Technical Specification Group Services and System Aspects **TSGS#8(00)316**

Meeting #8, Dusseldorf, Germany, 26-28 June 2000

Report on the IMT-2000 results at WRC-2000

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1 Introduction

On 30th May 2000, the 147 administrations participating in the ITU World Radiocommunication Conference 2000 (WRC-2000) in Istanbul, Turkey, made important new decisions on the identification of additional spectrum for the International Mobile Telecommunications 2000 system (IMT-2000).

This was an excellent result for the UMTS Forum, and it now provides ample opportunities for enterprising operators to build and grow global IMT-2000 businesses.

Originally conceived in an era when mobile telecommunications provided only voice and low-speed circuit-switched data, the IMT-2000 concept has adapted to the changing telecommunication environment as its development progressed. In particular, the advent of Internet, intranet, e-mail, e-commerce and video services has significantly raised end-user expectations of the responsiveness of the network and the terminals, and hence the data rate of the mobile channel. This demand for higher bandwidth services, coupled with the phenomenal increases in mobile penetration throughout the world's populations, has given rise to a requirement for 160MHz of additional spectrum for IMT-2000, above and beyond the 230MHz originally identified by WARC-92.

An objective of the Conference was therefore to identify bands which would provide this additional spectrum for the terrestrial component of IMT-2000, on a global basis, to complement the bands identified by WARC-92. Ideally this spectrum would have been found within one single global band. However, from the outset, it was clear that no such band could be found, within realistic timescales, to achieve this goal. The administrations therefore made an important decision to work together to identify, on a world-wide basis, a small number of bands from which each administration would be able to find the total spectrum it needed to fulfil its own particular IMT-2000 spectrum requirements.

This flexible approach required considerable compromise, as many administrations needed to accommodate the global identification of frequency bands that were not necessarily their preferred national choice. However, the common recognition of the enormous social and economic importance of IMT-2000, the unique opportunity presented by the relevant WRC-2000 Agenda Item and the spirit of co-operation that is always present at WRCs allowed the excellent results to be achieved.

2 About the conference

2.1 General comments

WRC-2000 was held in Istanbul, Turkey, from 8th May until 3rd June 2000.

The venue was the Istanbul International Conference and Exhibition Centre (ICEC), in the Harbiye district of Istanbul to the north of Taksim Square. The ICEC had been specially extended with a new suite of meeting rooms large enough to cater for this exceptional event. In particular, the new extension provided a plenary room able to seat in excess of 2500 people in reasonable comfort.

The Conference was hosted by the Turkish administration under contract to the ITU. The facilities and organisation were excellent, and despite earlier concerns the conference ran smoothly and effectively at all times. Turkey can be proud of their achievements in hosting this important conference.

It is difficult to describe the scale and intensity of the Conference to those not present, but the following statistics will give some insight into the event: -

- The cost of the Conference was about 6.5M Swiss Francs (about £2.6M), not including the cost of the conference centre extension and the security arrangements;
- Approximately 2300 delegates from 147 countries attended, plus more than 200 ITU and other support staff;
- There were 175 Formal meeting agendas, not including sub-working groups, drafting groups and the manifold ad-hoc discussions;
- Simultaneous translation was provided for the formal meetings for the 6 ITU languages: English, French, Spanish, Russian, Chinese and Arabic.
- There were ~530 Main documents, plus 300 temporary documents;
- Over 25 million photocopied pages were produced;
- Over 8500 pages were translated into 3 languages (English, French and Spanish);
- The documentation cost ~3.7M Swiss Francs;
- 24hr uniformed and special police protection was provided around the conference centre;
- The longest sub-working group meeting was of 13 hours duration. From 2pm Sunday to 3am Monday!

2.2 Chairmen

The **Conference Chairman** was **Dr Fatih Mehmet Yurdal**, Chairman of the Telecommunications Board of the Republic of Turkey. He proved to be an excellent choice, and to his great credit achieved good results across all the many Agenda Items without a single formal vote. This must be something of a record. He showed tact and patience when required, but also exhibited strength of character and strong leadership when the going got tough in the plenary sessions (which it did).

The IMT-2000 work came within the remit of **Committee 5**, which was chaired **by Chris Van Deepenbiek** of the Netherlands Administration. Chris had proved himself to be an able chairman at the November '99 Conference Preparatory Meeting (CPM) in Geneva, and his tough, no nonsense approach coupled with a dry sense of humour resulted in the agreements built up at the lower levels being maintained through the all-important Committee 5 stage.

Committee 5 (about 900 people) dealt with more than just IMT-2000, and the bulk of the detailed work on IMT-2000 was allocated to **Working Group 5A**, chaired by **Alan Jamieson** of New Zealand. Alan Jamieson was faced with a very difficult task indeed, trying to pull together the differing positions of CEPT, CITEL (except the USA), the US, APT, the RCC[1], and the African Countries. He is to be complemented on the successful way he handled the WG 5A business.

3 Summary of Results

The main results of the conference were: -

Protection of the existing "core bands". The identification of the existing IMT-2000 "core" bands was successfully defended, and the status of these bands remains unchanged. Potential threats to the stability of these bands did materialise during the conference, but these were resolved.

The band 2500-2690MHz was identified for IMT-2000 in all three ITU Regions[2]. This will be the main expansion band for Europe for the terrestrial component of IMT-2000. Initially only 2520-2670MHz will be available as the other 2x20MHz sub-bands are allocated to the Mobile-Satellite Service (MSS). Some countries in Asia-Pacific will also use all or part of this band for IMT-2000 expansion. Some Region 2 countries (CITEL) may study this band for possible longer-term use as expansion spectrum for IMT-2000, perhaps on a shared basis with other applications, but it is not available in most CITEL at the present time because of extensive MDS usage. Details of the identification of this band can be found in Annex 1 (see footnote **S5AAA**) and Annex 3 - Resolution [**COM5/24**](WRC-2000). The modifications to the Frequency table in Article S5 of the Radio Regulations for all the new IMT2-2000 bands are given in Annex 2.

The band 1710-1885MHz was also identified for IMT-2000 in all three Regions. This is the preferred IMT-2000 band for the CITEL administrations (except USA). It will in fact be their "core band" as the original IMT-2000 bands have been used for PCS etc. However, as the band is also identified on a global basis, it will allow eventual evolution of GSM 1800 to IMT-2000 at a later stage, if required. Some Asia-Pacific countries with broadcast interests in 2500-2690MHz will also use this band for IMT-2000 extension spectrum. Details of the identification of this band can also be found in Annex 1 (see footnote **S5.AAA**), Annex 2 and Annex 3 - Resolution [**COM5/24**](WRC-2000).

1st and 2nd Generation mobile bands below 1GHz (specifically in 806-960MHz, e.g. GSM 900 and US Cellular) are also identified, on a worldwide basis, for IMT-2000 to provide administrations with an opportunity to migrate these bands to IMT-2000 in the longer term. Details of the identification of these frequencies can be found in Annex 1 (Footnote **S5.XXX**), Annex 2 and Annex 4 (Resolution [**COM5/25**](WRC-2000)).

The **US achieved recognition** that they may wish to implement IMT-2000 in their soon-to-be auctioned bands at about 700MHz, and **China secured recognition** that 2300-2400MHz will be its preferred (national) expansion band. However, these bands are not specifically identified for IMT-2000.

The satellite component of IMT-2000 also received appropriate attention. The mobile-satellite service (MSS) bands at 1980-2010MHz and 2170-2200MHz are already identified for IMT-2000 applications by virtue of their location within the previously-identified "core bands". WRC-2000 decided also to identify

[1] RCC: Radio Communications Commonwealth. A group comprising Russia and 7 east European countries.

[2] Region 1 – Europe (including Russian Federation), Africa and the Middle East; Region 2 – The Americas; Region 3 – The rest of the world.

the other MSS bands below 3GHz for IMT-2000 to allow an equitable opportunity for all the MSS satellite operators to provide IMT-2000 services via their satellite networks. Details can be found in Annex 1 (Footnote **S5.SSS**), Annex 2 and Annex 4 (Resolution [**COM5/26**](WRC-2000)).

Finally, in an innovative decision, the conference agreed further provisions (a final footnote and resolution) that now enable **High Altitude Platform Stations (HAPS)** to be used in the existing core bands as platforms for base stations for the terrestrial component of IMT-2000 (see Annex 1 (Footnote **S5.BBB**), Annex 2 and Annex 5 (Resolution [**COM5/13**](WRC-2000)).).

The new provisions in the Radio Regulations provide **full flexibility** for administrations to choose whether or not to implement IMT-2000 in these bands. Those administrations wishing to go ahead with IMT-2000 can decide on how much spectrum to make available, which of the identified band(s) they want to take the spectrum from, and when they want to make it available. For administrations that have less immediate interest in IMT-2000, the use of the identified bands for other applications within the services to which the bands are formally allocated is not precluded in any way. This flexibility reflects the uncertainties over the size and timing of individual markets for IMT-2000 (especially in the developing countries).

With a clearly defined spectrum environment, the manufacturers within the 3 Regions now know the limits of the frequencies for which the terminals must be designed. By having a limited number of globally identified bands, the manufacturers have the best opportunity to reduce costs via economies of scale.

One of the most important attributes of IMT-2000 will be the capability for global roaming with a single terminal, allowing people to do "anything, any time, anywhere" in their day-to-day telecommunications context. The WRC Decisions to identify a limited number of new bands on a world-wide basis greatly facilitate global roaming with low-cost terminals.

The Decisions of WRC-2000 are very significant for the future of IMT-2000, which is one of the ITU's biggest ever projects. Taken together, the decisions create an excellent radio spectrum environment within which IMT-2000 networks can be deployed and developed to the benefit of all the peoples of the World.

4 Conclusions

The Decisions of WRC-2000 are very significant for the future of IMT-2000, which is one of the ITU's biggest ever projects. Taken together, the decisions create an excellent radio spectrum environment within which IMT-2000 networks can be deployed and developed to the benefit of all peoples of the World.

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Whilst the identification of the additional spectrum is the most visible element of the WRC-2000 decisions, an equally important feature is the flexibility that has been afforded to all administrations relating to the spectrum identified for IMT-2000.

A key action for the Forum members must be to actively participate in the work to be undertaken in ITU-R Working Party 8F. Important studies are planned to pave the way for the implementation of IMT-2000 in the 1.8GHz and 2.5GHz bands, in the bands below 1GHz, for the future evolution of IMT-2000 and for systems beyond IMT-2000.

Annex 1 - New and amended Footnotes

MOD

S5.388 The bands 1885-2025 MHz and 2110-2200 MHz are intended for use, on a world-wide basis, by administrations wishing to implement International Mobile Telecommunications-2000 (IMT-2000). Such use does not preclude the use of these bands by other services to which they are allocated. The bands should be made available for IMT-2000 in accordance with Resolution **212 (Rev.WRC-97)**. (See also Resolution **[COM5/24] (WRC-2000)**.)

ADD

S5.XXX Administrations wishing to implement International Mobile Telecommunications-2000 (IMT-2000) may use those parts of the band 806-960 MHz which are allocated to the mobile service on a primary basis and are used or planned to be used for mobile systems (see Resolution **[COM5/25] (WRC-2000)**). This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations.

ADD

S5.AAA The bands, or portions of the bands, 1 710-1 885 MHz and 2 500-2 690 MHz, are identified for use by administrations wishing to implement International Mobile Telecommunications-2000 (IMT-2000) in accordance with Resolution **[COM5/24] (WRC-2000)**. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations.

ADD

S5.SSS For the use of the bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 610-1 626.5 MHz, 1 626.5-1 645.5 MHz, 1 646.5-1 660.5 MHz, 1 980-2 010 MHz, 2 170-2 200 MHz, 2 483.5-2 500 MHz, 2 500-2 520 MHz and 2 670-2 690 MHz by the mobile-satellite service, see Resolutions **212 (Rev.WRC-97)** and **[COM5/26] (WRC-2000)**.

ADD

S5.BBB In Regions 1 and 3, the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz and, in Region 2, the bands 1 885-1 980 and 2 110-2 160 MHz may be used by high altitude platform stations as base stations to provide International Mobile Telecommunications-2000 (IMT-2000), in accordance with Resolution **[COM5/13] (WRC-2000)**. The use by IMT-2000 applications using high altitude platform stations as base stations does not preclude the use of these bands by any station in the services to which they are allocated and does not establish priority in the Radio Regulations.

Annex 2 - Updated frequency tables in Article S5

ARTICLE S5

Frequency allocations

470-890 MHz

<table>
<tr><th colspan="3">Allocation to services</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td>470-790
BROADCASTING

S5.149 S5.291A S5.294 S5.296
S5.300 S5.302 S5.304 S5.306
S5.311 S5.312</td><td>470-512
BROADCASTING
Fixed
Mobile
S5.292 S5.293
512-608
BROADCASTING
S5.297
608-614
RADIO ASTRONOMY
Mobile-satellite except aeronautical mobile-satellite (Earth-to-space)
614-806
BROADCASTING
Fixed
Mobile
S5.293 S5.309 S5.311
806-890
FIXED
MOBILE S5.XXX
BROADCASTING</td><td>470-585
FIXED
MOBILE
BROADCASTING
S5.291 S5.298
585-610
FIXED
MOBILE
BROADCASTING
RADIONAVIGATION
S5.149 S5.305 S5.306 S5.307
610-890
FIXED
MOBILE S5.XXX
BROADCASTING</td></tr>
<tr><td>790-862
FIXED
BROADCASTING
S5.312 S5.314 S5.315 S5.316
S5.319 S5.321</td><td></td><td></td></tr>
<tr><td>862-890
FIXED
MOBILE except aeronautical mobile S5.XXX
BROADCASTING S5.322</td><td></td><td></td></tr>
<tr><td>S5.319 S5.323</td><td>S5.317 S5.318</td><td>S5.149 S5.305 S5.306 S5.307
S5.311 S5.320</td></tr>
</table>

890-1 350 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
890-942 FIXED MOBILE except aeronautical mobile S5.XXX BROADCASTING S5.322 Radiolocation	**890-902** FIXED MOBILE except aeronautical mobile S5.XXX Radiolocation S5.318 S5.325	**890-942** FIXED MOBILE S5.XXX BROADCASTING Radiolocation
	902-928 FIXED Amateur Mobile except aeronautical mobile S5.CCC Radiolocation S5.150 S5.325 S5.326	
	928-942 FIXED MOBILE except aeronautical mobile S5.XXX Radiolocation	
S5.323	S5.325	S5.327
942-960 FIXED MOBILE except aeronautical mobile S5.XXX BROADCASTING S5.322 S5.323	**942-960** FIXED MOBILE S5.XXX	**942-960** FIXED MOBILE S5.XXX BROADCASTING S5.320

ADD

S5.CCC *Different category of service:* in Cuba, the allocation of the band 902-915 MHz to the land mobile service is on a primary basis.

1 525-1 610 MHz

<table>
<tr><th colspan="3">Allocation to services</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td>1 525-1 530
SPACE OPERATION (space-to-Earth)
FIXED
MOBILE-SATELLITE (space-to-Earth) S5.SSS
Earth exploration-satellite
Mobile except aeronautical mobile S5.349
S5.341 S5.342 S5.350 S5.351 S5.352A S5.354</td><td>1 525-1 530
SPACE OPERATION (space-to-Earth)
MOBILE-SATELLITE (space-to-Earth) S5.SSS
Earth exploration-satellite
Fixed
Mobile S5.343
S5.341 S5.351 S5.354</td><td>1 525-1 530
SPACE OPERATION (space-to-Earth)
FIXED
MOBILE-SATELLITE (space-to-Earth) S5.SSS
Earth exploration-satellite
Mobile S5.349
S5.341 S5.351 S5.352A S5.354</td></tr>
<tr><td>1 530-1 535
SPACE OPERATION (space-to-Earth)
MOBILE-SATELLITE (space-to-Earth) S5.353A S5.SSS
Earth exploration-satellite
Fixed
Mobile except aeronautical mobile
S5.341 S5.342 S5.351 S5.354</td><td colspan="2">1 530-1 535
SPACE OPERATION (space-to-Earth)
MOBILE-SATELLITE (space-to-Earth) S5.353A S5.SSS
Earth exploration-satellite
Fixed
Mobile S5.343
S5.341 S5.351 S5.354</td></tr>
<tr><td>1 535-1 559
S5.362A</td><td colspan="2">MOBILE-SATELLITE (space-to-Earth) S5.SSS
S5.341 S5.351 S5.353A S5.354 S5.355 S5.356 S5.357 S5.357A S5.359</td></tr>
</table>

1 610-1 660 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
1 610-1 610.6 MOBILE-SATELLITE (Earth-to-space) S5.SSS AERONAUTICAL RADIONAVIGATION S5.341 S5.355 S5.359 S5.363 S5.364 S5.366 S5.367 S5.368 S5.369 S5.371 S5.372	**1 610-1 610.6** MOBILE-SATELLITE (Earth-to-space) S5.SSS AERONAUTICAL RADIONAVIGATION RADIODETERMINATION-SATELLITE (Earth-to-space) S5.341 S5.364 S5.366 S5.367 S5.368 S5.370 S5.372	**1 610-1 610.6** MOBILE-SATELLITE (Earth-to-space) S5.SSS AERONAUTICAL RADIONAVIGATION Radiodetermination-satellite (Earth-to-space) S5.341 S5.355 S5.359 S5.364 S5.366 S5.367 S5.368 S5.369 S5.372
1 610.6-1 613.8 MOBILE-SATELLITE (Earth-to-space) S5.SSS RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION S5.149 S5.341 S5.355 S5.359 S5.363 S5.364 S5.366 S5.367 S5.368 S5.369 S5.371 S5.372	**1 610.6-1 613.8** MOBILE-SATELLITE (Earth-to-space) S5.SSS RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION RADIODETERMINATION-SATELLITE (Earth-to-space) S5.149 S5.341 S5.364 S5.366 S5.367 S5.368 S5.370 S5.372	**1 610.6-1 613.8** MOBILE-SATELLITE (Earth-to-space) S5.SSS RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION Radiodetermination-satellite (Earth-to-space) S5.149 S5.341 S5.355 S5.359 S5.364 S5.366 S5.367 S5.368 S5.369 S5.372
1 613.8-1 626.5 MOBILE-SATELLITE (Earth-to-space) S5.SSS AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) S5.341 S5.355 S5.359 S5.363 S5.364 S5.365 S5.366 S5.367 S5.368 S5.369 S5.371 S5.372	**1 613.8-1 626.5** MOBILE-SATELLITE (Earth-to-space) S5.SSS AERONAUTICAL RADIONAVIGATION RADIODETERMINATION-SATELLITE (Earth-to-space) Mobile-satellite (space-to-Earth) S5.341 S5.364 S5.365 S5.366 S5.367 S5.368 S5.370 S5.372	**1 613.8-1 626.5** MOBILE-SATELLITE (Earth-to-space) S5.SSS AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) Radiodetermination-satellite (Earth-to-space) S5.341 S5.355 S5.359 S5.364 S5.365 S5.366 S5.367 S5.368 S5.369 S5.372
1 626.5-1 660 S5.375 S5.376	MOBILE-SATELLITE (Earth-to-space) S5.SSS S5.341 S5.351 S5.353A S5.354 S5.355 S5.357A S5.359 S5.362A S5.374	

1 660-1 710 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
1 660-1 660.5	MOBILE-SATELLITE (Earth-to-space) S5.SSS RADIO ASTRONOMY S5.149 S5.341 S5.351 S5.354 S5.362A S5.376A	

1 710-2 170 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
1 710-1 930	FIXED MOBILE S5.380 S5.AAA S5.BBB S5.149 S5.341 S5.385 S5.386 S5.387 S5.388	
1 930-1 970 FIXED MOBILE S5.BBB S5.388	**1 930-1 970** FIXED MOBILE S5.BBB Mobile-satellite (Earth-to-space) S5.388	**1 930-1 970** FIXED MOBILE S5.BBB S5.388
1 970-1 980	FIXED MOBILE S5.BBB S5.388	
1 980-2 010	FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) S5.388 S5.389A S5.389B S5.389F	
2 010-2 025 FIXED MOBILE S5.BBB S5.388	**2 010-2 025** FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) S5.388 S5.389C S5.389D S5.389E S5.390	**2 010-2 025** FIXED MOBILE S5.BBB S5.388
2 025-2 110	SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) FIXED MOBILE S5.391 SPACE RESEARCH (Earth-to-space) (space-to-space) S5.392	
2 110-2 120	FIXED MOBILE S5.BBB SPACE RESEARCH (deep space) (Earth-to-space) S5.388	
2 120-2 160 FIXED MOBILE S5.BBB S5.388	**2 120-2 160** FIXED MOBILE S5.BBB Mobile-satellite (space-to-Earth) S5.388	**2 120-2 160** FIXED MOBILE S5.BBB S5.388
2 160-2 170 FIXED MOBILE S5.BBB S5.388 S5.392A	**2 160-2 170** FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) S5.388 S5.389C S5.389D S5.389E S5.390	**2 160-2 170** FIXED MOBILE S5.BBB S5.388

2 170-2 520 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
2 170-2 200	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) S5.388 S5.389A S5.389F S5.392A	
2 200-2 290	SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED MOBILE S5.391 SPACE RESEARCH (space-to-Earth) (space-to-space) S5.392	
2 290-2 300	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth)	
2 300-2 450 FIXED MOBILE Amateur Radiolocation S5.150 S5.282 S5.395	**2 300-2 450** FIXED MOBILE RADIOLOCATION Amateur S5.150 S5.282 S5.393 S5.394 S5.396	
2 450-2 483.5 FIXED MOBILE Radiolocation S5.150 S5.397	**2 450-2 483.5** FIXED MOBILE RADIOLOCATION S5.150 S5.394	
2 483.5-2 500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) S5.SSS Radiolocation S5.150 S5.371 S5.397 S5.398 S5.399 S5.400 S5.402	**2 483.5-2 500** FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) S5.SSS RADIOLOCATION RADIODETERMINATION-SATELLITE (space-to-Earth) S5.398 S5.150 S5.402	**2 483.5-2 500** FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) S5.SSS RADIOLOCATION Radiodetermination-satellite (space-to-Earth) S5.398 S5.150 S5.400 S5.402
2 500-2 520 FIXED S5.409 S5.410 S5.411 MOBILE except aeronautical mobile S5.AAA MOBILE-SATELLITE (space-to-Earth) S5.403 S5.SSS	**2 500-2 520** FIXED S5.409 S5.411 FIXED-SATELLITE (space-to-Earth) S5.415 MOBILE except aeronautical mobile S5.AAA MOBILE-SATELLITE (space-to-Earth) S5.403 S5.SSS	

S5.405 S5.407 S5.408 S5.412 S5.414	S5.404 S5.407 S5.414 S5.415A

2 520-2 700 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
2 520-2 655	**2 520-2 655**	**2 520-2 535**
FIXED S5.409 S5.410 S5.411	FIXED S5.409 S5.411	FIXED S5.409 S5.411
MOBILE except aeronautical mobile S5.AAA	FIXED-SATELLITE (space-to-Earth) S5.415	FIXED-SATELLITE (space-to-Earth) S5.415
BROADCASTING-SATELLITE S5.413 S5.416	MOBILE except aeronautical mobile S5.AAA	MOBILE except aeronautical mobile S5.AAA
	BROADCASTING-SATELLITE S5.413 S5.416	BROADCASTING-SATELLITE S5.413 S5.416
		S5.403 S5.415A
		2 535-2 655
		FIXED S5.409 S5.411
		MOBILE except aeronautical mobile S5.AAA
		BROADCASTING-SATELLITE S5.413 S5.416
S5.339 S5.403 S5.405 S5.408 S5.412 S5.417 S5.418 S5.[XXX2] S5.[XXX3]	S5.339 S5.403 S5.[XXX2] S5.[XXX3]	S5.339 S5.418 S5.[XXX1] S5.[XXX2] S5.[XXX3]
2 655-2 670	**2 655-2 670**	**2 655-2 670**
FIXED S5.409 S5.410 S5.411	FIXED S5.409 S5.411	FIXED S5.409 S5.411
MOBILE except aeronautical mobile S5.AAA	FIXED-SATELLITE (Earth-to-space) (space-to-Earth) S5.415	FIXED-SATELLITE (Earth-to-space) S5.415
BROADCASTING-SATELLITE S5.413 S5.416	MOBILE except aeronautical mobile S5.AAA	MOBILE except aeronautical mobile S5.AAA
Earth exploration-satellite (passive)	BROADCASTING-SATELLITE S5.413 S5.416	BROADCASTING-SATELLITE S5.413 S5.416
Radio astronomy	Earth exploration-satellite (passive)	Earth exploration-satellite (passive)
Space research (passive)	Radio astronomy	Radio astronomy
	Space research (passive)	Space research (passive)
S5.149 S5.412 S5.417 S5.420	S5.149 S5.420	S5.149 S5.420

2 670-2 690	**2 670-2 690**	**2 670-2 690**
FIXED S5.409 S5.410 S5.411	FIXED S5.409 S5.411	FIXED S5.409 S5.411
MOBILE except aeronautical mobile S5.AAA	FIXED-SATELLITE (Earth-to-space) (space-to-Earth) S5.415	FIXED-SATELLITE (Earth-to-space) S5.415
MOBILE-SATELLITE (Earth-to-space) S5.SSS	MOBILE except aeronautical mobile S5.AAA	MOBILE except aeronautical mobile S5.AAA
Earth exploration-satellite (passive)	MOBILE-SATELLITE (Earth-to-space) S5.SSS	MOBILE-SATELLITE (Earth-to-space) S5.SSS
Radio astronomy	Earth exploration-satellite (passive)	Earth exploration-satellite (passive)
Space research (passive)	Radio astronomy	Radio astronomy
	Space research (passive)	Space research (passive)
S5.149 S5.419 S5.420	S5.149 S5.419 S5.420	S5.149 S5.419 S5.420 S5.420A

Annex 3 – New Resolution on additional bands for IMT-2000

RESOLUTION [COM5/24] (WRC-2000)

Additional frequency bands identified for IMT-2000

The World Radiocommunication Conference (Istanbul, 2000),

considering

a) that IMT-2000 is the ITU vision of global mobile access and is scheduled to start service around the year 2000, subject to market and other considerations;

b) that IMT-2000 is an advanced mobile communication applications concept intended to provide telecommunication services on a world-wide scale regardless of location, network or terminal used;

c) that IMT-2000 will provide access to a wide range of telecommunication services supported by fixed telecommunication networks (e.g. PSTN/ISDN), and to other services which are specific to mobile users;

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 the evolution of IMT-2000 is being studied within ITU-R;

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

g) that at WARC-92, 230 MHz of spectrum was identified for IMT-2000 in the bands 1 885-2 025 MHz and 2 110-2 200 MHz, including the bands 1 980-2 010 MHz and 2 170-2 200 MHz for the satellite component of IMT-2000, in No. **S5.388** and under the provisions of Resolution **212 (Rev.WRC-97)**;

h) that since WARC-92 there has been a tremendous growth in mobile communications including an increasing demand for wideband multimedia capability;

i) that ITU-R studies forecasted that of the order of 160 MHz of spectrum, in addition to that already identified for IMT-2000 in No. **S5.388** and in addition to the spectrum used for first- and second-generation mobile systems in all three ITU Regions, will be needed in order to meet the projected requirements of IMT-2000 in those areas where the traffic is the highest by 2010;

j) that this conference has identified additional frequency bands in No. **S5.AAA** for IMT-2000 in order to meet the additional spectrum requirement projected by ITU-R;

k) that the bands identified for IMT-2000 are currently used by either first- or second-generation mobile systems or applications of other radiocommunication services;

l) that Recommendation ITU-R M.1308 addresses the evolution of existing mobile communication systems to IMT-2000;

m) that harmonized world-wide bands for IMT-2000 are desirable in order to achieve global roaming and the benefits of economies of scale;

n) that the bands 1 710-1 885 MHz and 2 500-2 690 MHz are allocated to a variety of services in accordance with the relevant provisions of the Radio Regulations;

o) that, for technical reasons, the existing applications in the bands identified for IMT-2000 require spectrum below 3 GHz;

p) that technological advancement and market demand will promote innovation and accelerate the delivery of advanced communication applications to consumers;

q) that changes in technology may lead to the further development of communication applications, including IMT-2000,

emphasizing

a) that flexibility must be afforded to administrations:

– to determine, at a national level, how much spectrum to make available for IMT-2000 from within the identified bands;

– to develop their own transition plans, if necessary, tailored to meet their specific deployment of existing systems;

– to have the ability for the identified bands to be used by all services having allocations in those bands;

– to determine the timing of availability and use of the bands identified for IMT-2000, in order to meet particular market demand and other national considerations;

b) that the particular needs of developing countries must be met;

c) that Recommendation ITU-R M.819 describes the objectives to be met by IMT-2000 in order to meet the needs of developing countries,

noting

a) Resolutions **[COM5/25] (WRC-2000)** and **[COM5/26] (WRC-2000)**, which also relate to IMT-2000;

b) that the sharing implications between services sharing the bands identified for IMT-2000 in No. **S5.AAA** will need further study in ITU-R;

c) that studies regarding the availability of the bands 1 710-1 885 MHz and 2 500-2 690 MHz for IMT-2000 are being conducted in many countries, the results of which could have implications for the use of those bands in those countries;

d) that, due to differing requirements, not all administrations may need all of the IMT-2000 bands identified at this conference, or, due to the usage by and investment in existing services, may not be able to implement IMT-2000 in all of those bands;

e) that the spectrum for IMT-2000 identified by this conference may not completely satisfy the expected requirements of some administrations;

f) that currently operating second-generation mobile communication systems may evolve to IMT-2000 in their existing bands;

g) that services such as fixed, mobile (second-generation systems), space operations, space research and aeronautical mobile are in operation or planned in the band 1 710-1 885 MHz, or in portions of that band;

h) that services such as broadcasting-satellite, broadcasting-satellite (sound), mobile-satellite and fixed (including multipoint distribution/communication systems) are in operation or planned in the band 2 500-2 690 MHz, or in portions of that band;

i) that the identification of several bands for IMT-2000 allows administrations to choose the best band or parts of bands for their circumstances;

j) that ITU-R has identified additional work to address further developments in IMT-2000 and beyond;

k) 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;

l) that the identification of a band for IMT-2000 does not establish priority in the Radio Regulations and does not preclude the use of the band for any application of the services to which they are allocated;

m) that the provisions of Nos. **S5.388**, **S5.AAA** and **S5.XXX** do not prevent administrations from having the choice to implement other technologies in the frequency bands identified for IMT-2000, based on national requirements,

recognizing

a) that some administrations are planning to use the band 2 300-2 400 MHz for IMT-2000;

b) that for some administrations the only way of implementing IMT-2000 would be spectrum refarming, requiring significant financial investment;

c) that spectrum for IMT-2000 is identified in Nos. **S5.388**, **S5.AAA** and **S5.XXX**, but this identification does not preclude the use for IMT-2000 of other bands allocated to the mobile service,

resolves

1 to invite administrations implementing IMT-2000 or planning to implement IMT-2000 to make available, based on market demand and other national considerations, additional bands or portions of the bands above 1 GHz identified in No. **S5.AAA** for the terrestrial component of IMT-2000; due consideration should be given to the benefits of harmonized utilization of the spectrum for the terrestrial component of IMT-2000, taking into account the use and planned use of these bands by all services to which these bands are allocated;

2 to acknowledge that the differences in the texts of Nos. **S5.388** and **S5.AAA** do not confer differences in regulatory status,

invites ITU-R

1 to study the implications of sharing of IMT-2000 with other applications and services in the bands 1 710-1 885 MHz and 2 500-2 690 MHz and the implementation, sharing and frequency arrangements of IMT-2000 in the bands 1 710-1 885 MHz and 2 500-2 690 MHz in accordance with Annex 1;

2 to develop harmonized frequency arrangements for operation of the terrestrial component of IMT-2000 in the spectrum mentioned in this resolution, aiming to achieve compatibility with existing frequency arrangements used by the first- and second-generation systems;

3 to continue its studies on further enhancements of IMT-2000, including the provision of Internet Protocol (IP)-based applications that may require unbalanced radio resources between the mobile and base stations;

4 to provide guidance to ensure that IMT-2000 can meet the telecommunication needs of the developing countries and rural areas in the context of the studies referred to above;

5 to include these frequency arrangements and the results of these studies in one or more ITU-R Recommendations,

invites ITU-T

1 to complete its studies of signalling and communication protocols for IMT-2000;

2 to develop a common world-wide intersystem numbering plan and associated network capabilities that will facilitate world-wide roaming,

further invites ITU-R and ITU-T

to commence these studies forthwith,

instructs the Director of the Radiocommunication Bureau

to facilitate to the greatest extent possible the completion of these studies and to report the results of the studies before the next competent conference, or within three years, whichever is the earlier,

requests administrations and Sector Members

to submit the necessary contributions and to participate actively in the ITU-R studies.

ANNEX 1 TO RESOLUTION [COM5/24] (WRC-2000)

Request for studies by ITU-R

In response to Resolution [**COM5/24] (WRC-2000)**, studies that address the following should be conducted:

1 sharing implications and possibilities for all services having allocations in the identified frequency bands;

2 harmonized frequency arrangements for the implementation of IMT-2000 in the bands mentioned in this resolution that take into account the services currently using the bands or planning to use the bands and the required compatible frequency arrangements of second-generation systems using

these bands, taking into account the need to facilitate the evolution of current mobile systems to IMT-2000;

3 means to facilitate global roaming across different regional band usage within the bands identified for IMT-2000;

4 spectrum demand predictions related to traffic density and timing;

5 planning tools for adaptation of mobile radiocommunication technologies, including IMT-2000, for the needs of developing countries;

6 maintaining a database of national studies and decisions on selection of spectrum for IMT-2000;

7 study of the provision of a fixed wireless access interface using IMT-2000 technologies.

Annex 4 – New Resolution on bands below 1GHz

RESOLUTION [COM5/25] (WRC-2000)

Frequency bands for the terrestrial component of IMT-2000 below 1 GHz

The World Radiocommunication Conference (Istanbul, 2000),

considering

a) that parts of the band 806-960 MHz are extensively used in the three Regions by first-and second-generation mobile systems;

b) that some administrations are planning to use part of the band 698-806 MHz for IMT-2000;

c) that, in some countries, the band 698-806 MHz is allocated to the mobile service on a primary basis;

d) that first- and second-generation mobile systems in the three Regions operate using various frequency arrangements;

e) that where cost considerations warrant the installation of fewer base stations, such as in sparsely populated areas, bands below 1 GHz are generally suitable for implementing mobile systems including IMT-2000;

f) Recommendation ITU-R M.819 which describes the objectives to be met by IMT-2000 to meet the needs of developing countries,

recognizing

that the evolution of first- and second-generation cellular-based mobile systems to IMT-2000 can be facilitated if they are permitted to use their current frequency bands,

emphasizing

a) that flexibility must be afforded to administrations:

– to determine, at a national level, how much spectrum to make available for IMT-2000 from within the identified bands;

– to develop their own transition plans, if necessary, tailored to meet their specific deployment of existing systems;

– to have the ability for the identified bands to be used by all services having allocations in those bands;

– to determine the timing of availability and use of the bands identified for IMT-2000, in order to meet particular market demand and other national considerations;

b) that the particular needs of developing countries must be met,

resolves

to request administrations which are implementing, or planning to implement IMT-2000, to consider the use of bands below 1 GHz and the possibility of evolution of first- and second-generation mobile systems to IMT-2000, in the frequency band identified in No. **S5.XXX**, based on market demand and other national considerations,

invites ITU-R

to study compatibility between mobile systems with different technical characteristics and provide guidance on any impact on spectrum arrangements.

Annex 5 – New Resolution for the Satellite component

RESOLUTION [COM5/26] (WRC-2000)

Use of additional frequency bands for the satellite component of IMT-2000

The World Radiocommunication Conference (Istanbul, 2000),

considering

a) that the bands 1 980-2 010 MHz and 2 170-2 200 MHz are identified for use by the satellite component of International Mobile Telecommunications-2000 (IMT-2000) through No. **S5.388** and Resolution **212 (Rev.WRC-97)**;

b) Resolutions **212 (Rev.WRC-97)**, **[COM5/24] (WRC-2000)** and **[COM5/25] (WRC-2000)** on the implementation of the terrestrial and satellite components of IMT-2000;

c) that the bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 610-1 626.5 MHz, 1 626.5-1 645.5 MHz, 1 646.5-1 660.5 MHz, 2 483.5-2 500 MHz, 2 500-2 520 MHz and 2 670-2 690 MHz are allocated on a co-primary basis to the mobile-satellite service and other services in accordance with the Radio Regulations;

d) that distress, urgency and safety communications of the Global Maritime Distress and Safety System and the aeronautical mobile-satellite (R) service have priority over all other mobile-satellite service communications in accordance with Nos. **S5.353A** and **S5.357A**,

recognizing

a) that services such as broadcasting-satellite, broadcasting-satellite (sound), mobile-satellite, fixed (including point-to-multipoint distribution/communication systems) and mobile are in operation or planned in the band 2 500-2 690 MHz, or in portions of that band;

b) that other services such as the mobile service and radiodetermination-satellite service are in operation or planned, in accordance with the Table of Frequency Allocations, in the bands 1 525-1 559/1 626.5-1 660.5 MHz and 1 610-1 626.5/2 483.5-2 500 MHz, or in portions of those bands, and that those bands, or portions thereof, are intensively used in some countries by applications other than the IMT-2000 satellite component, and the sharing studies within ITU-R are not finished;

c) that studies of potential sharing and coordination between the satellite component of IMT-2000 and the terrestrial component of IMT-2000, mobile-satellite service applications and other high-density applications in other services such as point-to-multipoint communication/distribution systems in the bands 2 500-2 520 MHz and 2 670-2 690 MHz bands are not finished;

d) that the bands 2 520-2 535 MHz and 2 655-2 670 MHz are allocated to the mobile-satellite, except aeronautical mobile-satellite, service for operation limited to within national boundaries pursuant to Nos. **S5.403** and **S5.420**;

e) Resolution ITU-R 47 on studies under way on satellite radio transmission technologies for IMT-2000,

resolves

1 that, in addition to the frequency bands indicated in *considering a)* and *resolves* 2, the frequency bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 610-1 626.5 MHz, 1 626.5-1 645.5 MHz, 1 646.5-1 660.5 MHz and 2 483.5-2 500 MHz may be used by administrations wishing to implement the satellite component of IMT-2000, subject to the regulatory provisions related to the mobile-satellite service in these frequency bands;

2 that the bands 2 500-2 520 MHz and 2 670-2 690 MHz as identified for IMT-2000 in No. **S5.AAA** and allocated to the mobile-satellite service may be used by administrations wishing to implement the satellite component of IMT-2000; however, depending on market developments, it may be possible in the longer term for bands 2 500-2 520 MHz and 2 670-2 690 MHz to be used by the terrestrial component of IMT-2000;

3 that this identification of frequency bands for the satellite component of IMT-2000 does not preclude the use of these bands by any applications of the services to which they are allocated and does not establish priority in the Radio Regulations,

invites ITU-R

1 to study the sharing and coordination issues in the above bands related to use of the mobile-satellite service allocations for the satellite component of IMT-2000 and the use of this spectrum by the other allocated services, including the radiodetermination-satellite service;

2 to report the results of these studies to a future world radiocommunication conference,

instructs the Director of the Radiocommunication Bureau

to facilitate to the greatest extent possible the completion of these studies.

Annex 6 – New Resolution enabling the use of HAPS for IMT-2000

RESOLUTION [COM5/13] (WRC-2000)

Use of high altitude platform stations providing IMT-2000 in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2

The World Radiocommunication Conference 2000 (Istanbul, 2000),

considering

a) that the bands 1 885-2 025 MHz and 2 110-2 200 MHz are identified in No. **S5.388** as intended for use on a world-wide basis for IMT-2000, including the bands 1 980-2 010 MHz and 2 170-2 200 MHz for the satellite component of IMT-2000;

b) that a high altitude platform station (HAPS) is defined in No. **S1.66A** as "a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth";

c) that HAPS may offer a new means of providing IMT-2000 services with minimal network infrastructure as they are capable of providing service to a large footprint together with a dense coverage;

d) that the use of HAPS as base stations within the terrestrial component of IMT-2000 is optional for administrations, and that such use should not have any priority over other terrestrial IMT-2000 use;

e) that, in accordance with No. **S5.388** and Resolution **212 (Rev.WRC-97)**, administrations may use the bands identified for IMT-2000, including the bands referred to in this resolution, for stations of other primary services to which they are allocated;

f) that these bands are allocated to the fixed and mobile services on a co-primary basis;

g) that ITU-R has studied sharing and coordination between HAPS and other stations within IMT-2000, has considered compatibility of HAPS within IMT-2000 with some services having allocations in the adjacent bands, and has established Recommendation ITU-R M.1456;

h) that ITU-R did not address sharing and coordination between HAPS and some existing systems, particularly PCS (personal communications service), MMDS (multichannel multipoint distribution service) and systems in the fixed service, which are currently operating in some countries in the bands 1 885-2 025 MHz and 2 110-2 200 MHz;

i) that, in accordance with No. **S5.BBB**, HAPS may be used as base stations within the terrestrial component of IMT-2000 in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170

MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2; the use by IMT-2000 applications using HAPS as base stations does not preclude the use of these bands by any station in the services to which they are allocated and does not establish priority in the Radio Regulations,

recognizing

that the values in *resolves* 1 may not be appropriate for the protection of some stations operating in these bands in the fixed and mobile services,

resolves

1 that:

a) for the purpose of protecting certain stations operating within IMT-2000 in neighbouring countries from co-channel interference, a HAPS operating as a base station to provide IMT-2000 shall not exceed a provisional co-channel power flux-density (pfd) of –121.5 dB (W/(m^2 · MHz)) at the Earth's surface outside an administration's borders unless agreed otherwise by the administration of the affected neighbouring country;

b) a HAPS operating as a base station to provide IMT-2000, in order to protect fixed stations from interference, shall not exceed the following provisional values of out-of-band pfd at the Earth's surface in the bands 2 025-2 110 MHz:

– –165 dB(W/(m^2 · MHz)) for angles of arrival (θ) less than 5° above the horizontal plane;

– –165 + 1.75 (θ – 5) dB (W/(m^2 · MHz)) for angles of arrival between 5° and 25° above the horizontal plane; and

– –130 dB(W/(m^2 · MHz)) for angles of arrival between 25° and 90° above the horizontal plane;

2 that, as of the end of WRC-03, such a HAPS shall operate only in accordance with such limits as are confirmed or, if appropriate, revised by WRC-03, irrespective of its date of bringing into use;

3 that administrations wishing to implement HAPS within a terrestrial IMT-2000 system shall comply with the following:

a) for the purpose of protecting certain stations operating within IMT-2000 in neighbouring countries from co-channel interference, administrations using HAPS as base stations within IMT-2000 shall use antennas that comply with the following antenna pattern:

$G(\psi) = G_m - 3(\psi/\psi_b)^2$ dBi for $0° \le \psi \le \psi_1$

$G(\psi) = G_m + L_N$ dBi for $\psi_1 < \psi \le \psi_2$

$G(\psi) = X - 60\log(\psi)$ dBi for $\psi_2 < \psi \le \psi_3$

$G(\psi) = L_F$ dBi for $\psi_3 < \psi \le 90°$

where:

$G(\psi)$: gain at the angle ψ from the main beam direction (dBi)

G_m: maximum gain in the main lobe (dBi)

ψ_b: one-half of the 3 dB beamwidth in the plane considered (3 dB below G_m) (degrees)

L_N: near side-lobe level in dB relative to the peak gain required by the system design, and has a maximum value of –25 dB

L_F: far side-lobe level, G_m – 73 dBi

$\psi_1 = \psi_b \sqrt{-L_N / 3}$ degrees

$\psi_2 = 3.745\ \psi_b$ degrees

$X = G_m + L_N + 60\log(\psi_2)$ dBi

$\psi_3 = 10^{(X - L_F)/60}$ degrees

The 3 dB beamwidth ($2\psi_b$) is again estimated by:

$(\psi_b)^2 = 7442/(10^{0.1Gm})$ degrees^2

where G_m is the peak aperture gain (dBi);

b) for the purpose of protecting mobile earth stations within the satellite component of IMT-2000 from interference, a HAPS operating as a base station to provide IMT-2000, shall not exceed an out-of-band pfd of –165 dB (W/(m^2 · 4 kHz)) at the Earth's surface in the bands 2 160-2 200 MHz in Region 2 and 2 170-2 200 MHz in Regions 1 and 3;

4 that administrations wishing to implement HAPS within a terrestrial IMT-2000 system shall, prior to their bringing into use, take into account in their bilateral coordination with affected neighbouring administrations the operation and growth of existing and planned systems in the fixed and mobile services having allocations on a primary basis;

5 that, for the purpose of protecting fixed service stations operating in neighbouring countries from co-channel interference, administrations wishing to implement HAPS within a terrestrial IMT-2000 system shall, pending the review by WRC-03 of the studies mentioned below, take full account of

the relevant ITU-R Recommendations relating to protection values for fixed stations (see Recommendation ITU-R F.758),

invites ITU-R

1 to complete, as a matter of urgency, additional regulatory, operational and technical studies on sharing criteria for HAPS with other systems in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 in Region 2, and in adjacent bands, so as to allow revision of the values in *resolves* 1;

2 to develop appropriate regulatory and technical provisions to allow the coordination mentioned in *resolves* 4;

3 to report on the results of these studies in time for consideration by WRC-03.