Reprint

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More frequencies needed for mobiles

Terrestrial spectrum sought for IMT

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As the market for mobile telephony continues to grow, a key question for the industry and regulators alike is how to satisfy the spectrum requirements for these services. The mobile industry has stressed the importance of identifying sufficient harmonized spectrum globally to support the high data rate mobile broadband services that are on the horizon.

The need for faster speed, global compatibility and multimedia services has led to the development of third-generation (3G) mobile systems. In an effort to consolidate existing incompatible mobile environments into a seamless global network, ITU adopted radio access interfaces at its Radiocommunication Assembly in Istanbul in early May 2000, targeted for deployment in global frequency bands already identified at the World Administrative Radio Conference in 1992 (WARC-92). Known as International Mobile Telecommunications-2000 (IMT-2000), this global standard was realized after years of collaborative work between ITU and the global cellular community. At the end of May 2000, the World Radiocommunication Conference (also held in Istanbul) identified additional frequency bands for IMT-2000 use.

ITU reaffirmed its support for the development of mobile wireless communications at the World Radiocommunication Conference in 2003 (WRC-03). In particulier, it recognized the need for a global vision for the development of IMT-2000 systems and systems beyond, known as IMT-Advanced. As part of this commitment, ITU has been studying technical and operational aspects of how these systems will evolve.

IMT-2000 and beyond

It is envisaged that IMT-Advanced will be able to handle a wide range of supported data rates in multi-user environments. The target is peak data rates of up to approximately 100 Mbit/s for high mobility services (such as mobile access), and up to approximately 1 Gbit/s for low mobility services, such as nomadic/local wireless access. Compared with the original IMT-2000 deployments which supported up to 144 kbit/s for high mobility and 2 Mbit/s for low mobility, IMT-Advanced will meet an entirely new category of service requirements. The IMT-2000 radio technologies are expected to converge towards IMT-Advanced, supported by a common packet core network.

A number of studies have been carried out to identify future spectrum requirements in preparation for the World Radiocommunication Conference (WRC-07) that will take place in Geneva from 22 October to 16 November 2007. There has been a tremendous effort within the ITU Radiocommunication

Sector (ITU–R) to prepare for this event, in particular for agenda item 1.4 on the identification and allocation of spectrum for the future development of IMT-2000 and IMT-Advanced. The preparatory work is being conducted in ITU–R Working Party 8F.

Agenda item 1.4 of WRC-07 can be considered one of the most important for the mobile communications industry since 1992, when the first frequency bands were identified for IMT-2000 at the World Administrative Radio Conference of that year.

The work of mib

The Mobile Industry Backing Terrestrial Spectrum for IMT (known for short as "**mib**") is an industry group that is promoting preparations for WRC-07 agenda item 1.4, in collaboration with such industry forums as the CDMA Development Group (CDG) and the UMTS Forum. Members of **mib** have also been very supportive of the work of ITU–R Working Party 8F, particularly in the preparations for WRC-07.

The companies that form **mib** include Alcatel-Lucent, Ericsson, Fujitsu, Huawei, Motorola, NEC, Nokia, Nortel, Panasonic, Qualcomm, Samsung, Siemens and ZTE. The industry group's key messages are:

- Mobile communications facilitate economic growth and development, and enable the creation of new jobs and businesses.
- The market for mobile services continues to evolve and grow. Studies show that, in some markets by 2020, the total traffic per user per day will rise almost 50 times from today's level.
- Users will demand from mobile networks the same high bit-rate services and quality that currently can be provided through cable and fixed digital subscriber line (DSL) networks.
- More spectrum will be needed for IMT services in response to increased traffic.
- New bands for IMT-Advanced should be globally common, wide enough to support carriers up to 100 MHz in bandwidth, and low enough in the spectrum (preferably below 5 GHz).
- Existing spectrum bands will not be sufficient to carry the predicted traffic for IMT services after 2015.
- A decision at WRC-07 would enable IMT deployment within the 2015–2020 timeframe.
- WRC-07 is the right time to identify new spectrum for IMT. This is important as it typically takes about 7–10 years from a WRC decision until spectrum can be made available. Also, by providing a harmonized spectrum solution for IMT at WRC-07, unnecessary regional divergence can be avoided.

Planning for future requirements

According to **mib**, these spectrum requirements for mobile telephony will need to be met if ITU's vision of connecting the unconnected by 2015 is to be achieved. A report by ITU's Radiocommunication Sector (Report ITU–R M.2078) predicts the total spectrum bandwidth requirement.

The report says that for existing mobile cellular systems (including pre-IMT-2000, IMT-2000 and its enhancements, and IMT-Advanced in 2020), 1 280 MHz will be needed for low user-demand situations, and 1 720 MHz for high user-demand ones. It should be noted that even the lower figure

WRC-07 agenda item 1.4 will "consider frequency-related matters for the future development of IMT 2000 and systems beyond IMT 2000 taking into account the results of ITU–R studies in accordance with Resolution 228 (Rev. WRC 03)".


Samsung


Nokia

Nokia

ITU/M. Zouhri

(1 280 MHz) is greater than the requirement for some individual countries, while in other countries, the requirement is larger than the higher value (1 720 MHz). The prediction is based on an assumption of a single network deployment, so spectrum requirements will be higher when several parallel networks exist in a country, as detailed in Report ITU–R M.2078.

The mobile industry is developing technologies to make the use of spectrum more efficient, as well as studying proposed new concepts of spectrum management. However, changing spectrum management systems is a long-term issue, and it does not affect the benefits of globally common spectrum bands, such as economies of scale, global roaming, and smooth implementation. So it is still important to achieve spectrum harmonization.

To be able to respond to the future demands of the global mobile society, planning for future spectrum needs for IMT must be done today. The WRC-07 agenda was set at WRC-03 in anticipation of the rapid growth of mobile communications, which is the reality today. It is beneficial to know spectrum bands well in advance, so as to start the development of radio interface standards and detailed band planning.

Furthermore, administrations and industry must recognize that additional time is needed for spectrum to be made available to accommodate the necessary regional and national consultations that follow WRC decisions. Also, if required, sufficient time must be allowed for retiring or renewing existing spectrum equipment, as well as for designing and building new equipment and systems.

The Conference Preparatory Meeting focuses on the issue

Discussions on agenda item 1.4 of WRC-07 were among the most intense during the Conference Preparatory Meeting (CPM), the second session of which took place in Geneva from 19 February to 2 March 2007. It adopted a report that represents an important step in the national and regional preparations for WRC-07, as reported in the March 2007 issue of *ITU News*. The CPM-07 Report contains many complex and far-reaching items, many of them linked with major technological developments in key areas of radiocommunications, coupled with innovative ideas for their regulation.

The report is intended to help WRC-07 navigate through its agenda as efficiently as possible. However, the different points of view expressed during the CPM are a sign that more difficult discussions, negotiations and compromises can be expected during WRC-07. While the CPM only produces a comprehensive report for reference, WRC will make decisions that are treaty binding. It will result in a new edition of the ITU Radio Regulations, which are crucial for the success of terrestrial mobile telecommunications around the globe.

The Conference Preparatory Meeting retained for consideration at WRC-07 the candidate bands for mobile telephony identified by ITU–R Working Party 8F. These bands are:

410–430 MHz	2.3–2.4 GHz
450–470 MHz	2.7–2.9 GHz
470–806/862 MHz	3.4–4.2 GHz
	4.4–4.99 GHz

The advantages and disadvantages for each of these bands were considered and included in the CPM-07 Report. However, a number of administrations remain opposed to some of the candidate bands.

The report also outlines methods, to be considered under agenda item 1.4, for allocating spectrum for the future development of IMT-2000 and IMT-Advanced. These are:

- Existing IMT-2000 spectrum could be identified generically for IMT, and any additional spectrum could be identified generically for IMT in the Radio Regulations.
- Existing IMT-2000 footnotes in the Radio Regulations would not change, and any additional spectrum could be identified generically for IMT in the Regulations.
- Any additional spectrum could be identified specifically for IMT-Advanced, or specifically for IMT-2000 (including its future development), or for both IMT-Advanced and IMT-2000.
- No specific identification of additional spectrum for IMT, but a Resolution or Recommendation may be prepared to provide the principles and conditions for the use of the frequency bands suitable for IMT.
- No change to the Radio Regulations. This method could be applied on a band-by-band basis to all or parts of any of the candidate frequency bands.

Consultations continue

Work to prepare for WRC-07 will continue in regional organizations, and the seminars conducted by **mib** are intended to assist in those preparations. So far, **mib** has conducted a seminar for countries in the Asia-Pacific Telecommunity (APT) in Bangkok, Thailand, as well as one in Africa (Yaoundé, Cameroon). It plans to hold a seminar for countries in the Inter-American Telecommunication Commission (CITEL) in April 2007 in San Salvador, El Salvador.

For further reading

- Recommendation ITU–R M.1645, "Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000", 2003. www.itu.int/rec/recommendation.asp?type=folders&lang=e&parent=R-REC-M.1645
- ITU Radio Regulations, 2004. www.itu.int/publications/folderdetails.aspx?lang=e&folder=R-REG-RR-2004&menu=categories
- ITU–R Wireless Access Systems Portal. www.itu.int/ITU-R/study-groups/was/index.html
- Recommendation ITU–R M.1457, "Detailed specifications of the radio interfaces of IMT-2000", 2006. www.itu.int/rec/recommendation.asp?type=folders&lang=e&parent=R-REC-M.1457
- ITU Handbook on "Deployment of IMT-2000 Systems", 2003. www.itu.int/itudoc/gs/imt2000/84207.html
- "Migration to IMT-2000 Systems" — Supplement 1 to the Handbook on Deployment of IMT-2000 Systems. www.itu.int/pub/R-HDB-46-2005/en
- ITU–R Handbook on "Land Mobile (including Wireless Access) Volume 2: Principles and Approaches on Evolution to IMT-2000", 1997. www.itu.int/pub/R-HDB-30-1997/en