li>• availability of products</li> </ul>	<ul style="list-style-type: none"> <li>• dual mode terminal</li> </ul>	<p><b>Motorola (1)</b> With dual mode (2G and 3G) terminals, dual mode subscriber has 3G services in network core, and 2G services in wide area.</p> <p><b>Nortel Networks (4)</b> Anticipates that the equipment cost in terms of bit/sec would be lowered by at least an order of magnitude by the year 2005</p>	<p><b>Nokia (1)</b> Availability of dual mode terminals supporting both 2G and 3G systems is very important to users.</p> <p><b>Nokia (2)</b> Dual mode operation would save investment and the adoption of new service could be realized from day one. From the customer perspective, many services in 3G are compatible or similar to those of 2G. Customers would therefore favour the use of dual mode handsets</p> <p><b>Ericsson (2)</b> Operators may prefer to implement wide area coverage of 3G system on a stage by stage basis. Dual mode handsets would therefore be useful towards the implementation of country wide 3G coverage.</p> <p><b>NEC (2)</b> Wide area deployment of 3G system should use single mode handsets. Dual mode handset would provide less profit to handset supplier.</p> <p><b>SmarTone (2)</b> Some mobile operators in Hong Kong operates in both the 900 MHz and 1.8 GHz spectrum, depending on the applications and market development, there might be a suitable driving market force for the introduction of dual mode handsets.</p> <p><b>Motorola (2)</b> In the initial launch phase, the demand for high speed data would likely be concentrated in selected areas only and hence the provision of dual-mode handsets target for voice service would be meet the demand of end users.</p>
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<p><b>Radio Spectrum issues</b></p> <ul style="list-style-type: none"> <li>total spectrum requirement</li> </ul>	<ul style="list-style-type: none"> <li>overseas development</li> </ul>	<p><b>Ericsson &amp; Motorola (1)</b>  Provide information to the following IMT-2000 spectrum plans:  <u>Europe</u>: 1900-2025 and 2110-2200 reserved for UMTS, sub-bands 1980-2010 and 2170-2200 reserved for mobile satellite service (MSS).  <u>Japan</u>: 1920-2025 and 2110-2200 reserved for IMT-2000, sub-bands 1980-2010 and 2170-2200 reserved for MSS.  <u>USA</u>: 1990-2025 and 2160-2200 reserved for MSS.</p> <p><b>Information from other sources (1)</b>  <u>China, People's Republic</u>: 1920-1945, 1980-2025 and 2110-2200 reserved for IMT-2000. Sub-bands 1980-2010 and 2170-2200 reserved for MSS.</p> <p><b>Information from other sources (2)</b>  UMTS Forum recommended that the full 155 MHz for terrestrial UMTS (phase 1) should be made available by 2005, an extra 185 MHz is required for terrestrial UMTS services by 2010. (phase 2).</p> <p><b>HKTCSL (3)</b>  Regarding the minimum spectrum per operator, in Europe such as Finland and UK the spectrum per operator is either 15 MHz or 20 MHz in pair or/and unpaired bands with the reason that the 3G services demand such spectrum rather than technical constraints.</p> <p><b>Information from other sources (4)</b>  The 16<sup>th</sup> TG 8/1 meeting has approved the additional terrestrial spectrum requirement of 160 MHz and the total MSS requirement of 2x67 MHz by year 2010. Candidate bands for the additional spectrum are being examined and has not yet been finalized. TG 8/1 would submit their views on additional spectrum requirement to the Conference Preparatory Meeting (CPM) of the WRC-2000 to be held on November 1999 in Geneva.</p>	<p><b>HKTCSL (3)</b>  In addition to technical constraints, the spectrum required is closely related to the scope of service brought by 3G. The Focus Group should also address the spectrum requirements from the angle of 3G services.</p>
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	<ul style="list-style-type: none"> <li>coordination with mainland China</li> </ul>	<p><b>HKTCSL (3)</b> Regarding the roaming arrangement, cross-border radio planning is essential in ensuring compatible operation among systems operating in neighbouring territories.</p>	<p><b>HKTCSL (1)</b> IMT-2000 spectrum allocation plan of mainland China should also be taken into consideration. IMT-2000 spectrum should be compatible with that of mainland China with a view to minimizing interference as far as possible</p> <p><b>SmarTone (1)</b> Worries about potential conflicts in the allocation of transmit/receive frequency blocks between Hong Kong and mainland China.</p> <p><b>HKTCSL (3)</b> In view of the uncertainty in the future frequency plan of China, different applications operating in the same frequency band at neighbouring territories might result in systems incompatibility. HKTCSL is of the view that compatibility of 3G systems across neighbouring territories should only be considered upon finalization of the frequency plan in China.</p> <p><b>SmarTone (5)</b> For better global roaming capabilities and a wider choice of compatible products, best effort should be spent on enforcing consistency with the IMT2000 frequency plan of the ITU, China and other major countries. On this ground, it is recommended to follow the ITU allocation, which matches that of China and would be preferred by most Asian countries.</p>
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<ul style="list-style-type: none"> <li>• Spectrum requirement for one operator</li> </ul>	<ul style="list-style-type: none"> <li>• Local requirement</li> </ul>	<p><b>Peoples (1)</b> The radio spectrum of 60 MHz, as in the case for Japan, could only accommodate three systems, each operator having 20 MHz. It would not be enough for the six PCS operators in Hong Kong.</p> <p><b>Peoples Telephone (3)</b> The UMTS Forum has considered various scenarios in terms of frequency re-use and service limitation.</p> <p><b>Ericsson, Motorola and Nokia (3)</b> In terms of frequency re-use, all three companies considered that 5 MHz is the technical minimum for one system.</p>	<p><b>Peoples (2)</b> Peoples support the 2x15 MHz (paired FDD) + 5 MHz (unpaired TDD) bandwidth proposal as the preferred spectrum requirement per operator.</p> <p><b>SmarTone (3)</b> On spectral efficiency, service provision and expansion capability should also be considered. It is proposed that the Focus Group should explore the relationship between capacity and service/application and considers that UMTS Forum recommendation is a good reference point to start with.</p> <p><b>Nokia (4)</b> Supports the UMTS recommendation of allocating 15 MHz x 2 FDD plus 5 MHz TDD spectrum per operator for the year 2002–2005. The allocation of 15 MHz x 2 spectrum for 3 FDD carriers allows implementation of hierarchical cell structures providing maximum flexibility to cater for different services.</p> <p><b>NWT(5)</b> Supports the proposal of 2x15 MHz (paired FDD) + 5 MHz (unpaired TDD) bandwidth as the preferred minimum spectrum requirement per operator for initial implementation. However, such minimum spectrum requirement is based on a traffic projection today. In order to cater for any unforeseen capacity requirements and change of call patterns, which may happen in the coming few years, it is preferable to reserve some spare spectrum in the FDD and TDD bands for future expansion.</p> <p><b>SmarTone (5)</b> The preferred total spectrum requirement per operator is 2 x 15 MHz paired spectrum plus 2 x 5 MHz paired spectrum (reserved) plus 5 MHz unpaired spectrum.</p> <p><b>Nortel Networks (5)</b> Considering the recommendation from the UMTS Forum, the preferred minimum spectrum requirement per operator for new entrant is 2 x 15 MHz paired plus 5 MHz unpaired spectrum at the initial phase.</p>
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	<ul style="list-style-type: none"> <li>Overseas development (UK, Finland, Sweden, USA, Japan, etc.)</li> </ul>	<p><b>Nokia (1)</b> In the <u>UK</u> and <u>Finland</u>, it is likely that 15 MHz would be allocated to each operator.</p> <p><b>Information from other sources (2)</b> The Basic Guideline for introducing 3G mobile communications systems issued by MPT of Japan stated each block of the 3 blocks of paired spectrum (20 MHz x 2) would be allocated to one operator in each geographical region.</p> <p><b>Information from other sources (2)</b> UMTS Forum recommends 2x15 MHz (paired) and 5 MHz (unpaired) as the preferred minimum spectrum requirement for public UMTS operator in the initial phase (year 2005). The allocation of unpaired spectrum is foreseen to handle asymmetric traffic in an optimized way.</p> <p><b>Samsung (2)</b> cdma2000 and WCDMA could be operated in either 2 X 15 MHz or 2 x 20 MHz bandwidth.</p> <p><b>Fujitsu (4)</b> The Adachi model is used to calculate the system capacity with different operating bandwidth for direct spread CDMA system. Fujitsu considers that at least 20 MHz x 2 bandwidth is required to support a maximum data rate of 2 Mbps.</p>	<p><b>Nokia (4)</b> In an indoor environment, each cell could support one 2 Mbps high-speed data user provided that the user is not in soft handover. She added that the provision of 2 Mbps service with 5 MHz x 2 allocation would depend on different environment, but the system could generally support one high-speed data user on a per cell basis.</p> <p><b>Fujitsu (4)</b> With an operating bandwidth of 20 MHz x 2, the system would be able to support multi-users of 2 Mbps services.</p> <p><b>HKTCSL (4)</b> 5 MHz x 2 is technically feasible for 3G system but feedback from vendors and field tests showed that it would not support a viable business case. He supported Nokia's view that 3 FDD plus 1 TDD carriers is the minimum spectrum per operator for starting a reasonable business with 3G system.</p> <p><b>Motorola (4)</b> 3G system with 5 MHz and 15 MHz operating bandwidth would support high quality video services with a data rate of 384 Kbit/sec and 2 Mbps respectively. Enhanced 2G system with GPRS would support lower quality video services with 144 Kbit/sec.</p>
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	<ul style="list-style-type: none"> <li>• Unpaired spectrum</li> </ul>		<p><b>Fujitsu (4)</b> Unpaired band is intended to support TDD high-speed, asymmetric data and low mobility applications such as wireless Internet access.</p> <p><b>Nokia (4)</b> If frequency sharing between 3G and PHS is incompatible, the remaining spectrum (i.e. 1910-1920 and 2010-2025 MHz) could be assigned to operators on a need basis or when requested by operators.</p> <p><b>HKTCSL (4)</b> OFTA to consider allocating the DECT and PHS block for TDD</p> <p><b>HKTCSL(4)</b> As the types of future 3G services are still unknown and hence there might be the possibility of having more asymmetrical TDD services than FDD services, TDD operation within UMTS 60 MHz x 2 FDD frequency bands should be considered. The proposed TDD operation in FDD bands would provide operators with more TDD spectrum and the flexibility in provision of services. If this approach is adopted, it should be based on non-proprietary standards and solutions.</p> <p><b>SmarTone (4)</b> In addition to the technical feasibility of allocating TDD blocks in the FDD bands, commercial availability of terminals supporting the proposed allocation is essential. Development in TDD terminal is slow compares with that of FDD terminals. Therefore, additional TDD blocks could be identified in the additional spectrum in the 2 GHz band to cope with the development of TDD terminals.</p> <p><b>Ericsson (5)</b> In view of the standardization of TDD for the unpaired band is about a year behind that of FDD for the paired bands and product prospect are uncertain at the moment, it can be argued that allocation of the unpaired bands may take a lower priority, until the applications and relationship with FDD become clearer. Ericsson further considers that spectrum efficiency is not achieved unless carrier spacing is more than 5 MHz. In the future, with more advanced filter technology, it may be possible to mix FDD and TDD more freely. CEPT allows such mixing but says that it is presently not technically feasible</p>
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	<ul style="list-style-type: none"> <li>• Frequency block allocation</li> </ul>		<p><b>Motorola (1)</b> Hong Kong could consider adopting part of the US allocation plan for both the European UMTS and the US cdma2000 system, which could possibly accommodate 3 to 4 operators.</p> <p><b>HKTCSL (5)</b> Does not support co-existence of UMTS and cdma2000 in the HK spectrum plan because standard products from two different technologies (UMTS &amp; cdma2000) are basically riding on different regional spectrum plan and operating on different radio parameters (i.e. duplex spacing: 80/190 MHz for cdma2000/UMTS respectively. As the Hong Kong spectrum plan is aligning with ITU plan, which is different from US FCC plan, potential interference problem may happen if both technologies are adopted and placed side-by-side on the HK spectrum plan.</p> <p><b>Ericsson (5)</b> If OFTA is going to adopt part of the US allocation plan for both the European UMTS and the US cdma2000 system, consideration should be given to the possibility of uplink and downlink crash.</p> <p><b>SmarTone (5)</b> Recommends to follow ITU allocation, which matches that of China and would be preferred by most Asian countries. It also provides a close match to the European and Japanese plans, except for the DECT and PHS portions. The existing use of DECT and PHS private phones in Hong Kong would be phased out eventually as IMT2000 system evolves. In any case, OFTA should consult terminal and equipment vendors to ensure that there will be sufficient terminal support for the proposed allocations.</p>
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Legend:

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CC	:	Consumer Council
DDI	:	DDI Corporation
Ericsson	:	Ericsson Limited
Fujitsu	:	Fujitsu Limited
HKIE	:	Hong Kong Institute of Engineers
HKTUG	:	Hong Kong Telecom Users Group
HKTC	:	Cable & Wireless HKT Telephone Ltd.
HKTCSL	:	Cable & Wireless HKT CSL
Hutchison	:	Hutchison Telecommunications Limited
Mandarin	:	Mandarin Communications Limited

Motorola	:	Motorola (China) Electronics Limited
NEC	:	NEC Corporation
New T&T	:	New T&T Hong Kong Limited
NWT	:	New World Telephone (New World PCS)
Nokia	:	Nokia (H.K.) Limited
Nortel Networks	:	Nortel Networks (Asia) Limited
NTT	:	NTT Mobile Communications Network Inc.
Peoples	:	Peoples Telephone Company Limited
Samsung	:	Samsung Electronics Co. Ltd.
Shun Hinge	:	Shun Hinge Technology Company Limited
Siemens	:	Siemens Limited
SmarTone	:	SmarTone Mobile Communications Ltd.
TAHK	:	Telecom Association of Hong Kong
OFTA	:	<u>Office of the Telecommunications Authority</u>

- Note:
- “(1)” after the name of individual organization denotes information updated on 10/98 for version 1.
  - “(2)” after the name of individual organization denotes information updated on 2/99 for version 2
  - “(3)” after the name of individual organization denotes information updated on 4/99 for version 3.
  - “(4)” after the name of individual organization denotes information updated on 7/99 for version 4.
  - “(5)” after the name of individual organization denotes information updated after the final Focus Group meeting held on 16/7/99.

**IMT-2000 RRT Proposals**

(Extracted from ITU Circular Letter 8/LCCE/64 dated December 1998)

Proposal	Description	Environment				Source
		Indoor	Pedestrian	Vehicular	Satellite	
DECT	Digital Enhanced Cordless Telecommunications, TDMA	X	X	-	-	ETSI Project (EP) DECT
UWC-136	Time Division Multiple Access	X	X	X	-	TIA TR45
WIMS W-CDMA	Wireless Multimedia and Messaging Services Wideband CDMA	X	X	X	-	TIA TR46
TD-SCDMA	Time-Division Synchronous CDMA	X	X	X	-	China Academy of Telecommunication Technology (CATT)
W-CDMA	Wideband CDMA	X	X	X	-	ARIB (Japan)
Global CDMA II	Asynchronous DS-CDMA	X	X	X	-	TTA (Korea)
UTRA	UMTS Terrestrial Radio Access Harmonized Wideband CDMA (FDD), TD/CDMA (TDD)	X	X	X	-	ETSI SMG
WCDMA/NA	Wideband CDMA: North American	X	X	X	-	ATIS T1P1
Cdma2000	Wideband CDMA	X	X	X		TIA TR45
Global CDMA I	Multiband synchronous DS-CDMA	X	X	X		TTA (Korea)
SAT-CDMA	49 LEO sats in 7 planes at 2000 km	-	-	-	X	TTA (Korea)
SW-CDMA	Satellite wideband CDMA	-	-	-	X	ESA
SW-CTDMA	Satellite wideband hybrid CDMA/TDMA	-	-	-	X	ESA
ICO RTT	10 MEO sats in 2 planes at 10390 km	-	-	-	X	ICO Global Communications
Horizons	Horizons satellite system	-	-	-	X	Inmarsat
INX	INX mobile communications system	-	-	-	X	Iridium LLC

The following gives a brief description of each radio transmission technology proposal based on available information:

- The **Digital Enhanced Cordless Telecommunications (DECT)** system is a general radio access technology for wireless telecommunications. It is a high capacity digital technology, for wide cell radii ranging from a few meters to several kilometers, depending on application and environment. It provides telephony quality voice services and a broad range of data services. It can be effectively implemented in a range from simple residential cordless telephones up to large systems providing a wide range of telecommunications services, including 'Fixed Wireless Access' (FWA).
- **UWC-136** is a TDMA based evolution path to IMT-2000 that meets or exceeds the performance requirements of the indoor, pedestrian and vehicular environments. The driving factors identified for the definition of this technology were cost effective evolution from existing technologies, global TDMA harmonization, time to market, risk management, minimum spectrum allocation, high spectral efficiency, and band independence. To address the driving factors, UWC-136 utilizes core aspects of existing IS-136 and GSM based systems.
- **WIMS W-CDMA** uses Wideband Code Division Multiple Access to provide wireless information and messaging services, with a special emphasis on Packet Communications. The application of advanced techniques such as a strong time multiplexed header and advanced power control schemes are expected to speed packet transactions. The WIMS W-CDMA proposal is currently being merged with the WCDMA/NA proposal. The merged proposal is called Wideband Packet-Code Division Multiple Access (WP-CDMA).
- The **TD-SCDMA** adopts a combination of TDMA and SCDMA scheme as a primary multiple access scheme and contains a fundamental mechanism for synchronous operations. A smart antenna system is presumably built in the BS to enhance receive sensitivity, cancel co-channel interference, combat multipath fading, and reduce the transmission power requirement on a portable handset. To fully exploit the advantages of the smart antenna system and reduce the radio frequency (RF) circuit complexity, TDD is adopted as a duplex scheme. The system will work even without using smart antenna, but this proposal gives us very simple way to use smart antenna for increasing capacity.
- **W-CDMA** from ARIB, Japan, is a Wideband Code Division Multiple access technology for both FDD and TDD operation designed to meet and exceed the requirements and objectives for IMT-2000 such as advanced multi-rate services up to 2 Mbps and a quality comparable to that of the fixed communication networks. At the same time, the RTT can achieve to realize a simple cell structure, easy channel management, high subscriber capacity and low transmit power.
- **UTRA** is the ETSI/SMG terrestrial RTT proposal, with two harmonised modes, WCDMA for FDD operation in the paired bands and TD-CDMA for TDD operation in the unpaired band. Cooperation with other organizations resulted in high

commonalties between UTRA and their respective RTT proposals. UTRA offers: high spectrum and coverage efficiency, bit rates up to 2 Mbps within a 5 MHz channel, efficient multimedia and packet communication, service flexibility, easy and robust deployment, easy introduction of enhanced features, e.g. adaptive antennas, asynchronous base station operation for FDD mode, support of handover to other systems, hierarchical cellular structures, option of dual mode TDD/FDD operation, and low cost terminals.

- **WCDMA/NA** is based out of the same family of CDMA technologies as the UTRA and ARIB proposals. The driving factors are support for high-data-rate and packet data capabilities. Other considerations are high service flexibility with support of multiple parallel variable-rate services on each connection and built-in support for future capacity/coverage-enhancing technologies, such as adaptive antennas and transmitter diversity. Support of inter-frequency handover for operation with hierarchical cell structures and handover to other systems, including handover to GSM, is provided.
- The **cdma2000** RTT is a wideband, spread spectrum radio interface that uses Code Division Multiple Access (CDMA) technology to exceed the IMT-2000 requirements. The system operates in FDD and TDD mode. The requirements are satisfied for the Indoor Office, Indoor to Outdoor/Pedestrian, and Vehicular environments. In addition, the RTT meets all of the requirements for the next generation evolution of the current TIA/EIA-95-B family of standards, including support for voice only, simultaneous voice and data, data only, and location services. In addition, existing TIA/EIA-95-B Services, including speech coders, packet data services, circuit data services, fax services, Short Messaging Services (SMS), and Over the Air Activation and Provisioning support is included.
- **Global CDMA I** has been developing in order to meet ITU requirements for the IMT-2000. The main system design concept was the systems have to have the features for the commercial success of IMT-2000 services, for example multimedia services up to 2 Mbps. It is natural for Korea to develop the system based on CDMA technology that is currently being used in Korea.
- **Global CDMA II** has been developing in order to meet the ITU requirements for the IMT-2000. The system has been designed for providing the multimedia services including high quality voice services. Particularly efficient utilization of spectrum and power in high rate data communications were considered as main design concept. Even though this system has different characteristics from the Global CDMA I, TTA is still making the harmonization between two systems in order to have one global RTT standard.
- **SAT-CDMA** developed by Korean industries is based on CDMA technologies in order to have the compatibility with the terrestrial component, particularly the Global CDMA II proposed by TTA, KOREA. It is also designed to provide the Wide range of voice and non-voice service including packet data and multimedia service as complementary to terrestrial components.

- The **ICO** system will provide users anywhere on the earth with access to telecommunications services. The system consists of a constellation of MEO satellites working with 12 ground stations, which are located around the world and interconnected by a ground network. The ICO RTT supports robust and flexible communications, both voice and data, with rates up to 38.4 kbps, in a spectral and power efficient manner. The large majority of ICO User Terminals (UTs) are expected to be truly hand-portable and capable of dual-mode (terrestrial and satellite) operation. A wide range of other UTs will be supported including vehicular, aeronautical and maritime mobile, and semi-fixed terminals.
- The **Horizons** system uses a constellation of geostationary satellites to provide worldwide coverage for multi-media terminals, in line with the objectives of IMT-2000. The primary terminal type is a laptop or palmtop computer connected to a small, portable communications unit incorporating a directional antenna. Such terminals can achieve information transfer rates of up to 144 kbps. The RTT caters for all terminal mobilities ranging from stationary (including Fixed Wireless Access) up to aircraft speeds. The primary traffic objective is data, particularly for connectivity to the public Internet and to private Intranets, in support of typical applications used over these networks such as e-mail and information browsers. Traditional telecommunications services, such as voice and fax, are also supported. Higher bandwidths are also possible, for semi-fixed terminals, through the aggregation of radio channels. The satellites planned for the Horizons system use state-of-the-art geostationary technology. Each satellite deploys a large number of spot beams, which together cover continental sized areas and achieve frequency reuse in a manner analogous to that of terrestrial cellular systems.
- The **INX** candidate IMT-2000 satellite RTT is proposed by Iridium LLC for its next generation of satellite/terrestrial mobile communications system. It is based on the Macrocell 2GHz MSS filing with the FCC in September 1997 and continuing studies for the development of INX. The proposal meets all criteria specified for the IMT-2000 satellite component. INX will use a NGSO constellation with virtually global coverage, seamless roaming within the network, and will be capable of interworking with terrestrial wireless networks including 3G systems. INX will support the IMT-2000 services specified for satellite component, increase the spectrum efficiency and system capacity, reduce the power requirement for user terminals, and provide sufficient fade margin to meet service requirements in a variety of user environments.

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**(ITU update:** After 30 September 1998, ITU received the Wideband Packet CDMA RTT proposal submitted by the WP-CDMA Committee. The WP-CDMA is based on the WCDMA/NA and WIMS-CDMA RTTs under the development of the USA TIA TR46.1 & USA T1 T1P1.5 respectively).

**Technical limitations on spectrum allocation per operator**

	Frequency re-use (e.g. impact on network hierarchy, etc.)	Data rate (e.g. maximum data rate supported, etc.)	Types of services (e.g. high speed data, interactive multimedia, etc)	System capacity (e.g. traffic handling capability, etc)	Spectral efficiency (e.g. trunking efficiency over other spectrum allocation scenarios, etc.)	Others (e.g. requirement for unpaired block, spectrum sharing with other services, etc.)
5 MHz x 2	Hierarchical network design not possible.  All data and voice service share same carrier.	384 kbps for wide area applications. 2 Mbps for one user in indoor environment and not in soft handover.	Limited capability in simultaneously supporting multiple voice and data services.	System capacity depends on user mobility, services mix and radio environment, the air interface capacity ranges from 0.8 - 2 Mbps per cell.	For real time high-speed data services, the average end user traffic throughput (at 2% GOS) is estimated at 47.7 kbit/MHz /cell.	TDD spectrum allocation would be beneficial to the provision of high-speed data service.
10 MHz x 2	2 hierarchical network layers supported.  Opportunity to segregate high-speed data from low-speed data/voice services for better system efficiency.	Ditto.	Capable to support medium speed multi-media and voice services simultaneously. Very limited capability in support high-speed multi-media services at 2 Mbps.	1.6 - 4 Mbps per cell	Additional carrier improves trunking efficiency by 76% 84.1 kbit/MHz /cell.	TDD/FDD partitioning could increase downlink capacity if traffic pattern is highly asymmetrical.  For dense urban deployment, TDD/FDD partitioning could provide better overall

						efficiency.
15 MHz x 2	Multiple network layers supported.  Opportunity to segregate high-speed data from low-speed data/voice services for better system efficiency.	384 kbps and 2 Mbps for wide area applications.	Support high-speed data and voice services simultaneously.	2.4 - 6 Mbps per cell	Additional carriers improves trunking efficiency (with respect to 5 MHz allocation) by 98% to 94.4kbit/MHz /cell.	Ditto.
20 MHz x 2	Ditto.	Ditto.	Ditto.	3.2 - 8 Mbps per cell	Additional carriers improves trunking efficiency (with respect to 5 MHz allocation) by 124% to 107 kbit/MHz /cell.	TDD allocation is not needed.