

# GSM frequency bands

**GSM frequency bands** or frequency ranges are the cellular frequencies designated by the ITU for the operation of GSM mobile phones.

## GSM frequency bands

There are fourteen bands defined in 3GPP TS 45.005, which succeeded 3GPP TS 05.05:

System	Band	Uplink (MHz)	Downlink (MHz)	Channel number
T-GSM-380	380	380.2–389.8	390.2–399.8	dynamic
T-GSM-410	410	410.2–419.8	420.2–429.8	dynamic
GSM-450	450	450.4–457.6	460.4–467.6	259–293
GSM-480	480	478.8–486.0	488.8–496.0	306–340
GSM-710	710	698.0–716.0	728.0–746.0	dynamic
GSM-750	750	747.0–762.0	777.0–792.0	438–511
T-GSM-810	810	806.0–821.0	851.0–866.0	dynamic
GSM-850	850	824.0–849.0	869.0–894.0	128–251
P-GSM-900	900	890.2–914.8	935.2–959.8	1–124
E-GSM-900	900	880.0–914.8	925.2–959.8	975–1023, 0-124
R-GSM-900	900	876.0–914.8	921.0–959.8	955–1023, 0-124
T-GSM-900	900	870.4–876.0	915.4–921.0	dynamic
DCS-1800	1800	1710.2–1784.8	1805.2–1879.8	512–885
PCS-1900	1900	1850.0–1910.0	1930.0–1990.0	512–810

- P-GSM, Standard or Primary GSM-900 Band
- E-GSM, Extended GSM-900 Band (includes Standard GSM-900 band)
- R-GSM, Railways GSM-900 Band (includes Standard and Extended GSM-900 band)
- T-GSM, TETRA-GSM

## GSM-900, GSM-1800 and EGSM/EGSM-900

GSM-900 and GSM-1800 are used in most parts of the world: Europe, Middle East, Africa, Australia, Oceania (and most of Asia). In South and Central America the following countries use the following:

- Costa Rica - GSM-1800
- Brazil - GSM-850, 900, 1800 and 1900
- Guatemala - GSM-850, GSM-900 and 1900
- El Salvador - GSM-850, GSM-900 and 1900

GSM-900 uses 890–915 MHz to send information from the mobile station to the base station (uplink) and 935–960 MHz for the other direction (downlink), providing 124 RF channels (channel numbers 1 to 124) spaced at 200 kHz. Duplex spacing of 45 MHz is used. Guard bands 100 kHz wide are placed at either end of the range of frequencies.<sup>[1]</sup>

### GSM-1800

GSM-1800 uses 1710–1785 MHz to send information from the mobile station to the base transceiver station (uplink) and 1805–1880 MHz for the other direction (downlink), providing 374 channels (channel numbers 512 to 885). Duplex spacing is 95 MHz. GSM-1800 is also called DCS (Digital Cellular Service) in the United Kingdom, while being called PCS in Hong Kong<sup>[2]</sup> (not to mix up with GSM-1900 which is commonly called PCS in the rest of the world.) Mobile Communication Services on Aircraft (MCA) uses GSM1800.<sup>[3]</sup>

### GSM-850 and GSM-1900

GSM-850 and GSM-1900 are used in Canada, the United States and many other countries in the Americas.

- GSM-850 uses 824–849 MHz to send information from the mobile station to the base station (uplink) and 869–894 MHz for the other direction (downlink). Channel numbers are 128 to 251.

GSM-850 is also sometimes called *GSM-800* because this frequency range was known as the "800 MHz band" (for simplification) when it was first allocated for AMPS in the United States in 1983.

The term *Cellular* is sometimes used to describe the 850 MHz band, because the original analog cellular mobile communication system was allocated in this spectrum.

- GSM-1900 uses 1850–1910 MHz to send information from the mobile station to the base station (uplink) and 1930–1990 MHz for the other direction (downlink). Channel numbers are 512 to 810.

*PCS* is the original name in North America for the 1900 MHz band. It is an initialism for Personal Communications Service.

- Note: Telstra in Australia uses the 850MHz for its Next G network (3G)

### GSM-450

Another less common GSM version is GSM-450.<sup>[4]</sup> It uses the same band as, and can co-exist with, old analog NMT systems. NMT is a first generation (1G) mobile phone system which was primarily used in Nordic countries, Benelux, Alpine Countries, Eastern Europe and Russia prior to the introduction of GSM. It operates in either 450.4–457.6 MHz paired with 460.4–467.6 MHz (channel numbers 259 to 293), or 478.8–486 MHz paired with 488.8–496 MHz (channel numbers 306 to 340). The GSM Association claims one of its around 680 operator-members has a license to operate a GSM 450 network in Tanzania. However, currently all active public operators in Tanzania use GSM 900/1800 MHz. Overall, where the 450 MHz NMT band exists, it either still runs NMT, or its been replaced by CDMA. GSM-450 is a provision, it has not seen commercial deployment.

## GSM frequency usage across the world

### The Americas

In North America, GSM operates on the primary mobile communication bands 850 MHz and 1900 MHz. In Canada, GSM-1900 is the primary band used in urban areas with 850 as a backup, and GSM-850 being the primary rural band. In the United States, regulatory requirements determine which area can use which band.

GSM-1900 and GSM-850 are also used in most of South and Central America, and both Ecuador and Panama use GSM-850 exclusively (Note: Since November 2008, a Panamanian operator has begun to offer GSM-1900 service). Venezuela and Brazil use GSM-850 and GSM-900/1800 mixing the European and American bands. Some countries in the Americas use GSM-900 or GSM-1800, some others use 3, GSM-850/900/1900, GSM-850/1800/1900, GSM-900/1800/1900 or GSM-850/900/1800. Soon some countries will use GSM-850/900/1800/1900 MHz like the Dominican Republic, Trinidad & Tobago and Venezuela.

In Brazil, the 1900 MHz band is paired with 2100 MHz to form the IMT-compliant 2100 MHz band for 3G services.

The result is a mixture of usage in the Americas that requires travelers to confirm that the phones they have are compatible with the band of the networks at their destinations. Frequency compatibility problems can be avoided through the use of multi-band (tri-band or, especially, quad-band), phones.

## Europe, Middle East and Asia

In Europe, Middle East and Asia most of the providers use 900 MHz and 1800 MHz bands. GSM-900 is most widely used. Fewer operators use DCS-1800 and GSM-1800. A dual-band 900/1800 phone is required to be compatible with almost all operators. At least the GSM-900 band must be supported in order to be compatible with many operators.

## Multi-band and multi-mode phones

Today, most telephones support multiple bands as used in different countries to facilitate roaming. These are typically referred to as multi-band phones. Dual-band phones can cover GSM networks in pairs such as 900 and 1800 MHz frequencies (Europe, Asia, Australia and Brazil) or 850 and 1900 (North America and Brazil). European tri-band phones typically cover the 900, 1800 and 1900 bands giving good coverage in Europe and allowing limited use in North America, while North American tri-band phones utilize 850, 1800 and 1900 for widespread North American service but limited worldwide use. A new addition has been the quad-band phone, also known as a world phone, supporting all four major GSM bands, allowing for global use (excluding non-GSM countries such as Japan).

There are also multi-mode phones which can operate on GSM as well as on other mobile phone systems using other technical standards or proprietary technologies. Often these phones use multiple frequency bands as well. For example, one version of the Nokia 6340i GAIT phone sold in North America can operate on GSM-1900, GSM-850 and legacy TDMA-1900, TDMA-800, and AMPS-800, making it both multi-mode and multi-band.

Note that while the Nexus One, like many other devices on the market, may also become available in a UMTS I/II/IV or 2100/1900/850MHz combo,<sup>[5]</sup> it would still be considered tri-band UMTS, not quad-band, as the hardware is limited to supporting any 3 bands at one time. Further, as HSPA runs atop UMTS, it would not be considered a "mode" by strict definition.

## See also

- 3GPP
  - Cellular frequencies
  - OD-GPS
  - Roaming
  - UMTS frequency bands
  - United States 2008 wireless spectrum auction
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## References

- [1] Rappaport, Theodore S., Wireless Communications: Principles and Practices, 2nd Ed. Upper Saddle River, NJ: Prentice Hall, 2002. p. 554.
- [2] OFTA of HK, Office of the Telecommunications Authority (<http://www.ofta.gov.hk/en/ad-comm/tsac/tsacpaper.html>)
- [3] <http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/220&format=HTML&aged=1&language=EN&guiLanguage=en>
- [4] Ericsson, Nokia Eye 450 MHz GSM technology (<http://www.cdrinfo.com/Sections/News/Print.aspx?NewsId=15254>)
- [5] "Nexus One for AT&T's 3G bands likely in the works" (<http://www.engadget.com/2010/01/29/nexus-one-for-atandts-3g-bands-likely-in-the-works/>). Engadget. 2010. .

## External links

- GSM Coverage Maps and Roaming Information (<http://www.gsmworld.com/roaming/gsminfo/index.shtml>)  
GSM World's listing of countries, frequencies, and roaming agreements.
  - [coveragemaps.com](http://www.coveragemaps.com/gsmposter.htm) - Publications - Current Coverage Maps (<http://www.coveragemaps.com/gsmposter.htm>)  
Charts of GSM/3GSM coverage and frequency usage for the world, Europe, Asia and the Americas
  - LDpost.com - History of GSM and More (<http://www.ldpost.com/telecom-articles/History-of-GSM-and-More.html>) GSM history, technology, bands, multi-band phones
  - 3GPP Specification detail TS 05.05 (<http://www.3gpp.org/ftp/Specs/html-info/0505.htm>) Specification  
3GPP TS 05.05 Radio Transmission and Reception
  - 3GPP Specification detail TS 45.005 (<http://www.3gpp.org/ftp/Specs/html-info/45005.htm>) Specification  
3GPP TS 45.005 Radio Transmission and Reception
  - 3GPP Specifications for group: R4 (<http://www.3gpp.org/ftp/Specs/html-info/TSG-WG--R4.htm>) -  
Frequencies info for UMTS (TS 25.101/102/104/105)
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