

ATTACHMENT 7.14

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PROPOSED TEXTS FOR SECTION 7.2 OF CPM REPORT TO WRC-03

7.2 Agenda Item 1.22 - Consider progress on ITU-R studies concerning future development of IMT-2000 and beyond

"to consider progress of ITU-R studies concerning future development of IMT-2000 and systems beyond IMT-2000, in accordance with Resolution 228 (WRC-2000):"

Resolution 228 (WRC-2000), "Studies to consider requirements for the future development of IMT-2000 and systems beyond IMT-2000 as defined by ITU-R".

7.2.1 Introduction

7.2.1.1 The trends of mobile communications

The number of mobile communications subscribers has increased much faster than predicted, particularly for terrestrial use. By the end of the year 2000 the number of mobile subscribers was 736 million worldwide and by the year 2010 more than 1700 million mobile subscribers are anticipated.

The majority of traffic, on first and second-generation mobile networks, is speech-oriented communications. However, the traffic from data and multimedia communications is already increasing rapidly, and this traffic is expected to become dominant on IMT-2000 and systems beyond IMT-2000 networks. As the majority of this traffic will be IP (packet) based, networks and systems must be designed to efficiently transfer packet data. The new multimedia data services will require both very high peak data rates and sustained high data rates. As one of such services, mobile world wide web applications will become commonplace and mobile radio terminals will become an important internet access tool.

The convergence and integration of the various forms of information technology (IT), media (content) and mobile telecommunications will continue to change and enhance the sharing and transmission of information in the 21st century.

7.2.1.2 Radio Conference decisions related to IMT-2000 and systems beyond IMT-2000

Spectrum was first identified for IMT-2000 by WARC-92, in Radio Regulation 5.388.

WRC-2000 considered issues related to IMT-2000, resulting in the identification of additional spectrum for the terrestrial component of IMT-2000 in Radio Regulations 5.317A and 5.384A. This spectrum identification for IMT-2000 at WRC-2000 was based on the total forecasted need for spectrum by the year 2010. WRC-2000 also identified existing global MSS allocations as being available for use by the satellite component of IMT-2000, in accordance with Resolution 225.

In Resolution 228 (WRC-2000), the ITU-R was invited to continue studies on overall objectives, applications and technical and operational implementation for the future development of IMT-2000 and systems beyond IMT-2000. It was also invited to study spectrum requirements and potential frequency ranges suitable for the future development of IMT-2000 and systems beyond IMT-2000, and in what time-frame such spectrum would be needed.

In accordance with Resolutions 228 (WRC-2000) and 801 (WRC-2000), the requirements for the future development of IMT-2000 and systems beyond IMT-2000 are to be reviewed by WRC-05/06, taking into consideration the results of ITU-R studies presented to WRC-03.

7.2.2 Summary of technical and operational studies, including a list of relevant ITU-R Recommendations

7.2.2.1 Vision for the future development of IMT-2000 and systems beyond IMT-2000¹

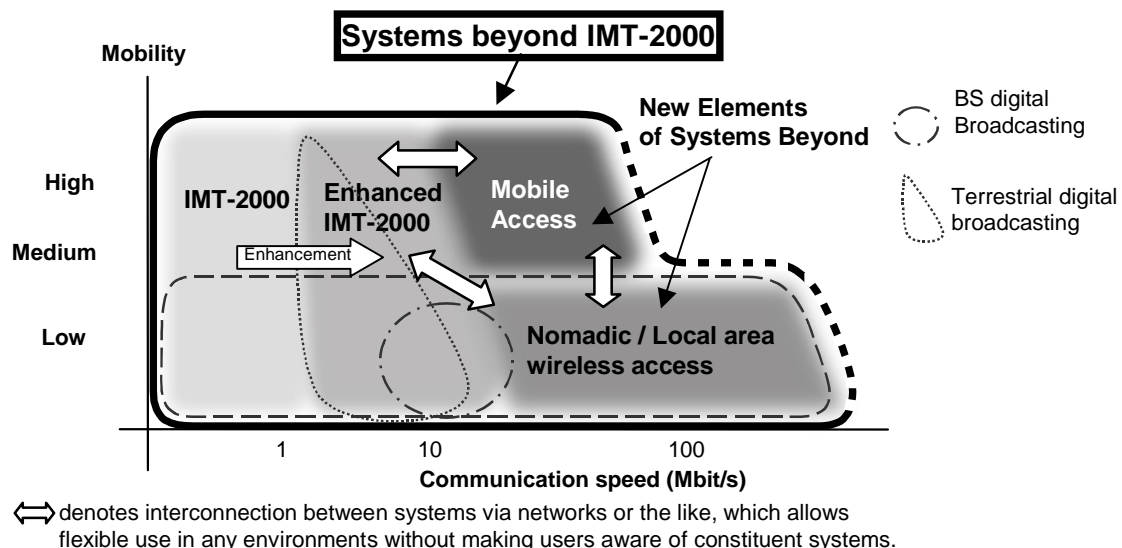
In response to Resolution 228 (WRC-2000), ITU-R has developed a vision for the further development of IMT-2000 and systems beyond IMT-2000, which will be documented in an ITU-R Recommendation.

The ITU vision is that IMT-2000, its enhancements, and systems beyond IMT-2000 will together provide a ubiquitous capability for all of the mobile communication needs of a user. It is envisaged that this vision will be achieved through three distinct, but overlapping, trends of technology development:

- 1) The existing IMT-2000 radio interfaces and networks will continue to be enhanced throughout their operational life times, perhaps reaching communication speeds of 20-30 Mbit/s.
- 2) There will be an increasing relationship between IMT-2000 (as it is enhanced throughout its life) and other radio systems (possibly including WLAN, digital broadcasting and satellite elements).
- 3) In order to deliver the complete ITU Vision of systems beyond IMT-2000, new elements will be required, especially in the areas of mobile access (high data rates combined with high mobility) and nomadic/local area access. These will also form part of the relationship with other radio systems.

Systems beyond IMT-2000 will be the result of these three trends of technology development, with seamless inter-working. It will support the two demands of *ubiquity* and *diversity* and will fulfill the user's requirements of the customized services based on diverse individual needs. ITU-R is currently developing a preliminary draft new Report on technology trends, which includes information on promising technologies applicable to the new elements of systems beyond IMT-2000.

The envisaged capabilities of IMT-2000 and systems beyond IMT-2000 are illustrated in Figure 1.



¹ Work on the vision for the future development of IMT-2000 and systems beyond IMT-2000 is in progress in WP 8F.

FIGURE 1

Illustration of capabilities of IMT-2000 and systems beyond IMT-2000**7.2.2.2 Future development of IMT-2000**

It is expected that operators who deploy IMT-2000 networks will continue to enhance their capabilities for at least the next 10 years. This would then be followed by continued operation of the network for possibly an additional 10 years. Terrestrial IMT-2000 is already being enhanced; for instance, the IMT-2000 specifications are being developed to include:

- an all-IP transport network;
- enhancements is to the radio interface, to significantly increase the downlink data rate.

Preliminary studies have already started on further enhancements, and this process is expected to continue until at least 2010, perhaps reaching communication speeds of 20-30 Mbit/s.

The satellite component of IMT-2000 may further evolve to provide complementary services in areas covered by cellular systems², such as broadcasting, multicasting, etc., in addition to providing services in those areas not planned for service by terrestrial systems.

The convergence of services and delivery platforms in the future development of IMT-2000 should offer users what they need in any specific mobile environment. An individual person, or machine, can from time to time be a user on one or more of these platforms, either sequentially or simultaneously, depending on the task in hand. A commonality of how services and applications are applied across the different platforms is therefore beneficial to users, and this has stimulated the current trend towards convergence. Furthermore, a broadly similar user experience across the different platforms leads to a large-scale take up of products and services, common applications and content, and an ease and efficiency of use.

The increasing prevalence of IP-based applications is a key driver of this convergence, and stimulates the establishment of relationships between previously separate wireless platforms. What form these relationships will take depends on what the market wants, but they might include, for example; hardware integration within a device, network inter-working, common access, authentication, accounting, common person-machine interfaces, portals, roaming and hand-over between platforms.

7.2.2.3 Systems beyond IMT-2000

The ITU Vision for systems beyond IMT-2000 includes advanced services. There may be a requirement for a new wireless access technology, particularly to deliver high data rates to users with high mobility by around the year 2010. The mobile access element of systems beyond IMT-2000 will handle a wide range of supported data rates that are beyond 30 Mbps, according to economic and service demands to achieve full area coverage for systems in multi-user and multi-cell environments and with terminals moving at vehicular speeds (high mobility), as shown in Figure [X]. Because the capabilities of systems beyond IMT-2000 will substantially exceed those of enhanced IMT-2000 to support new applications and market opportunities, systems beyond IMT-2000 will likely deploy wireless access methods distinct from those in Recommendation ITU-R M.1457.

Many types of access systems will be connected to a common, flexible and seamless core network. The mobility management will be part of a new wireless access system as an interface between the core network and a particular access technology to connect a user via a single number for different access systems to the core network. Global roaming for all access technologies is required. The

² In this context, “cellular” refers to the method of deployment of base station sites and re-use of frequencies, and not to the frequency band employed.

interworking between these different access systems in terms of global roaming, inter-system handover and seamless services with service negotiation including mobility, security and QoS will be a key requirement, which will be handled in the newly developed wireless access systems and core network.

7.2.2.4 Related Recommendations

- Recommendation ITU-R M.687-2: International Mobile Telecommunications-2000 (IMT-2000)
- Recommendation ITU-R M.819: International Mobile Telecommunications-2000 (IMT-2000) for developing countries
- Recommendation ITU-R M.1311: Framework for modularity and radio commonality within IMT-2000
- Recommendation ITU-R M.1390: Methodology for the calculation of IMT-2000 terrestrial spectrum requirements
- Recommendation ITU-R M.1457: Detailed specifications of the radio interfaces of IMT-2000
- Recommendation ITU-R P.1411-1: Propagation data and prediction method for the planning of short-range outdoor radiocommunication systems and radio local area networks in the frequency range 300 MHz to 100 GHz.

7.2.3 Analysis of the results of studies related to the further development of IMT-2000 and systems beyond IMT-2000

7.2.3.1 Preliminary studies of spectrum requirements

Report ITU-R M.2023 "Spectrum Requirements for IMT-2000" forecasts the spectrum requirement for IMT-2000 in the year 2010, in those areas where the traffic is highest. It concluded that, in 2010, "there is a forecasted need for 160 MHz of additional spectrum for terrestrial IMT-2000, beyond the terrestrial IMT-2000 spectrum already identified in S5.388 and beyond the spectrum used in the various Regions for 1st and 2nd generation mobile systems". ITU-R is developing a recommendation that addresses spectrum implications that will detail the spectrum requirements and potential frequency ranges suitable for the future development of IMT-2000 and systems beyond IMT-2000, and in what timeframe such spectrum would be needed. ITU-R is also working on developing a framework of services for the future development of IMT-2000 and systems beyond, which will be used to help refine the spectrum requirements also being developed. Furthermore, the ITU-R is studying whether a revision to Recommendation ITU-R M.1390 to incorporate a spectrum calculation methodology for systems beyond IMT-2000 or a new Recommendation on a spectrum calculation methodology is needed. This will be completed in time for WRC-05/06.

7.2.3.2 Particular requirements of developing countries

In the era of globalization, it is recognized that developing countries have the same needs for telecom services as developed countries. These services may be provided by a combination of various ITM-2000 telecommunications networks: terrestrial mobile networks and/or satellite networks which may further evolve to provide complementary services in areas not planned for service by terrestrial systems. Particular needs of developing countries are not to be perceived in terms of new or special telecom services: they are to be examined in regard to particular conditions required to satisfy the time and economic needs of developing countries.

However, developing and developed countries may not have the same needs at the same time.

These differences may include the overall amount of spectrum needed, when such spectrum will be

needed, and in what frequency range it is needed. Additional ITU-R studies on the spectrum needs of developing countries for IMT-2000 will help identify these differences and assist developing countries meet certain objectives, defined in Recommendation ITU-R M.819-2.

Necessary spectrum should be identified worldwide to provide global roaming and economies of scale which would be even more important for developing countries. Also there is a need to allow a smooth transition from the second generation to the third generation in many developing countries. Therefore, the following characteristics and needs of the developing countries need to be considered:

7.2.3.2.1 Characteristics of most developing countries

- Low level of income per inhabitant (less than 600 US dollars per annum).
- Young population (more than 50% of the population is less than 35 years old).
- Large rural and sparsely populated areas (more than 50% of the population live in rural areas).
- Difficult geographical terrain.

7.2.3.2.2 Needs of most developing countries for IMT-2000

- Affordable pricing of mobile services, minimal initial investment and total cost of the network.
- Solutions that enable coverage of rural areas (with varied terrain characteristics) with large cells.

7.2.3.2.3 Additional studies to meet the needs of developing countries for IMT-2000

Additional ITU-R studies on the needs of developing countries for IMT-2000 will further promote the investigation on Question ITU-R 77-4/8 and assist developing countries in meeting certain objectives, as defined in Recommendation ITU-R M.819-2. These studies should focus on:

1. Assessing and forecasting market demand for mobile telecommunication services in developing countries;
2. Adapting mobile telecommunication technologies to the needs of developing countries focusing on establishing cost-effective, true nation-wide IMT-2000 networks, solving the problems of propagation in forestry, mountainous, desert and/or coastal regions, and ensuring effective use of frequencies in sparsely populated and low-density traffic areas;
3. The advantages and disadvantages of the use of frequencies below 600 MHz for IMT-2000 systems;
4. Effective and economical use of frequency bands above 1 GHz for IMT-2000 systems.

7.2.3.3 Progress towards potential frequency ranges for spectrum

The suitability of a frequency band or bands for the future development of IMT-2000 and systems beyond IMT-2000 depends, amongst others, on the following factors, which have technical and economic aspects:

a) Mobility

Viewed from the user perspective, those systems should support a level of mobility as high as that of the existing cellular systems. This should take into account the physical nature of the fading radio channels.

b) Area coverage

The area coverage is one of the essential requirements for mobile radio systems. As the operating frequency increases, the maximum practicable cell size reduces. As a result more base stations will be required to provide contiguous wide area coverage— impacting coverage and deployment cost.

c) Available bandwidth

Sufficient bandwidth should be available to enable the delivery of high data rate services that are expected to become increasingly important in the future development of IMT-2000 and systems beyond IMT-2000.

d) Global Roaming

Viewed from the user perspective, there should be capability for global roaming. Therefore, globally harmonized frequency bands will minimize requirements for multi-mode/multi-band mobile terminals.

In addition, radio propagation characteristics will have significant impacts on the consideration of the potential frequency ranges for spectrum.

Therefore, the preferred frequency ranges for enhanced IMT-2000 and systems beyond IMT-2000 consist of those bands that are currently identified for IMT-2000, or currently allocated to primary mobile use and are not far from the existing frequency bands identified for IMT-2000.

7.2.3.4 Relationship with studies documented under other CPM Sections

The spectrum requirements of the Nomadic/ Local Area Wireless Access element of systems beyond IMT-2000 may also be related to WRC-03 Agenda item 1.5, which addresses new allocation of frequencies to the mobile service in the 5 GHz range for the Nomadic/ Local Area Wireless Access applications.

WRC-03 will consider progress of ITU-R studies on terrestrial wireless interactive multimedia applications under Agenda item 1.21, documented in Section 7.1 of this report. These studies have indicated that IMT-2000 and systems beyond IMT-2000 may be regarded as forming a part of a future terrestrial wireless interactive multimedia concept.

7.2.4 Methods to satisfy the agenda item and the advantages and disadvantages

WRC-03 may decide to include an agenda item for WRC-06 to review requirements for the future development of IMT-2000 and systems beyond IMT-2000, taking into account Resolution 228 (WRC-2000), and take any necessary action.

This agenda item should include the consideration of the particular requirements of developing countries for IMT-2000 as described in 7.2.3.2.

WRC-03 may appropriately modify Resolution 228 (WRC-2000) for further studies to consider detailed requirements, to enable any necessary action to be taken by WRC-05/06. The possible revision of Resolution 228 (WRC-2000) is shown in Annex 1 to Section 7.2. WRC-03 may also invite the ITU-R to conduct and complete in time for WRC-06, the appropriate studies leading to technical and operational Recommendations, including spectrum requirements and potential frequency ranges suitable for the future development of IMT-2000 and systems beyond IMT-2000. These studies should consider i) the rapidly growing demand of the spectrum for these systems and other systems/services; ii) sufficient time to ensure the availability of the spectrum; and iii) sufficient time for system development.

7.2.5 Regulatory and procedural considerations

No regulatory or procedural considerations have been identified.

ANNEX 1

MODRESOLUTION 228 (~~WRC-2000~~)(REV.WRC-03)

**Studies to consider ~~requirements~~ frequency related matters ~~for of~~
the future development of IMT-2000
and systems beyond
IMT-2000 as defined by ITU-R**

The World Radiocommunication Conference (~~Istanbul~~Caracas, 20002003),

considering

- a) that International Mobile Telecommunications-2000 (IMT-2000) systems have started operation in-is-scheduled-to-start-service-around the year 2000, subject to market and other considerations;
- b) that Question ITU-R 229/8 addresses the future development of IMT-2000 and systems beyond IMT-2000;
- c) that the future development of IMT-2000 and Systems beyond IMT-2000 are being studied within ITU-R;
- ~~e)~~d) that the technical characteristics of IMT-2000 are specified in ITU-R and ITU-T Recommendations, including Recommendation ITU-R M.1457 which contains the detailed specifications of the radio interfaces of IMT-2000;
- e) that it was nine years ahead of the IMT-2000 initial deployment that WARC-92 identified the spectrum for IMT-2000 in No. 5.388 and under the provisions of Resolution 212 (Rev.WRC-97);
- f) that the review of IMT-2000 spectrum requirements at WRC-2000 concentrated on the bands below 3 GHz;
- ~~d)~~g) that telecommunication and information technologies evolve rapidly;
- ~~e)~~h) that adequate spectrum availability is a prerequisite for the technological and economic success of the future development of IMT-2000 and systems beyond IMT-2000;
- ~~f)~~i) that the demand for the provision of multimedia applications such as high-speed data, IP-packet and video by mobile communication systems will continue to increase;
- ~~g)~~k) that the future development of IMT-2000 and systems beyond IMT-2000 is foreseen to address the need for higher data rates than those currently ~~planned~~deployed for IMT-2000;
- ~~h)~~l) that, for global operation and economy of scale, it is desirable to agree on common technical, operational and spectrum-related parameters of systems,
- ~~i)~~m) that it is therefore timely to study technical, spectrum and regulatory issues pertinent to the future development of IMT-2000 and systems beyond IMT-2000,
- n) that Question ITU-R 77.4/8 addresses adaptation of mobile radiocommunications technology to the needs of developing countries, including the optimum arrangements and technical characteristics needed to use mobile technology/equipment in urban, rural or remote areas.

noting

- a) that the IMT-2000 radio interfaces as defined in Recommendation ITU-R M.1457 are expected to evolve within the framework of ITU-R beyond those initially specified, to provide enhanced services and services beyond those envisaged in the initial implementation;

b) that the ITU-R has identified the new elements of systems beyond IMT-2000 to be developed, which will closely inter-work with the currently operating IMT-2000 and the enhanced IMT-2000,

recognizing

- a) the time necessary to develop and agree on the technical, operational, spectrum and regulatory issues associated with the continuing enhancement of mobile services;
- b) that service functionalities in fixed and mobile networks are increasingly converging;
- c) that future mobile systems will require the adoption of more spectrum-efficient techniques;
- d) the needs of developing countries for the cost-effective and rapid implementation of advanced mobile communication technologies and the propagation characteristics of lower frequency bands that result in larger cell sizes.

resolves

- 1 ~~to invite ITU-R to continue studies~~ to invite ITU-R to further study and develop Recommendations on overall objectives, applications and technical and operational implementation issues, as necessary, for relating to the future development of IMT-2000 and systems beyond IMT-2000;
- 2 ~~to invite ITU-R to study~~ to invite ITU-R to complete studies, in time for WRC-05/06, on the spectrum requirements and potential frequency ranges suitable for the future development of IMT-2000 and systems beyond IMT-2000, and in what time frame such spectrum would be needed taking into consideration the evolution of pre-IMT-2000 systems through advances in technology;
- 3 ~~that the requirements for the future development of IMT-2000 and systems beyond IMT-2000 be reviewed by WRC-05/06, taking into consideration the results of ITU-R studies presented to WRC-03,~~
- 4 to invite ITU-R to complete studies, in time for consideration by WRC-05/06, on the spectrum needs of developing countries.

urges administrations

to participate actively in the studies by submitting contributions to ITU-R.