CHAPTER 7

Future work programme

(WRC-03 agenda items 1.21, 1.22, 7.2)

CONTENTS

Page

7.1 Agenda item 1.21

"to consider progress of the ITU-R studies concerning the technical and regulatory requirements of terrestrial wireless interactive multimedia applications, in accordance with Resolution **737 (WRC-2000)**, with a view to facilitating global harmonization"

Resolution **737 (WRC-2000)**.

Review of spectrum and regulatory requirements to facilitate worldwide harmonization of emerging terrestrial wireless interactive multimedia applications.

7.1.1 Summary of technical and operational studies

7.1.1.1 Terms related to the studies

Most of the terms used in relation to WRC-03 agenda item 1.21 are defined in one or more ITU Recommendations. Due to the fact that the definitions have been developed in different groups and at different times there may be variations in the definitions. It is considered important to get a common understanding of the terms used in this section of the CPM Report and a list of references providing definitions has been developed to achieve this goal (see below).

The terms and definitions in the references list should be read in addition to those in the Radio Regulations. In some cases the same term may have been defined differently in an ITU-R Recommendation from that in the Radio Regulations (or even the Constitution). In these cases, the definition in the basic instruments of the ITU shall prevail.

Term	**Reference**
Bidirectional	Recommendation ITU-R V.662
Broadband	ITU-T Recommendation I.113
Broadband wireless access (BWA)	Recommendation ITU-R F.1399-1
Broadcasting	Recommendation ITU-R V.662
Core network (CN)	ITU-T Recommendation Y.101
Downstream	Recommendation ITU-R F.1399-1
End-user	Recommendation ITU-R F.1399-1
Fixed wireless access (FWA)	Recommendation ITU-R F.1399-1
Fixed wireless systems (FWS)	Recommendation ITU-R F.592-3
High Density applications in the Fixed Service (HDFS)	Recommendation ITU-R F.592-3
Interactive service	Recommendation ITU-R M.1224
Mobile wireless access (MWA)	Recommendation ITU-R F.1399-1
Multimedia service	Recommendation ITU-R M.1224 ITU-T Recommendation I.113
Multimedia wireless system (MWS)	Recommendation ITU-R F.1399-1
Narrow-band wireless access	Recommendation ITU-R F.1399-1
Network	Recommendation ITU-R M.1308
Nomadic wireless access (NWA)	Recommendation ITU-R F.1399-1
Service	Recommendation ITU-R M.1308
Station	Recommendation ITU-R F.1399-1
System	Recommendation ITU-R M.1308
Unidirectional	Recommendation ITU-R V.662
Universal personal telecommunications (UPT) service	ITU-T Recommendation I.114

Upstream	Recommendation ITU-R F.1399-1
User	Recommendation ITU-R F.1399-1
Wideband wireless access	Recommendation ITU-R F.1399-1
Wireless access	Recommendation ITU-R V.573-4 Recommendation ITU-R F.1399-1

7.1.1.2 General characteristics (technical and operational) of terrestrial wireless interactive multimedia systems, various applications and technologies

7.1.1.2.1 Technical and operational characteristics

With regard to earlier studies within ITU, issues related to "terrestrial wireless interactive multimedia" (TWIM) applications have resulted in a number of Recommendations (see Section 7.1.1.1).

In order to support TWIM applications, a system should be capable of carrying simultaneously many different radiocommunication services offered to individuals and capable of delivering specific information to individuals.

A key requirement is the availability of downstream and upstream communication between the provider(s) of the multimedia content and the user. The systems used for the downstream and upstream channels could be the same, or different, and might operate within the same or different services, as defined in the Radio Regulations.

The wireless access network traffic to and from users may be symmetrical or asymmetrical depending on the variety of communication services offered to these users.

The downstream and upstream bandwidth requirements will depend on the type of the multimedia content, the user interface devices, the desired quality, etc. The support of some services (for instance, "high definition television" (HDTV)) will require the capability for broadband access.

Other technical characteristics of these systems that are important for some types of TWIM applications include:

- support of various levels of quality of service (QoS);
- seamless[1] services across such systems and networks;
- roaming capability and interoperability between existing systems and future systems as they become available;
- the ability of the system to efficiently use the available bandwidth of the upstream and downstream channels.

7.1.1.2.2 Applications and technologies

Examples of applications that may be supported by TWIM:

- alternate scenario dramas
- broadcasting service on demand
- car navigation and passenger information and entertainment
- e-mail
- e-education
- shopping and "electronic funds transfer at point of sale" (EFTPOS)

---

[1] Seamless: connection between end-user and information source without the user being aware that the communication path may have used many different networks or connections.

- database access
- electronic newspapers
- emergency and alert functions
- file transfers and photo albums
- form filling and submission
- game show and talk show participation
- Internet and intranet access
- multi-camera angle sport viewing and replay
- e-health
- travel information
- video and music on demand
- video content contribution
- video games including multi-players
- virtual private networks services
- voting
- voice and video calls and conferencing
- web-casting and web-cameras

Table 7.1-1 provides technical characteristics of example systems, which could be considered relevant to enable TWIM applications.

TABLE 7.1-1

Some typical technical characteristics of example systems

System		Transmitted data rate	Typical frequency range	Information data rate
Cellular/MWA	Pre-IMT-2000 systems (Note 1)	14.4 kbit/s	0.8-2 GHz	14.4 kbit/s
	IMT-2000	2 Mbit/s (pico cells) 384 kbit/s (micro cells) 144 kbit/s (macro cells)	0.8-2.7 GHz	2 Mbit/s (pico) 384 kbit/s (micro) 144 kbit/s (macro)
	Systems beyond IMT-2000	(under study)	(under study)	(under study)
TICS (Note 2)		Up to 54 Mbit/s	0.9-6 GHz	Up to 54 Mbit/s
RLAN/wireless home networks		Up to 54 Mbit/s	0.9-6 GHz	Up to 54 Mbit/s
FWA/BWA (Note 3)		56 kbit/s up to 312 Mbit/s	1 to 66 GHz (Note 4)	n×1.5 Mbit/s (Note 6) n×2 Mbit/s (Note 6) n×6.3 Mbit/s (Note 6) 45 Mbit/s 52 Mbit/s 156 Mbit/s ≤10 Mbit/s (Note 7) ≤ 100 Mbit/s (Note 8)
LMCS/LMDS/MMDS/MVDS/ MCS/MWS (Note 5)		up to 156 Mbit/s	2 to 6 GHz, above 20 GHz (Note 4)	-
Broadcasting (Note 9)	Sound (digital)	up to 1.843 Mbit/s (Note 10) (stationary) 1.152 Mbit/s (mobile)	0.54-1 500 MHz	-
	DTTB (Note 11)	up to 32 Mbit/s (stationary) 5 Mbit/s (mobile)	45-900 MHz	-

NOTE 1 – It is recognized that some pre-IMT-2000 systems can provide some Internet browsing and an interactive channel for broadcasting systems.

NOTE 2 – Traffic Information Control System.

NOTE 3 – BWA: Wireless access in which the connection(s) capabilities are higher than the primary rate.

NOTE 4 – Systems operating at a lower frequency range typically have a lower data rate.

NOTE 5 – It is noted that there are also other abbreviations used for these systems (Local Multipoint Communication System/Local Multipoint Distribution System/Multichannel Multipoint Distribution System/ Multichannel Video Distribution System/ Multipoint Communication System/Multimedia Wireless System).

NOTE 6 – n = 1, 2, 3, 4.

NOTE 7 – Maximum per one direction for Ethernet access interface, Point-to-Multipoint only (10 Base-T as defined in IEEE 802.3).

NOTE 8 – Maximum per one direction for Ethernet access interface, Point-to-Multipoint only (100 Base-T as defined in IEEE 802.3).

NOTE 9 – When using broadcasting, interactivity can be provided through another service.

NOTE 10 – In some countries, where single channel systems are used, the transmitted data rate is lower.

NOTE 11 – Digital Terrestrial Television Broadcasting.

7.1.1.3 Summary of sharing studies

A number of studies have been made on frequency sharing between the terrestrial fixed or mobile service and other radiocommunication services in certain bands, and the results are summarized in Table 7.1-2.

TABLE 7.1-2

Summary of sharing study results between the Fixed or Mobile Service (including FWA and NWA systems) with other services

Other service, which is sharing the band with the FS or MS	Frequency band	Recommendation
FSS	3.4-3.8 GHz	SF.1486
	5.15-5.25 GHz	M.1454
	37.5-42.5 GHz	SF.1484 SF.1573
MS	800-900 MHz	F.1402
	1.8-1.9 GHz	F.1402, F.1518
BSS	1.4-1.5 GHz	F.1338
RL	3.4-3.7 GHz	F.1489
ISS	24-27 GHz	F.1249, F.1509
RN	31.8-33.4 GHz	DNR F.[Doc. 9/BL/27]
EESS (active) / SR (active)	5.25-5.35 GHz	DNR F.[Doc. 9/130] PDNR M.[WAS5GHz-EESS]
	5.47-5.57 GHz	PDNR M.[WAS5GHzexpansion-EESS]

7.1.2 Analysis of the results of studies

7.1.2.1 Scope of terrestrial wireless interactive multimedia

TWIM is a concept that is emerging in the marketplace and is not synonymous with any specific existing or planned system; it is, rather, more of a vision of future wireless applications.

In studies for preparation of the CPM Report it has been understood that the TWIM concept is a multi-network, multi-access, multi-service and interactive arrangement. This suggests the need for convergence:

– in the access network;

– of network management;

– of format of content;

– in methods of information exchange;

– of database functions and capabilities.

These functions and capabilities will likely include:

– integral seamless wireless access through broadcasting, fixed and mobile infrastructures,

– location and navigation facilities, and

– on-demand service,

supporting person-to-person, person-to-many persons, many persons-to-person, person-to-machine, machine-to-person and machine-to-machine communications. These understandings of the scope have been derived from the experience of the increased usage of Internet downstream capabilities, the accelerated penetration by mobile telephones, and the integration of FWA functionality into mobile systems.

This concept encompasses systems that allow the delivery of multimedia content with which the user may interact, as well as systems capable of conveying multimedia information and providing interactive functions between the user and the server or between users.

The term "interactive" implies a two-way, but not necessarily symmetrical, communication system in either a simplex or duplex form. More specifically, the term "interactive" implies not only two-way physical transport of information but also the functionality of conveying end-users' reaction or response to the network in order to provide a certain application. Depending on the application, interactivity can be real-time, such as voice communications, or non-real-time such as e-mail. Many applications are expected to deliver larger amounts of multimedia data in the downstream direction compared to the amount of data carried from the user in the upstream direction.

In consideration of the above, the following is a working description for the scope of TWIM applications:

– Applications in one or more of the terrestrial Mobile, Fixed and Broadcasting Services that are capable of supporting bidirectional exchange of information of more than one type (e.g. video, image, data, voice, sound, graphics) between users or between users and servers.

  NOTE – The bidirectional exchange of information may be provided with different levels of interactivity and mobility.

7.1.2.2 Current situation of spectrum use and sharing scenarios

7.1.2.2.1 Current use and future trends for spectrum

Since it is anticipated that there will be many different TWIM applications, the systems will inevitably operate in many different frequency bands, typically, but not exclusively, across the range up to 66 GHz, with higher mobility systems tending to favour the lower frequency bands.

The frequency bands, which are currently allocated to the broadcasting service, may, in time, be more efficiently used through the conversion from analogue to digital transmission. Under certain circumstances and with appropriate transition measures, the introduction of TWIM applications to the end user may take place.

In general, TWIM applications of one-to-many type, having broad appeal to a larger number of end users, would be suitable for the broadcasting infrastructure. In that way, content providers will be able to aggregate content over a large number of end users. Also, in that case, enough downstream data capacity will remain available for carriage of main broadcast content of the non-interactive type and the end users will still be able to perceive enough personalization within the application. In this way, since broadcasting is a service which may have the capability for some personalized addressable applications, the downstream data from interactive multimedia and non-interactive applications may be combined with conventional broadcasting applications and therefore use the same channel. However, in order to provide interactivity, the upstream channel must be provided either by another radiocommunication service or by non-radio means. In principle, multimedia applications provided by broadcasting operators may use a variety of frequency bands for the upstream channel in the fixed or mobile services through national planning and coordination. If the upstream and downstream channels share the same frequency band for TWIM applications, this could provide some economies of scale due to reuse of some existing user equipment, such as the antenna. In such cases, some international consideration would be required for equipment standardization for upstream channels to achieve economies of scale. In the case where the broadcasting service shares the same frequency band with the mobile service, fixed service, or both services, the above sharing of upstream and downstream channels can also be achieved by national planning or bilateral coordination. The other cases should be further considered.

For the mobile service, the spectrum used by mobile applications and technologies is heavily used, and studies are under way to both increase the spectrum efficiency of those systems, and the identification of additional spectrum that could be used.

For the fixed service, the ITU-R is currently considering certain bands in the 5-20 GHz range with a view to accommodating FWA applications in bands where there is little growth of traditional point-to-point systems. Moreover, work is being undertaken to identify spectrum in bands above 70 GHz for short-range, broadband FWA applications. Further, studies are also ongoing on how to use mobile-derived technologies for FWA systems underlining the convergence process (see for example, draft revised Recommendations ITU-R F.1401 and ITU-R F.757).

Some administrations are considering making TWIM applications available in rural and remote areas. To this effect, access to sufficient spectrum for broadband channels below 1 GHz would help service providers reach subscribers in areas with clutter and difficult terrain and allow greater reach for the base stations. Some other administrations from developing countries do not think that spectrum for broadband channels for such applications below 1 GHz is required, due to intensive use by these administrations of the bands below 1 GHz for existing Services.

The demand for spectrum for wireless access systems including radio local area networks (RLANs) is being studied by the ITU-R under WRC-03 agenda item 1.5, Resolution 736 (WRC-2000), *resolves* 1, which address a possible new allocation to the mobile service in the 5 GHz bands, and

the studies have shown that spectrum requirements consistent with the bands covered by this *resolves* (455 MHz) is justifiable. Such a possible allocation is conditioned by the sharing analysis in section 2.2 of this Report.

7.1.2.2.2 Band sharing scenarios with other services

Systems carrying TWIM applications may require minimal technical and operational constraints with regards to sharing with other radiocommunication services. In this regard, special frequency coordination procedures may be necessary. For example, given the expected ubiquitous nature of these systems, it may not be practical to require frequency coordination on a site-specific basis with stations in other radiocommunication services. However, it may be possible to establish sharing conditions on the basis of technical and operational limits.

The feasibility of spectrum sharing will depend on the technologies used in different bands, wideband vs. narrow-band, high power vs. low power etc.; the nature of the terminal and the type of system modulation. It is believed that the sharing scenarios for systems carrying TWIM applications will be similar to those for a broadcasting system, a high-density land mobile system or a high-density FWA system where TWIM applications may be provided on a geographical basis.

The feasibility of spectrum sharing and need for frequency coordination procedures (if any) should be studied further.

7.1.2.3 Future trends

The convergence of certain telecommunication and broadcasting technologies and service aspects is expected over the next several years to satisfy the need for flexible use of spectrum, at reasonable cost, to users for delivery of a range of multimedia applications. The delivery of such applications to the end user will be achieved through systems carrying TWIM applications.

There are systems starting to appear that can offer a number of applications provided separately by the terrestrial Mobile, Fixed and Broadcasting Services. This situation may result in economies of scale by which the same user equipment is used to support applications within combinations of these three services complementing each other. A number of administrations believe that such trends will lead towards more efficient utilization of the spectrum and resources.

Multi-service networks supporting terrestrial mobile, fixed and broadcasting services may be developed in the future, forming a truly global phenomenon, and may become a dominant model for all further mainstream development of radiocommunications.

7.1.2.3.1 Market trends

A number of possible market trends, resulting from development of the above-mentioned multi-service networks and multi-purpose user equipment, may include:

- the further growth of Internet use and broadband applications, where users can access on-demand multimedia content;
- an increasing demand for miniature equipment that is driven by the phenomenal expansion of personalized, information services for which the user equipment is always accessible;
- the compelling case for e-services/applications (e.g. e-commerce);
- increasing strong demand for high-speed Internet, broadband telecommunication services and interactive broadcasting in semi-rural, rural and remote areas in developed countries;
- emergence of multiple wireless service providers offering various grades of service to meet specific requirements of client groups.

These trends will be driven by the emerging convergence in technology and applications in the field of terrestrial wireless services.

7.1.2.3.2 Technology trends

One trend that is already emerging and is anticipated to be further developed over the coming years is the integration of low power broadband wireless access devices to support coverage in limited geographical areas ("hot-spot" coverage), which may develop in the future to provide contiguous coverage through e.g. cellular-like re-use. Consequently, it is expected that such devices may facilitate more efficient use of the spectrum and the delivery of high-speed multimedia applications. A further trend is the increasing use of packet-based transport and in particular the use of packet-based protocols in the access network for most end-user and enterprise-based applications. It is also foreseen that the core network will increasingly become packet-based, supporting a wide variety of different user speed/mobility/coverage scenarios. Thus it will become possible to support such requirements as security[1], authentication and billing in a more flexible way than with currently operating digital transmission systems.

Asymmetric nature in communication will also be a factor of the future trends. The notion of point-to-multipoint mode in terrestrial broadcasting, fixed and mobile systems will be integrated in the access network to end users, in particular in delivering a set of services simultaneously to small as well as to large user groups. In the case of terrestrial fixed and mobile services, increase of downstream access transport will be achieved by:

- upgrading of existing system capability;
- supplementary or additional downstream connection through bearers operating in one of the three terrestrial services.

For extended interactivity, upstream access transport will also be a factor for more flexibility through the converged technologies including multi-service network and multi-service user equipment.

Such trends will further facilitate the convergence of systems which are now considered as being distinct (e.g. example systems given in Table 1, relevant to enable TWIM applications).

Advances in technologies, including the development of "software defined radio" (SDR), could facilitate the following functions:

- switching of the operating mode, e.g. public network, office network, home link;
- adaptive multi-states modulation and adaptive bit rate;
- adaptive array antenna;
- different grade of service;
- multiband operation including interactivity.

One of the SDR impacts is that manufacturers could develop a common hardware platform on which various SDR functions are implemented, and that a single hardware platform is economically applied to many operators' different specifications. The impact of SDR on spectrum utilization depends largely on adaptability of the software that defines the above-listed functions. Highly adaptive SDR may change its technical parameters on a real-time basis. For example, one SDR may operate in different systems in different radiocommunication services according to the designed software. SDR technology may become an important enabler to the future development of TWIM applications as well as to the possible enhancement of the spectrum utilization.

---

[1] There is no Recommendation on security in the ITU.

7.1.2.4 Future studies in ITU-R

The convergence of technologies and applications considered in this section may require future studies by ITU-R on whether modifications to ITU Radio Regulations Service definitions, or other Regulations, are necessary. It may also be necessary to review whether any such modifications may have an impact on the existing international frequency coordination procedures as well as future use of frequency spectrum.

Studies may be necessary to identify possible spectrum with a view to facilitating the development of TWIM applications. Studies may also be required to evaluate the extent to which TWIM applications may be introduced in frequency bands, which are not shared by all three terrestrial services (fixed, mobile, broadcasting).

Additional studies may also be required to assess the advantages and disadvantages of global and regional harmonization of spectrum for systems carrying TWIM applications, bearing in mind that this factor is important for potential cost advantages through economy of scale and the possible need to recognize the aspect of harmonization in the Radio Regulations. At the same time, studies should look at the potential advanced technologies, which could be used to lessen such need for global or regional harmonization.

7.1.3 Methods to satisfy the agenda item

Method A

In order to complete the work associated with this agenda item it will be necessary to conduct further studies with the results to be completed and reported to the WRC-07. WRC-03 may revise Resolution **737 (WRC-2000)**, based on considerations of §§ 7.1.1, 7.1.2 and 7.1.4. In doing so, relevant parts of these sections may be included in an Annex to the Resolution.

Further recommended exploration of issues related to the TWIM concept include:

- Study possible frequency bands for TWIM applications, taking into account the scope of TWIM systems as described in § 7.1.2.1 above (including sharing between different radiocommunication services, § 7.1.2.2).
- Study the advantages and disadvantages of global and regional harmonization of spectrum for TWIM applications and the possible need for recognition of such harmonization within the Radio Regulations.
- Review the existing radiocommunication service definitions, including how they are used to determine the use of frequency bands and the consequences they may have on international frequency coordination procedures.

Method B

It may be possible to conclude this agenda item at WRC-03 on the basis that no regulatory impediments have been identified. Resolution **737 (WRC-2000)** may be suppressed. The Study Groups within ITU-R may prepare relevant Questions and continue their work under the normal activities in order to examine any issues related to the deployment of TWIM applications.

Method C

Some administrations in Region 1 consider that no regulatory impediments have been identified, with the exception of the broadcasting service in Region 1 in the frequency range 470-790 MHz, where there is no co-allocation to the broadcasting, fixed or mobile services (as noted in § 7.1.2.2.1). This will restrict the possibilities for those countries in Region 1 that so wish, to develop TWIM applications associated with the broadcasting service. Noting that this frequency range will be the subject of re-planning for the introduction of digital broadcasting by two Regional

Radiocommunication Conferences (the first in 2004), it may be appropriate to have an item on the agenda of WRC-07 to consider if there are any consequential issues for terrestrial services (fixed, mobile, broadcasting) arising from this re-planning exercise that would need to be taken into consideration by WRC-07. WRC-03 may replace the general agenda item relating to TWIM applications by this item on the agenda of WRC-07. The general studies on TWIM applications may continue within the normal activities of the ITU-R.

Some other administrations are of the view that there should be no link between this agenda item and the revision of the Stockholm 61 and Geneva 89 Plan(s) foreseen to be carried out in 2004 and 2005/2006.

7.1.4 Regulatory and procedural considerations

The distinctions between the terrestrial fixed, mobile and broadcasting services have been clear and unambiguous, and the traditional national regulatory processes and the organization of the ITU-R were designed to reflect those distinctions. It is believed that the definitions of the three radiocommunication services are still valid and applicable; however it should be understood that systems are starting to appear that are capable of operating within two or even all of the three radiocommunication services.

Apart from that identified in Method C, there is no evidence at this time that there are any Radio Regulations impediments to the development of TWIM applications. However, it may be necessary to continue to study the boundaries between existing radiocommunication services to determine if any impediments to such TWIM applications may appear.

7.2 Agenda item 1.22

"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)**"

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

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 1 700 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 a 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 No. **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 Nos. **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 (WRC-2000)**.

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.

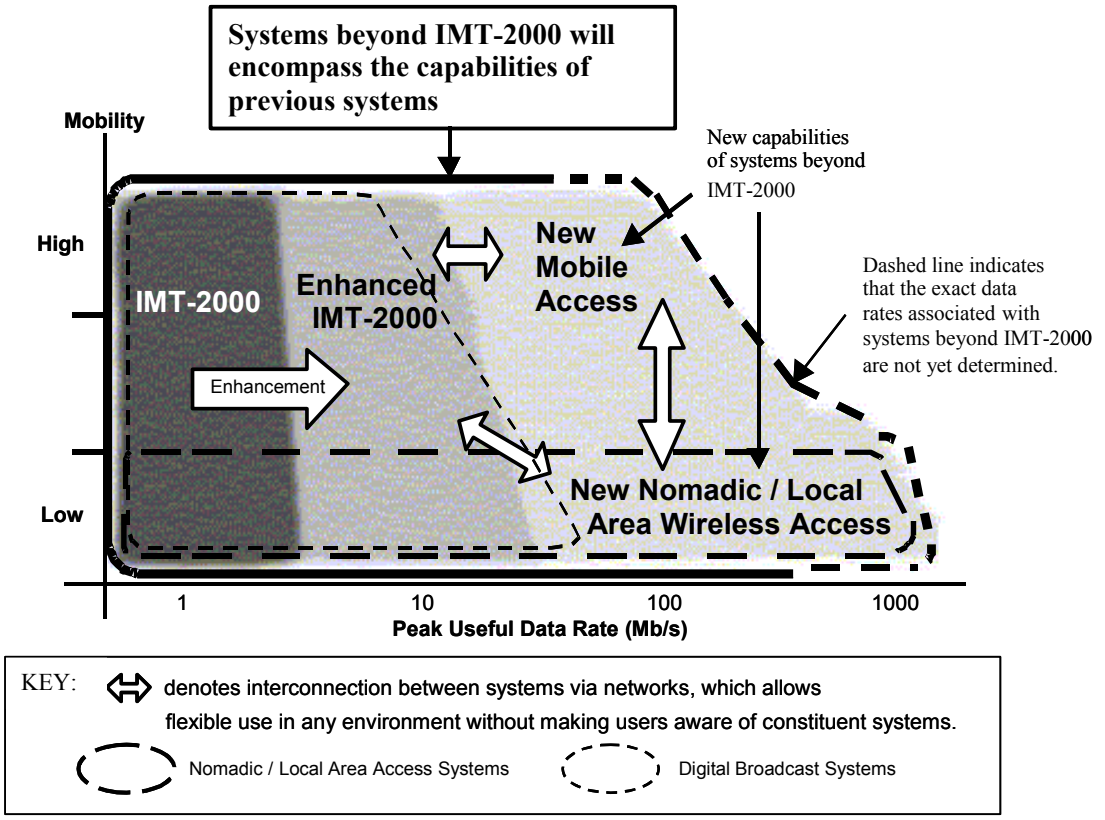
In accordance with Resolutions **228 (WRC-2000)** and **801 (WRC-2000)**, the requirements for the future development of IMT-2000 and systems beyond IMT-2000 are to be reviewed by WRC-07, taking into consideration the results of ITU-R studies presented to WRC-03.

7.2.1.3 Vision for the future development of IMT-2000 and systems beyond IMT-2000[2]

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 envisaged capabilities of IMT-2000 and systems beyond IMT-2000 are illustrated in Figure 7.2-1.

[2] There is a need for appropriate naming to be developed in advance of WRC-07 for the future development of IMT-2000 and systems beyond IMT-2000. This is being addressed within WP 8F.



Dark shading indicates existing capabilities, medium shading indicates enhancements to IMT-2000, and the lighter shading indicates new capabilities of systems beyond IMT-2000.

The degree of mobility as used in this figure is described as follows: Low mobility covers pedestrian speed, and high mobility covers high speed on highways or fast trains (60 km/h to ~250 km/h, or more).

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 up to approximately 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 of up to approximately 100 Mbit/s for high mobility) and nomadic/local area access (high data rates of up to 1 Gbit/s for low mobility). These will also form part of the relationship with other radio systems.

However, it should be noted that the data rates available and the dates of introduction may vary from country to country.

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 fulfil 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.

7.2.1.4 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 systems are already being enhanced (for instance, towards IP-based networks and to offer bit rates up to 10 Mbit/s under favourable circumstances). These initial enhancements, for which standards are already being developed, will be followed by further enhancements that could increase the peak aggregate useful data rate up to approximately 30 Mbit/s under favourable circumstances by around 2005; h0owever, some operators may need additional spectrum to realize these enhancements.

The satellite component of IMT-2000 may further evolve to provide complementary services in areas covered by cellular systems[3], 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.

7.2.1.5 New capabilities for systems beyond IMT-2000

The ITU Vision for systems beyond IMT-2000 includes advanced services. There may be a need for a new wireless access technology to be developed around the year 2010 capable of supporting high data rates with high mobility, which could be widely deployed around the year 2015 in some countries. The new mobile access element(s) of systems beyond IMT-2000 will handle a wide range of supported data rates of up to approximately 100 Mbit/s, according to economic and service demands to achieve full area coverage for systems in multi-user and multi-cell environments and

---

[3] In this context, "cellular" refers to the method of deployment of base station sites and reuse of frequencies, and not to the frequency band employed.

with terminals moving at vehicular speeds (high mobility), as shown in Figure 7.2-1. 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 new wireless access methods which will closely inter-work with 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 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.

7.2.1.6 Related ITU-R Recommendations

Relevant ITU-R Recommendations: M.687; M.819; M.1311; M.1390; M.1457; P.1411.

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

7.2.2.1 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 RR No. **5.388** 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 time-frame 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 IMT-2000, 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-07.

7.2.2.2 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 IMT-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.

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:

7.2.2.2.1 Characteristics of most developing countries

- Low level of income per inhabitant (less than USD 600 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.

7.2.2.2.2 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.

7.2.2.2.3 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. 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 nationwide 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 identified for IMT-2000 at WARC-92 and WRC-2000.

7.2.2.3 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.

7.2.2.4 Relationship with studies documented under other CPM Report 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.

7.2.3 Methods to satisfy the agenda item and their advantages and disadvantages

WRC-03 may decide to include an agenda item for WRC-07 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-07. The possible revision of Resolution **228 (WRC-2000)** is shown in Annex 7.2-1. WRC-03 may also invite the ITU-R to conduct and complete in time for WRC-07, 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;

iii) sufficient time for system development;

iv) possibilities for sharing and compatibility with services already allocated in potential spectrum for the future development of IMT-2000 and systems beyond IMT-2000, taking into account appropriate protection criteria for the existing services; and

v) the possible development of systems/services in potential spectrum for the future development of IMT-2000 and systems beyond IMT-2000.

7.2.4 Regulatory and procedural considerations

No regulatory or procedural considerations have been identified.

ANNEX 7.2-1

MOD

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

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

The World Radiocommunication Conference (~~Istanbul, 2000~~Geneva, 2003),

considering

a) that International Mobile Telecommunications-2000 (IMT-2000) ~~is scheduled to start service around the year 2000, subject to market and other considerations~~ systems started operation in the year 2000;

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~~ is being studied within ITU-R;

~~*c*~~*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 eight years ahead of the IMT-2000 initial deployment that WARC-92 identified the spectrum for IMT-2000 in No. **5.388** and in Resolution **212**;

f) that the review of IMT-2000 spectrum requirements at WRC-2000 concentrated on the bands below 3 GHz;

~~*d*~~*g)* that information technology and telecommunication ~~technologies~~markets evolve rapidly;

~~*e*~~*h)* that adequate spectrum availability is a prerequisite for the market and technological ~~and economic~~ success of the future development of IMT-2000 and systems beyond IMT-2000;

~~*f*~~*i)* that a continuing and accelerating growth in 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~~ is forecasted;

~~*g*~~*j)* 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;

k) that an orderly process of change and development of IMT-2000 towards the capabilities and functionalities of systems beyond IMT-2000 is needed;

~~*h*~~*l)* that, for global operation and economy of scale, which are key requirements for success of mobile communications services, it is desirable to agree on a harmonized time-frame and common technical, operational and spectrum-related parameters of systems, taking account of relevant IMT-2000 and other experience;

~~*i*~~*m)* that it is therefore timely to study market, technical, spectrum and regulatory issues pertinent to the future development of IMT-2000 and systems beyond IMT-2000~~,~~;

n) that sharing and compatibility should be addressed between existing services and the future development of IMT-2000 and systems beyond IMT-2000;

o) that Question ITU-R 77-4/8 addresses adaptation of mobile radiocommunication 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 ITU-R has envisaged that new elements of systems beyond IMT-2000 will be developed, which will closely interwork and be interoperable with currently operating IMT-2000 and its future enhancements;

c) that there is a need for appropriate naming to be developed in advance of WRC-07 for the future development of IMT-2000 and systems beyond 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 and broadcasting networks are increasingly converging;

c) that, in the future, mobile systems ~~will require the adoption of more~~are expected to adopt more spectrum-efficient techniques;

d) the needs of developing countries for the cost-effective implementation of advanced mobile communication technologies and the propagation characteristics of lower frequency bands that result in larger cells,

resolves

1 to invite ITU-R to ~~continue studies~~further study and develop Recommendations on ~~overall objectives, applications and~~ technical and operational ~~implementation, as necessary, for~~issues relating to the future development of IMT-2000 and systems beyond IMT-2000;

2 to invite ITU-R to ~~study~~complete studies on the spectrum requirements and the 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 evolving market, including the growth in demand for IMT-2000 services, and the evolution of IMT-2000 and other mobile systems through advances in technology;

3 that the studies referred to in *resolves* 1 and 2 should take into consideration the particular needs of developing countries;

4 that the studies referred to in *resolves* 1 and 2 should include sharing and compatibility studies with services already allocated in potential spectrum for the future development of IMT-2000 and systems beyond IMT-2000;

~~3~~5 that the spectrum requirements for the future development of IMT-2000 and systems beyond IMT-2000 should be ~~reviewed~~considered by WRC-0~~5/06~~7, taking into ~~consideration the~~account the results of the ITU-R studies ~~presented to WRC-03~~referred to in *resolves* 2,

urges administrations

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

7.3 Agenda item 7.2

"to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, taking into account Resolution **801 (WRC-2000)**"

7.3.1 Preliminary agenda items for WRC- 07

2.2 to review the operational procedures of the Global Maritime Distress and Safety System (GMDSS), taking into account the experience since its introduction and the needs of all classes of shipping;

The GMDSS entered into force in 1992. In light of the continued transition to the GMDSS, it is essential that an evaluation be made of the experience gained to date and that this be taken into account when reviewing the procedures of the GMDSS trying to best serve the needs of all classes of shipping. Given that the IMO has urged administrations to implement GMDSS for all non-SOLAS vessels under national legislation as soon as possible and, additionally, to encourage all maritime vessels voluntarily carrying maritime VHF radio equipment to be fitted with DSC, it is essential that the lessons learned be used to support and shape the evolution of such a widely implemented system. Furthermore the review of the VHF channel 16 watch-keeping requirements scheduled to take place some time prior to 2005 by IMO implies that some future adjustments to the operational procedures of GMDSS are indeed likely. In addition, there are provisions in the Radio Regulations that impose unnecessary operational burdens upon the maritime community, including those of Appendix **16** that impose outdated requirements on vessels. It is essential that all such provisions be identified and reviewed at the earliest opportunity.

2.3 to review studies and consider allocations in the frequency bands above 275 GHz;

This item has been under study within the ITU-R since 2000.

The ITU-R began studies in 2000 of fundamental propagation characteristics and prediction techniques relevant to systems operating in the range 20 and 375 THz (15-0.8 μm). The studies have resulted in DNRs on fundamental propagation characteristics, DNR ITU-R P.[OPTICAL] (see Doc. 3/69), and on propagation prediction techniques, DNR ITU-R P.[THz] (see Doc. 3/74), applicable to the range 20 to 375 THz (15-0.8 μm). Existing Recommendations on atmospheric absorption already address the spectrum between 275 and 1 000 GHz.

For the 275-1 000 GHz range, ITU-R studies have resulted in the identification of spectral lines of interest to radio astronomy. Studies are being conducted to determine continuum bands of interest in this range. ITU-R studies have resulted in the identification of bands of interest to EESS (passive) and SRS (passive), performance criteria, and permissible levels of interference. Sharing studies between active services and passive services in this frequency range will be completed when characteristics of active services become available. ITU-R studies have also identified the bands of interest to the amateur services. Studies establishing the requirements, performance criteria, and acceptable levels of interference for the amateur service are expected to be complete in time for WRC-06.

ITU-R studies have resulted in the description of the technical and operational characteristics of radio astronomy systems operating in the range 10-1 000 THz (30-0.3 μm). Studies to identify technical and operational characteristics of SRS and EESS systems operating in the frequency range 10-1 000 THz are ongoing. Sharing studies for this region of the spectrum have yet to be conducted.

ITU-R studies have resulted in a DNR ITU-R S.[4/65] on technical and operational characteristics of satellites operating in the range 20-375 THz (15-0.8 μm). Sharing studies for the frequency range 20-375 THz (15-0.8 μm) are being conducted and will be available by WRC-07.

Therefore, this item may be considered to be maintained in the agenda of WRC-07.

2.4 to consider a resolution specifying the technical bases for the global operation of stations in the land mobile and land mobile-satellite services between 30 MHz and 6 GHz;

2.5 to review the allocations to services in the HF bands, taking account of the impact of new modulation and adaptive control techniques and any recommendations by WRC-03 on the adequacy of the frequency allocations for HF broadcasting and the fixed and mobile services (excluding those bands whose allotment plans are in Appendices 25, 26 and 27), from about 4 MHz to 10 MHz;

Whether there is a need to maintain this item in the agenda for WRC-07 is dependent upon the conclusions of WRC-03 on agenda items 1.36 and 1.23.

Some administrations expect that WRC-03 will, having examined the adequacy of the frequency allocations for HF broadcasting, issue a resolution or recommendation specifying the broadcasters' analysis. This means that further studies will be needed for all services concerned with the quoted bands in order to analyse the consequences for these services. These studies shall also analyse the experience gained with new modulation techniques and adaptive control techniques; therefore, WRC-07 should consider the results of these studies under this agenda item.

Other administrations expect that the conclusions of WRC-03 with regard to agenda items 1.23 and 1.36 will effectively provide all decisions needed in connection with reallocations among the amateur, broadcasting, fixed and mobile services in the portion of the spectrum under consideration. These administrations believe that all parties concerned will have an opportunity at WRC-03 to state their case, and therefore there would be no need for an agenda item at WRC-07.

*2.6 to consider possible changes in response to Resolution **86** (Marrakesh, 2002): "Coordination and notification procedures for satellite networks";*

2.7 to consider potential for sharing at around 4 300 MHz between radio altimeters and space-based passive earth sensors;

Potential for sharing at around 4 300 MHz between radio altimeters and space-based passive earth sensors has been under study within the ITU-R since 1998. ITU-R studies have resulted in Recommendation ITU-R SA.[EESS-4300]. These studies are mature and conclude that sharing between passive spaceborne sensors operating in the Earth exploration-satellite service (passive) and radio altimeters operating in the aeronautical radionavigation service is feasible.

Due to the safety of life aspects of the radio altimeters operating in the airborne radionavigation service in this band, it may be necessary to implement a footnote that states that the use and development of the airborne radionavigation service is not to be constrained, nor can protection be claimed by the EESS (passive).

ITU-R studies on this item are expected to be completed in time for the next WRC.

Therefore, this item may be considered to be maintained in the agenda of WRC-07.

*2.8 on the basis of the results of studies, to consider allocations, if appropriate, to non-GSO MSS with service links below 1 GHz in the band 470-862 MHz, in accordance with Resolution **728 (Rev.WRC-2000)**;*

*2.9 to consider the use of frequency adaptive systems in the MF/HF bands, in accordance with Resolution **729 (WRC-97)**;*

2.10 to consider allocation of the frequency band 14.5-14.8 GHz to the fixed-satellite service (Earth-to-space) in Region 3 (expansion of the fixed-satellite service to include links other than feeder links of the broadcasting-satellite service);

2.11 to review the possibility for additional allocations for the fixed service in the bands above 3 GHz;

2.12 consider spectrum requirements for wideband aeronautical telemetry in the band between 3 and 30 GHz.

In response to Administrative Circular CA/109, administrations expressed a need for an additional allocation in this range, as close to 3 GHz as practical. Sharing studies are to be undertaken looking toward the identification of possible candidate bands.

For these reasons, the item may be considered to be maintained in the agenda of WRC-07.

*2.13 to review No. **S5.332** in respect of the frequency band 1 215-1 260 MHz and No. **S5.333** in respect of the frequency band 1 260-1 300 MHz, concerning the Earth exploration-satellite (active) service and other services;*

*2.14 to take into account ITU-R studies in accordance with Resolution **342 (Rev.WRC-2000)**, and to consider the use of new digital technology for the maritime mobile service in the band 156-174 MHz, and consequential revision of Appendix 18;*

Studies on this matter are still ongoing. The item may be considered to be maintained in the agenda of WRC-07.

*2.15 to review, with a view to identifying necessary spectrum for global harmonization, spectrum and regulatory issues related to terrestrial wireless interactive multimedia applications in accordance with Resolution **737 [GT PLEN-2/2] (WRC-2000)**;*

*2.16 to review the requirements for the future development of IMT-2000 and systems beyond IMT-2000, taking into account Resolution **228 (WRC-2000)**;*

ITU-R studies on the vision for the future development of IMT-2000 and systems beyond IMT-2000 have concluded and are documented in the Vision DNR [Doc. 8/110]. To fulfil the ITU vision for future development of IMT-2000 and systems beyond IMT-2000, it is envisaged that further spectrum may be needed, in addition to that identified for IMT-2000 at WARC-92 and WRC-2000. Work on this matter continues to be carried out by ITU-R and a work plan has been developed by ITU-R Working Party 8F that prepares for the potential identification of spectrum at WRC-07. This work will take into account relevant IMT-2000 and other experience, the frequency bands already identified and used for IMT-2000, and future needs of services already allocated to potential spectrum for the future development of IMT-2000 and systems beyond IMT-2000. ITU-R is studying 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. ITU-R is also developing a framework of services for the future development of IMT-2000 and systems beyond IMT-2000, which will be used to refine these spectrum requirements.

For these reasons, the item may be considered to be maintained in the agenda of WRC-07.

A summary of the progress of ITU studies on the future development of IMT-2000 and systems beyond IMT-2000 is contained in section 7.2 of this report.

7.3.2 Items for inclusion in the agendas of future conferences

3.1 to consider results of ITU-R studies on the feasibility of sharing in the band 2 700-2 900 MHz between the aeronautical radionavigation service, meteorological radars and the mobile service, and to take appropriate action on this subject;

ITU-R has conducted studies on the feasibility of sharing between IMT-2000 and radar systems operated in the band 2 700-2 900 MHz. Those studies indicate sharing of the 2 700-2 900 MHz

band between the MS (IMT-2000) and ARNS and meteorological radars is not feasible. WRC-03 may wish to consider deletion of this agenda item from the WRC-05/06 agenda.

NOTE – ITU-R is studying the possible identification of other frequency ranges for use by the AM(R)S in addition to the current allocations. This would be intended to overcome an expected shortage in spectrum expected by 2010 for line-of-sight air-ground communications.

*3.2 to consider results of ITU-R studies in accordance with Resolution **222 [COM5/22] (WRC-2000)** to ensure spectrum availability and protection for the aeronautical mobile-satellite (R) service and the Global Maritime Distress and Safety System (GMDSS), and to take appropriate action on this subject, while retaining the generic allocation for the mobile-satellite service;*

Spectrum availability and protection for the safety services are to be ensured in the bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz by RR Nos. **5.353A** and **5.357A**, and Resolution **222**. However, these frequency bands are fully used. Thus it is difficult to accommodate spectrum required for safety service, which are prioritized and protected by the above provisions, where at the same time safeguarding the investment and operation of other MSS systems. It is urgently required to improve this situation and to ensure long-term spectrum availability required for MSS, in particular the safety services.

Resolution **222 (WRC-2000)** invited ITU-R to complete studies to determine the feasibility and practicality of prioritization and real-time pre-emptive access between different networks of mobile-satellite systems, while taking into account the latest technical advances in order to maximize spectral efficiency.

ITU-R is now carrying out the studies on this subject mainly focusing to AMS(R)S in the bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz. The studies are not yet complete. Although some mobile-satellite networks currently provide intra-system pre-emptive access functions, there are no actual MSS systems providing inter-system pre-emptive access functions and there are no plans and no methods of inter-system pre-emptive access available.

7.3.3 Additional suggested item

Based on the contributions to the CPM, the following proposal for inclusion on the agenda of a future world radiocommunication conference (WRC) was also noted

*"to consider Nos. **5.530** and **5.484A**, and taking account Resolutions **507** and **525 (WARC-92)**, with a view to planning of the BSS band 21.4-22 GHz at a future competent conference"*

7.3.4 Principles for agendas for world radiocommunication conferences

In response to proposals to establish principles for agendas for World Radiocommunication Conferences (WRCs), CPM noted the basic provisions in the framework of the ITU Constitution and Convention.

Article 13 of the Constitution, No. 89, specifies the scope of a WRC to revise the Radio Regulations and to deal with any question of a worldwide character within its competence and related to its agenda.

Article 13 also prescribes that conferences shall take into account the foreseeable financial implications, and that they should avoid adopting resolutions and decisions which might give rise to expenditure in excess of the financial limits.

Article 7 of the Convention lists in some more detail relevant kinds of items that may be included in a WRC agenda:

- partial or, exceptionally, complete revision of the Radio Regulations;
- any other question of a worldwide character within the competence of the conference;

- an item concerning instructions to the Radio Regulations Board and the Radiocommunication Bureau regarding their activities, and a review of those activities;
- the identification of topics to be studied by the radiocommunication assembly and the radiocommunication study groups, as well as matters that the assembly shall consider in relation to future radiocommunication conferences.

Additionally, the Convention in Article 34 on financial responsibilities of conferences prescribes:

- that conferences, before adopting proposals or taking decisions with financial implications, the conferences of the Union shall take account of all the Union's budgetary provisions with a view to ensuring that they will not result in expenses beyond the credits which the Council is empowered to authorize;
- that no decision of a conference shall be put into effect if it will result in a direct or indirect increase in expenses beyond the credits that the Council is empowered to authorize.

The Plenipotentiary Conference at Marrakesh September/October 2002 reviewed the WRC process based on recommendations by the Reform Group of ITU and proposals to the conference. The conclusions are formulated in Resolution 80 (Rev. Marrakesh, 2002):

- that world radiocommunication conference preparations and administration, including budgetary appropriations, should be planned on the basis of two consecutive world radiocommunication conferences: a WRC shall propose the draft agenda of the next WRC and a provisional agenda for the second WRC;
- to support the regional harmonization of common proposals, as stated in Resolution 72 (Rev.WRC-2000), for submission to world radiocommunication conferences;
- to encourage both formal and informal collaboration in the interval between conferences, with a view to resolving differences on items already on the agenda of a conference or new items;
- that administrations, when proposing specific agenda items for WRC, should to the extent possible include some indication of the possible financial and resource implications (preparatory studies and decision implementation), to which effect they may request the assistance of the Radiocommunication Bureau.

In spite of the provisions of the Constitution and Convention, CPM noted the tendency that WRCs are proposing longer and more involved agendas, in several cases including very wide topics, and in some cases there are topics having a very limited scope.

The cumulative effect of the consequential workload upon administrations, ITU-R Sector and the Union in general both for preparatory work and for the implementation cycle is considerable. A great deal of time, effort and resources have been associated with several agenda items during the recent two WRC cycles, which only assess studies and do not require modification to the RR and repeatedly appear in or stem from agenda items of earlier WRCs; therefore, such "rolling agenda items" need to be restricted.

WRC agendas with a wide variety of subjects are cumbersome for most administrations, in particular for those of developing countries. Some limitations in the scope of a WRC would make it more manageable for the administrations as well as for ITU-R. It is also important to take into account the financial situation of ITU.

CPM concluded that there is a need for some principles for the establishment of a WRC agenda item, in addition to the provisions in Article 13 of the Constitution, Articles 7 and 34 of the Convention and Resolution 80 (Rev. Marrakesh, 2002), to reduce enumerated difficulties and to take into account the financial situation of ITU. CPM therefore recommends that, following studies

by RAG, further improvements of the WRC process should be adopted by a WRC or PP as appropriate. The following guidelines were offered by some administrations for consideration:

a) the subjects on a WRC agenda should be kept within a range which is manageable for administrations as well as for ITU-R;

b) subjects that are not mature and studied within ITU-R, nor required to become items on the agenda for the first forthcoming WRC, could be stored as alternative agenda items in a "basket" for future conferences;

c) to the extent possible, any subject that has been on the agenda for two consecutive world radiocommunication conferences should not be considered for the following WRC;

d) subjects for WRC agenda items should be encouraged to be coordinated in regional preparation for the WRC establishing the agenda.