# Frequency bands available for UMTS around the world

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# Introduction

The number of subscriptions using mobile telecommunication services based on UMTS grew by around 13 million to more than 47 million in Q4 2005, three times more than at the start of 2005. From the first launch of services in year 2001 in Japan, this represents the fastest subscriber take-up of any technology in the mobile industry.

One reason for this rapid take-off is the worldwide support for a standardised technology in a worldwide harmonised frequency band, together with the market-driven ambition to make available bands, as well as redefining other usage in favour of UMTS. This success comes also from the desire of operators and regulators around the world to be able to deploy UMTS in a number of different frequency bands, subject to their national or regional requirements. The UMTS Forum strongly promotes the international harmonisation of frequency bands for UMTS deployment in order to guarantee consumer satisfaction, seamless international roaming and industry-scale operations.

This paper is intended to provide regulators, operators, members of the press, consumers, vendors and other interested parties with a wide reference to the frequency bands which are used or proposed for national UMTS deployments with regard to global and regional situations.

# Frequency bands for which 3GPP UMTS standards have been developed

Under the umbrella of the IMT-2000 family of the International Telecommunication Union (ITU) and in addition to the UMTS core band, multiple frequency bands have been introduced in the partner project for third generation systems. 3GPP has developed numerous technical specifications in different releases. This is due to the fact that different frequency bands were authorised by the different national regulators in different timeframes. The frequency bands for UMTS UTRA-FDD are summarised in Table 1 and the frequency bands for UMTS UTRA-TDD are given in Table 2.

**Table 1. Frequency bands for UMTS UTRA-FDD**

| | Band name | Uplink (MHz) | Downlink (MHz) | Duplex (MHz) | Rec. ITU-R M.1036 | 3GPP Spec[1] Release | Note |
|---|---|---|---|---|---|---|---|
| I | UMTS2000 | 1920–1980 | 2110–2170 | 190 | B1 | Rel-99 | IMT-2000 core band |
| II | UMTS1900 | 1850–1910 | 1930–1990 | 80 | B3 | Rel-5 | PCS1900 band |
| III | UMTS1800 | 1710–1785 | 1805-1880 | 95 | B2 | Rel-5 | GSM1800 band |
| IV | UMTS1700/2100 | 1710–1755 | 2110-2155 | 400 | B6[2] | Rel-6 | For Region 2 |
| V | UMTS850 | 824–849 | 869-894 | 45 | A1 | Rel-6 | For Region 2 |
| VI | UMTS800 | 830-840 | 875-885 | 45 | A1[2] | Rel-6 | For Japan |
| VII | UMTS2600 | 2500–2570 | 2620–2690 | 120 | C1<br>C2 | Rel-7 | IMT-2000 extension band[3] |
| VIII | UMTS900 | 880–915 | 925–960 | 45 | A2 | Rel-7 | GSM900 band |
| IX | UMTS1700 | 1749.9-1784.9 | 1844.9-1879.9 | 95 | B2[2] | Rel-7 | For Japan |

[1] *Frequency bands for UMTS UTRA-FDD are included in the 3GPP specifications TS25.104 (UTRA-FDD BS) and TS25.101 (UTRA-FDD UE). It should be noted that each frequency band is 3GPP release independent.*

[2] *Parts of this frequency arrangement in Rec. ITU-R M.1036.*

[3] *CITEL band plan is compatible with the CEPT band plan, but the FCC (USA) band plan is different.*

It should be noted that an overlap does exist between some of the bands listed in the table above. For example, band VI for Japan is part of band V, and band IX is part of band III. Because of some specific regional regulation requirements, they are specified as separate bands in 3GPP specifications.

Table 2. Frequency bands for UMTS UTRA-TDD

| Frequency (MHz) | Rec. ITU-R M.1036 | 3GPP Spec Release[1] | Note |
|---|---|---|---|
| 1900-1920 | B1[2], B4[2] | Rel-99 | IMT-2000 core band |
| 2010-2025 | B1[2], B4[2] | Rel-99 | IMT-2000 core band |
| 1850-1910 | | Rel-99 | For Region 2, PCS1900 uplink band |
| 1930-1990 | | Rel-99 | For Region 2, PCS1900 downlink band |
| 1910-1930 | B3[2] | Rel-99 | For Region 2 |
| 2570-2620 | C1[2] | Rel-7 | IMT-2000 extension band. It can also be used for FDD DL external |

[1] *High chip rate TDD (3.84 Mcps option) was introduced in 3GPP Release 99. Low chip rate TDD (1.28 Mcps option) was introduced in 3GPP Release 4. Frequency bands for UMTS UTRA-TDD are included in the 3GPP specifications TS25.105 (UTRA-TDD BS) and TS25.102 (UTRA-TDD UE).*

[2] *Parts of this frequency arrangement in Rec. ITU-R M.1036.*

It should also be noted that the 2.6 GHz band was identified by WRC-03 as a global IMT-2000 band for all of the three Regions 1, 2 and 3. This is the unique common frequency band in Regions 1, 2 and 3. 3GPP technical specifications for band VII (UMTS2600) were developed, based on the CEPT 2.6 GHz band plan for Region 1. CITEL adopted a recommendation[1] for Region 2 and, based on this recommendation, the CITEL arrangement is compatible with the CEPT band plan. The FCC band plan in the US is slightly different from the CEPT band plan.

[1] *CITEL Recommendation PCC.II/REC. 8 (IV-04), available at: www.citel.oas.org/ccp2-radio/Final_Reports/P2!R-0606r1c1_i.doc*

# Availability of different frequency bands in different regions/countries

**UMTS frequency bands in Europe**

IMT-2000/UMTS UTRA-FDD and UTRA-TDD frequency bands in Europe are summarised in Table 3. In Europe, UMTS-FDD networks have been widely deployed in the frequency band UMTS2000. It is planned to deploy UMTS networks in other bands in the future. It should be noted that the frequency range 2570-2620 MHz is allocated to FDD downlink external or TDD. However, the use of this frequency band by both FDD external downlink and TDD in the same geographical area is not expected.

Table 3. Frequency bands in Europe

| Band | Uplink (MHz) | Downlink (MHz) |
|---|---|---|
| UMTS2000 | 1920-1980 | 2110-2170 |
| UMTS900 | 880-915 | 925-960 |
| UMTS1800 | 1710-1785 | 1805-1880 |
| UMTS2600 | 2500-2570 | 2620-2690 |
| UMTS2600 (FDD External) | tbd | 2570-2620 |
| TDD (Main band) | 1900-1920, 2010-2025 | |
| TDD (Extension band) | 2570-2620 | |

In addition, there are discussions within CEPT on the possibility of pairing TDD 2GHz bands with the middle block of 2.6 GHz band:

- 1900-1920 MHz as FDD uplink to be paired with 2600-2620 MHz as FDD downlink
- 2010-2025 MHz as FDD uplink to be paired with 2585-2600 MHz as FDD downlink

## UMTS frequency bands in Japan

In Japan, WCDMA UTRA-FDD has been deployed in the frequency band UMTS2000. It is expected to deploy UMTS in the 800 MHz band and 1700 MHz band in the near future

Table 4. Frequency bands in Japan

| Band | Uplink (MHz) | Downlink (MHz) |
|---|---|---|
| UMTS2000 | 1920-1980 | 2110-2170 |
| UMTS800 | 830-840 | 875-885 |
| UMTS1700 | 1749.9-1784.9 | 1844.9-1879.9 |
| TDD | 2010-2025 | |

## UMTS frequency bands in China

China MII (Ministry of Information Industry) has published the frequency bands for IMT-2000. The allocated 3G frequency bands are summarised in Table 5.

Table 5. Frequency bands in China

| Band | Uplink (MHz) | Downlink (MHz) |
|---|---|---|
| UMTS2000 | 1920-1980 | 2110-2170 |
| UMTS1800 | 1755-1785 | 1850-1880 |
| FDD (Complementary band) | 825-835<br>885-915<br>1710-1755 | 870- 880<br>930-960<br>1805-1850 |
| TDD (Main TDD bands) | 1880-1920, 2010-2025 | |
| TDD (Complementary band) | 2300-2400 | |

In China, the IMT-2000 FDD bands are expected to be used for both WCDMA UTRA-FDD and CDMA2000. TDD frequency bands are dedicated to TD-SCDMA, which is the 1.28 Mcps option of UTRA-TDD.

## UMTS frequency bands in the Americas

Multiple frequency bands are available for the deployment of UMTS in the Americas: PCS1900 band, 850 MHz band, 1700/2100 MHz band and in some countries the UMTS2000 band. It should be noted that in Canada and the USA operators may deploy any technology in the frequencies licensed to them. In several Latin American countries the spectrum arrangements for UMTS are not yet decided and the spectrum arrangements considered differ from those listed below.

**Table 6. Frequency bands in America**

| Band | Uplink (MHz) | Downlink (MHz) |
|---|---|---|
| UMTS1900 [1] | 1850-1910 | 1930-1990 |
| UMTS850 | 824-849 | 869-894 |
| UMTS1700/2100 [2] | 1710-1770 | 2110-2170 |
| UMTS2000[3] | 1920-1980 | 2110-2170 |

[1] *In the USA, the UMTS1900 frequency band is being extended to 1850-1920 MHz as uplink and 1930-2000 MHz as downlink.*

[2] *For the US, the UMTS1700/2100 frequency band is 1710-1755 MHz as uplink and 2110-2155 MHz as downlink. The downlink band is, however, in the process of being extended to encompass the full band 2110-2180 MHz.*

[3] *This band is available in Brazil and in parts under consideration in other countries, such as Uruguay and Venezuela.*

In addition, UMTS can also be deployed in the USA in the 2.5 GHz band either in the configuration of FDD or TDD or in combination. The remainder of Region 2 has not made any firm commitment to the availability of 2.5 GHz band yet.

In the US additional PCS1900 blocks H (1915-1920 MHz and 1995-2000 MHz), J-Block (2020-2025 and 2175-2180 MHz) and the band 2155-2175 MHz may in future be suitable for UMTS. There is currently an FCC proceeding to define the service rules.

# Conclusions:
# UMTS network deployment worldwide

The continued success of the UMTS roll out, subscriber take-up and usage in the global context will benefit from the harmonisation of frequency bands, which will allow regulators, operators and vendors to focus their developments, deployments and commercialisation activities on the right targets.

The UMTS Forum will certainly focus on its target; that is to continue promoting and supporting the deployment of UMTS in globally harmonised frequency bands. When global bands are not available, or not available in sufficient amounts, regional or local frequency bands could alternatively or additionally be used.

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