



The spectrum policy dictionary

Spectrum primer series



Produced February 2017





Introduction to the primer series

The spectrum policy dictionary

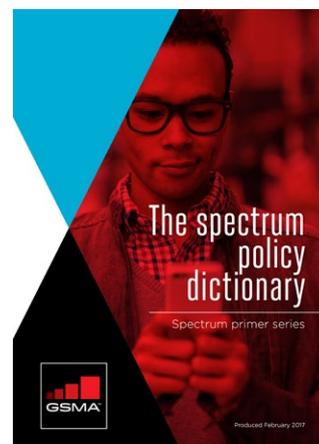
Intro

These handbooks provide a general introduction to mobile spectrum, how it is managed and the challenge posed by rapidly growing data usage. They have been designed for readers who don't have a technical background in the subject. While this is only a very brief introduction to the subject, these handbooks should hopefully provide a useful overview.

Primes

The titles in this series are:

- ▶ Introducing radio spectrum;
- ▶ Introducing spectrum management; and
- ▶ The spectrum policy dictionary.



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1G

The first generation of ‘cellular’ mobile phone systems used in the late 1970s until the early 1990s. These analogue-based systems were replaced by 2G digital mobile systems – most notably GSM. Examples include Advanced Mobile Phone System (AMPS), Nordic Telecommunication System (NMTS) and Total Access Communications (TACS).

2G

The second generation of ‘cellular’ mobile phone systems which appeared in the 1990s were the first to employ digital coding. The vast majority of 2G mobile networks around the world use GSM technology. However, there are other 2G systems including D-AMPS, PDC, iDEN and most notably cdmaOne which continues to be used by some operators around the world.

2.5G

(See GPRS)

2.75G

(See GPRS)

3G

The third generation of ‘cellular’ mobile phone systems were the first to be designed from the outset to support high speed data services as well as voice. The most dominant system used is WCDMA which was deployed by the operators which previously used GSM. However, other systems are used including CDMA2000 (largely by operators that previously used cdmaOne) and the Chinese system TD-SCDMA.

3.5G

(See GPRS)

3GPP (3G Partnership Project)

The body which defines the standards for GSM (2G), WCDMA (3G), and LTE (4G) technologies.

3GPP2 (3G Partnership Project)

The body which defines the standards for cdmaOne (2G) and CDMA2000 technologies (3G) that are sometimes referred to as the 'CDMA family'.

4G

The fourth generation of 'cellular' mobile phone technologies that support higher data rates through wider channel bandwidths and the use of Orthogonal Frequency Division Multiplexing which delivers higher spectrum efficiency. The vast majority of networks use the LTE (Long Term Evolution) system which is the fastest growing mobile technology in history although a small number use a similar but incompatible system called WiMAX. Use of the term 4G to describe LTE and WiMAX networks is sometimes controversial but the ITU decided it was an acceptable marketing term for the technologies as they present a significant advance on its IMT2000 criteria. However, the term may also be used to describe technologies which meet the ITU's criteria for IMT-Advanced (see IMTAdvanced).

5G

Next generation network architecture that could dramatically improve the delivery of services and support a variety of new applications. The mobile industry, wider telecommunication industry, academic institutions and national governments are currently defining requirements and investigating what technologies could be used in 5G networks. The speed and reach of 5G services will be heavily dependent on access to the right amount and type of spectrum.



Administered Incentive Pricing (AIP)

A model for setting fee levels for spectrum. It is based on the regulator's estimate of the value of the spectrum rather than directly by the market, as in an auction.

Administrative approach

Sometimes known as 'command and control' this is the traditional regulatory approach whereby a regulator has overall control and chooses who should be assigned spectrum, often through a beauty contest where several companies outline their proposed service and the regulator chooses the one with the greatest socioeconomic benefit. This allows the regulator to protect spectrum for non-revenue making public interest services like the police, but decisions are subjective and can fail to ensure spectrum is used efficiently.

Administrative Incentive Pricing (AIP)

The concept where a fee is levied on the users (e.g. mobile operators) in order to incentivise them to only use the spectrum they need, and therefore freeing spectrum up for other services. AIP uses the opportunity cost method of valuation (see opportunity cost).

Advanced Wireless Services (AWS)

A collective term used to describe a number of different spectrum bands. The most well-known one is the 1710-1755 MHz and 2110-2155 MHz spectrum range — the former is used as the uplink and the latter for downlink traffic.

African Telecommunications Union (ATU)

A continental organization fostering developments of information and communications technologies infrastructure and services in Africa. The organisation was founded in 1977 and took its present name in 1999.

Aggregation risk

The risk of failing to aggregate spectrum. Aggregation risk arises when a spectrum bidder needs to secure two spectrum bands to offer a particular service, but there is a risk they may only secure one which will fail to meet their need and therefore be worth less than they would otherwise have paid.

Allocation (of a spectrum band)

The services which may operate in a specific frequency band (e.g. mobile services or terrestrial TV broadcasting). This process is overseen by the ITU and reviewed at its World Radiocommunication Conference when a band may be reallocated to allow it to be used differently. This is sometimes confused with assignment which is the decision made by a national regulator to grant a band for use by a specific company (e.g. a specific mobile operator). The ITU designates allocations as 'primary' when the service has priority use of the band (this is co-primary where there are several services) or 'secondary' when the service may operate as long as it does not interfere with 'primary' services.

Ancillary Ground Terrestrial Component (ATC)

The ground based infrastructure of a mobile satellite system. It is used to improve coverage in areas where traditional satellites struggle, such as cities.

Arab Spectrum Management Group (ASMG)

An organisation whose task is to manage and coordinate all issues related to Spectrum Management, World Radiocommunications Conferences and other spectrum matters between the Arab States.

Ascending clock auction (aka Japanese auction)

Sometimes known as a 'Japanese auction', this is a method whereby the auctioneer begins at a low price and only the bidders willing to pay it proceed to the next round. The price is raised again and the process is repeated until only one bidder remains.

Asia-Pacific Telecommunity (APT)

An intergovernmental organisation that operates in conjunction with telecom service providers, manufacturers of communications equipment, and research and development organisation active in the field of communication, information and innovation technologies.

Assignment (of a spectrum band)

The process of awarding spectrum to a particular user (e.g. a mobile operator). It is usual for the national regulator acting on behalf of the government to be responsible for the process of spectrum assignment. They use a number of techniques to allocate spectrum to particular users: auctions and beauty contests are the most common. Often the term is confused with 'allocation'.

Auction

A method used by a regulator to assign a licence to a specific user (e.g. a mobile operator) allowing them to use a specific frequency band in a certain area, at certain times, for a specific period. There are numerous auction methods (see ascending clock auction, combinatorial clock auction, Dutch auction, English auction, sealed bid auction, simultaneous (ascending) multi-round auction).



Band (Spectrum Band)

A discrete block of spectrum that may be allocated for use by certain services (e.g. mobile services) and assigned by a national regulator to a specific user (e.g. a mobile operator).

Base station (aka cell tower)

A base station is a structure that contains radio equipment which is used to link mobile devices in a specific geographical area to a mobile operator's network. A base station may provide coverage over a large area (several miles), just a few city blocks, or even a single location such as a train station or home (see heterogeneous network).

Beauty contest

The process whereby a regulator issues a spectrum licence after listening to all proposals and choosing the one which offers the greatest benefit.

Benchmarking

Benchmarking uses the results of similar auctions in other markets to estimate the expected value of a spectrum band. The main criticism of benchmarking is that it is difficult to obtain like-for-like comparisons as market conditions are seldom identical. It is one of the three methods of valuing spectrum – the others are 'modelling' and 'opportunity cost'.



CDMA development group (CDG)

An international consortium of companies — service providers, infrastructure manufacturers, device suppliers, test equipment vendors, application developers and content providers — who work together to foster the growth and evolution of CDMA2000 systems.

CDMAOne

Also known as IS-95, this 2G cellular system is used by numerous operators around the world. It is based on CDMA technology (see CDMA) which forms the basis of most 3G networks.

Cellular

The method of building wireless networks that cover wide areas by using a number of relatively low-power radio base stations laid out in a hexagonal, cellular-like grid. This allows large numbers of phone calls and data sessions to be supported because frequency channels can be re-used. This means several mobile phones can use the same frequency channel without causing interference as long as they are connected to different “cells” (i.e. base stations) that are sufficiently far apart. It also means that when a user drops out of range of one base station, their session can be handed over to another.

Channel

The amount of spectrum used for the transmission of a radio signal. For example, a 2G (GSM) channel is 200 kHz wide, a 3G (WCDMA) channel is 5 MHz wide and a 4G (LTE) channel can be up to 20 MHz wide.

Closed circuit television (CCTV)

A system that sends television signals from cameras to a limited number of screens. The most common application is surveillance.

Code division multiple access (CDMA)

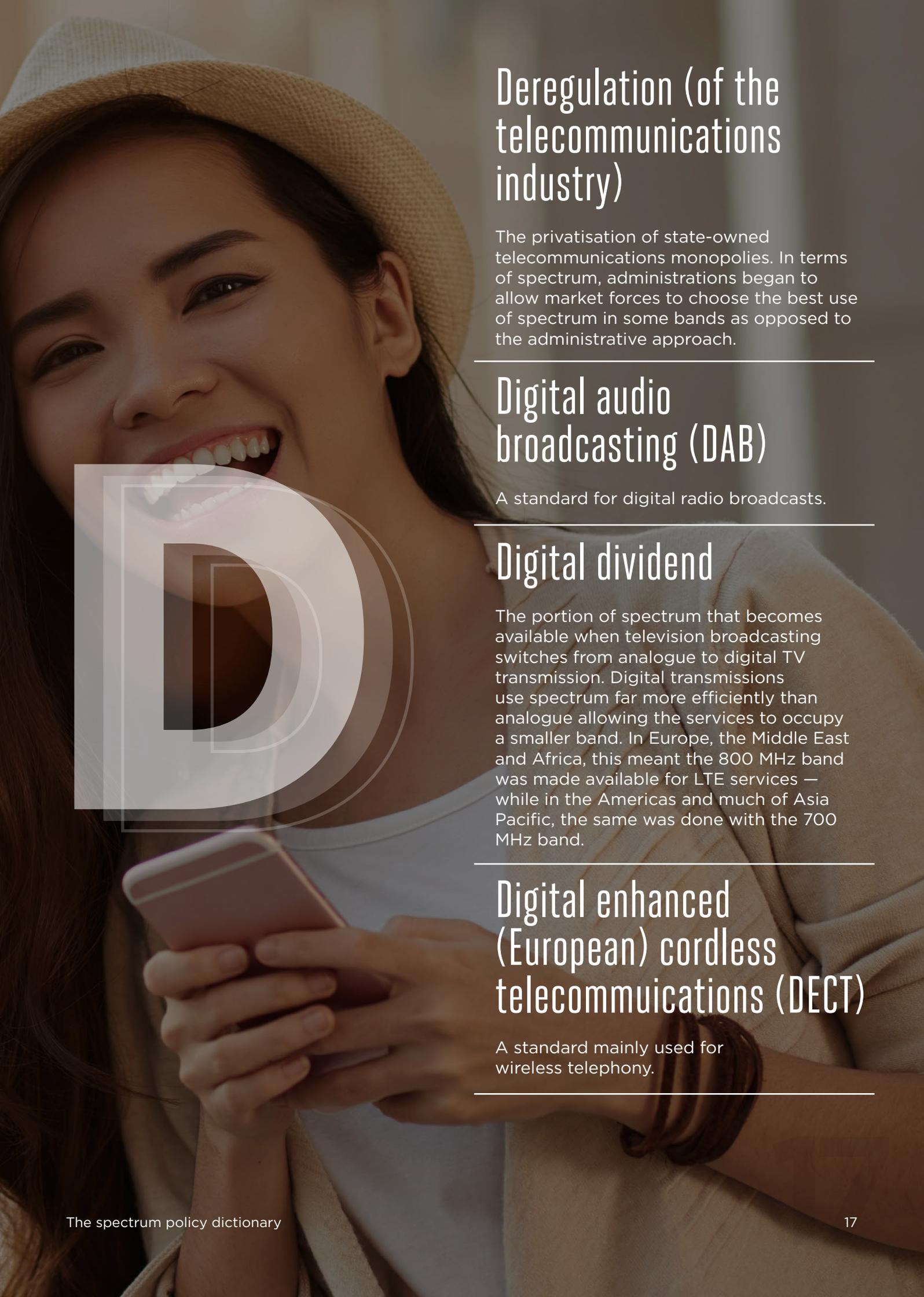
A radio technology used in several mobile standards including all the main varieties of 3G (WCDMA, CDMA2000 and TD-SCDMA) and the 2G cdmaOne system. It allows individual voice and data sessions to be sliced up and spread across different frequencies enabling more efficient spectrum use.

Combinatorial clock auction (CCA)

An auction method that uses multiple rounds with ascending bids. At the end of each round participants are allowed to bid on a different combination of licences.

Conference of European Post and Telecommunications Administrations (CEPT)

An organisation where policy makers and regulators from 48 countries across Europe collaborate to harmonise telecommunication, radio spectrum, and postal regulations to improve efficiency and co-ordination.



Deregulation (of the telecommunications industry)

The privatisation of state-owned telecommunications monopolies. In terms of spectrum, administrations began to allow market forces to choose the best use of spectrum in some bands as opposed to the administrative approach.

Digital audio broadcasting (DAB)

A standard for digital radio broadcasts.

Digital dividend

The portion of spectrum that becomes available when television broadcasting switches from analogue to digital TV transmission. Digital transmissions use spectrum far more efficiently than analogue allowing the services to occupy a smaller band. In Europe, the Middle East and Africa, this meant the 800 MHz band was made available for LTE services — while in the Americas and much of Asia Pacific, the same was done with the 700 MHz band.

Digital enhanced (European) cordless telecommunications (DECT)

A standard mainly used for wireless telephony.

Digital terrestrial television (DTV)

A general term for ground-based digital TV distribution.

Dutch auction

An auction method where the auctioneer posts the highest price first and reduces it over time, until a price which is acceptable to one of the bidders is reached.

Dynamic spectrum access (DSA)

A set of technologies that enable radios to safely share multiple frequency bands without interfering with legacy and other protected wireless systems.

English auction

An auction technique whereby the auctioneer opens the bidding with a price which is raised as bidders indicate their willingness to pay, until only one remains.

Enhanced data rates for GSM evolution (EDGE)

The fastest 2G data service, sometimes known as 2.75G, that enables data to be delivered at rates up to 384 Kbps.

European Broadcast Union (EBU)

An association of national broadcasters that negotiates and advocates for the interests of public broadcasters in Europe. It has about 70 members and was founded in 1950.

European Telecommunications Standards Institute (ETSI)

An organisation that develops globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and Internet technologies.



Federal Communications Commission (FCC)

A U.S. regulator in charge of interstate and international communications by radio, television, wire, satellite, and cable in all 50 states, the District of Columbia and U.S. territories.

Fixed wireless access (services) (FWA)

Fixed wireless access — a broadband connection that is fixed, but still uses some form of wireless technology.

Frequency division duplex (FDD)

Duplex scheme for paired spectrum. It uses of separate frequency channels for uplink and downlink transmission, with a potential guard band to reduce interference if the channels are adjacent.





General packet radio service (GPRS)

A 2G data technology used in GSM networks, sometimes known as 2.5G, that enables data to be delivered at rates of up to 56-114 Kbps.

Gigahertz (GHz)

One million cycles per second (Hz)
(1,000,000 Hz)

Global positioning system (GPS)

A space-based navigation system that provides location and time information. Once a compatible device knows its distance from at least four satellites, it can use geometry to determine its location on Earth in three dimensions.

Global systems for mobile communications (GSM)

(See 2G)

The GSM Association (GSMA)

The GSMA represents the interests of mobile operators worldwide. Spanning more than 220 countries, the GSMA unites nearly 800 of the world's mobile operators with 250 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and Internet companies, as well as organizations in sectors such as financial services, healthcare, media, transport and utilities. The GSMA also produces industry-leading events such as Mobile World Congress and Mobile Asia Expo.

Hertz

A unit of frequency equal to one cycle/wave per second. As most radio waves operate at high frequencies they are referred to in terms of:

- Kilohertz (or Khz), a thousand waves per second
- Megahertz (or Mhz), a million waves per second
- Gigahertz (or Ghz), a billion waves per second

Heterogeneous network (HetNet)

A recent trend in mobile network design which uses a variety of different sized base stations that can support numerous radio standards including 2G, 3G, 4G and Wi-Fi. These include macrocells as well as small cells which are very low-power base stations that bring the full data capacity of a conventional cell to a relatively small area. These include femtocells that cover a home, picocells that cover a business and microcells that cover small urban or rural areas.



High efficiency video coding (HEVC)

High Efficiency Video Coding is a new video compression standard promising to halve the bandwidth required to transport video content compared to today's leading implementation of MPEG-4 AVC. Also known as H.265.

High-speed packet access (HSPA)

An enhancement to WCDMA (3G) networks that enable faster data connection speeds — sometimes known as 3.5G. The enhancement to download speeds (known as HSDPA) could reach peaks of 14.4 Mbps but future upgrades could accelerate speeds up to 42 Mbps and beyond. The enhancements to upload speeds (known as HSUPA) enable speeds of around 5.76 Mbps in existing devices but further upgrades could in principle reach 34.5 Mbps.

IMT-2000

Published by the ITU, IMT2000 specifies the criteria for 3G services and networks. Compatible technologies include; WCDMA, HSPA, LTE, TD-SCDMA, CDMA2000 and WiMAX.

Industrial, scientific and medical (ISM)

A set of radio bands (including 902-928 MHz, 2.4 GHz and 5.7-5.8 GHz) that were originally set aside for electromagnetic radiation produced by industrial, scientific and medical (ISM) equipment. Today they are used by a wide variety of unlicensed communication equipment, including Wi-Fi networks.

Industry 4.0

A moniker used mostly in Europe to describe changes possible thanks to the implementation of IoT in, for example, factories.

Inter-American Telecommunication Commission (CITEL)

An organisation that works to promote the development of interoperable, innovative and reliable telecommunications/ICTs in the Americas, under the principles of universality, equity and affordability. Also known as Comisión Interamericana de Telecomunicaciones, it is a part of the Organization of American States (OAS).

Interference

A situation where unwanted signals from one radio system leak into the receivers of another system thereby degrading their performance.

International Mobile Telecommunications (IMT)

Describes the technologies that meet the standard for IMT-2000 and IMT-Advanced which include all technologies known as 3G and 4G. See IMT-2000 and IMTAdvanced.

International Mobile Telecommunications Advanced (IMT Advanced)

The ITU benchmark for the next generation of networks which seeks to set the target for a significant improvement in performance and quality of service compared with IMT-2000 (i.e. 3G) compliant systems. The criteria specify that the networks should be entirely IP-based and support data rates of 1 Gbps for stationary mobile devices and 100 Mbps for those which are moving. Candidate technologies include LTE-Advanced, the upgraded form of LTE, and WiMAX 2.

International Telecommunications Union (ITU)

A specialist agency of the United Nations responsible for information and communication technologies (ICTs). This includes setting international, treaty-bound spectrum designations. The ITU also works towards developing the technical standards to ensure networks and technologies seamlessly interconnect, and improves access to ICTs for underserved communities.

Internet of things (IoT)

A collective term used to describe a network that connects all kinds of physical objects.

Internet protocol TV (IPTV)

The distribution of TV broadcasts over the internet protocol.

IS-95

(See cdmaOne)

ITU-R

ITU-R is the division of the ITU that is responsible for setting international, treaty-bound radio-frequency spectrum designations. The mission of the ITU-R is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including those using satellite orbits, and to carry out studies and approve recommendations on radiocommunication matters. It mainly carries out its work through ITU study groups which prepare a technical framework for spectrum related topics in preparation for debate at the World Radiocommunication Conference.

ITU Region 1/2/3

The International Telecommunication Union (ITU) divides the world into three regions for the purpose of managing radio spectrum availability.



Region 1:
Europe, the Middle East, Africa, Russia and Mongolia



Region 2:
The Americas including Greenland and some of the Eastern Pacific Islands



Region 3:
Asia Pacific including most of Oceania



Japanese auction

(See ascending clock auction)



Kilohertz

(See Hertz)

Liberalisation

The removal of technology restrictions on spectrum to allow more flexible use. Spectrum liberalisation has fostered several active areas of policy research including technology neutrality, spectrum usage rights, auction incentive pricing and spectrum trading.

Licence (for radio spectrum use)

A collection of usage rights for a block of spectrum that is granted by a regulator often through an auction.

Licensed shared access (LSA)

A concept that allows spectrum that has been licensed for international mobile telecommunications (IMT) to be used by more than one entity.

Licensed spectrum

A frequency band which requires a licence from the national regulator that specifies the frequency range, the geographical area and the times when it may be used. The majority of radio spectrum is licensed. Examples of services that use licensed spectrum include mobile/cellular, TV and radio broadcasts, the military, emergency services, etc.

Long-term evolution (LTE)

(See 4G)





Machine-to-machine (M2M)

(See IoT)

Macrocell

A base station that provides coverage over a large area, as opposed to a small cell which provides coverage over a smaller area.

Market-based approach

A regulatory approach which uses market forces to determine the most efficient distribution of spectrum. Regulators treat spectrum like any other private asset, so licences are typically sold at auction and could in principle be re-sold or leased out by their owners afterwards to make sure market forces continue to ensure the spectrum is used and distributed optimally.

Megahertz

(See Hertz)

Mobile Network Operator (MNO)

A mobile service provider that owns a network infrastructure and owns or controls the necessary spectrum.

Modelling (the value of spectrum)

A method for calculating the value of new spectrum using the current cash value of the expected stream of revenues that the spectrum will bring in the future (less costs). The weakness is the heavy reliance on the accuracy of cost and revenue projections. It is one of the three methods of valuing spectrum – the others are ‘benchmarking’ and ‘opportunity cost’.

Motion Picture Experts Group (MPEG)

A working group that develops standards for coded representation of digital audio and video, and related data. It was established in 1988 and is part of the International Standards Organization (ISO) and International Electrotechnical Commission (IEC).

Multimedia broadcast multicast service (MBMS)

A standard used for broadcast and multicast content distribution in cellular networks. The introduction of eMBMS (the e stands for enhanced) added more efficient spectrum usage.

Multiple-input multiple output (MIMO)

Technology that sends and receives data using multiple antennas at the same time.

National Association of Broadcasters (NAB)

Industry organisation for U.S. radio and television broadcasters.

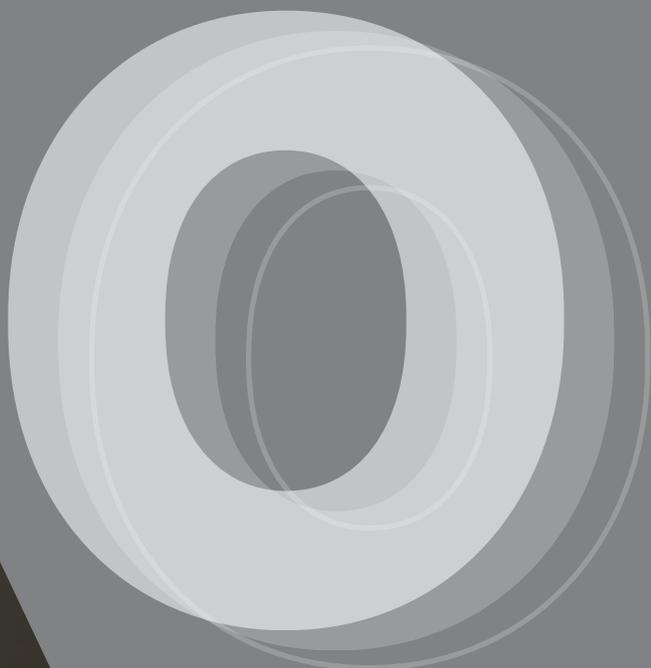
National Regulatory Authority (NRA)

A regulatory authority is responsible for areas such as telecom in a regulatory or supervisory capacity.

Network functions virtualisation (NFV)

A generic term for running mobile or fixed networks in a virtualised environment.





Opportunity cost (of spectrum)

A method of valuing spectrum that assumes that the cost of purchasing a specific band should be less than the alternative method of delivering the same capabilities.

For example, a new licence will give an operator a certain amount of additional network capacity which could also be achieved by deploying a certain number of additional base stations — the value of which can be easily calculated. This is one of the three methods of valuing spectrum — the others are ‘benchmarking’ and ‘modelling’.

Personal communications services (PCS)

A term that encompasses a range of advanced wireless mobile technologies and services.

Pico cells

A small mobile phone base station. Pico cells are carrier owned and operated and typically used to improve mobile phone reception indoors.

Primary allocation

(See allocation)

Private mobile radio or professional mobile radio (PMR)

A concept developed for business users who need to keep in contact over relatively short distances with a central base station or dispatcher.

Programme making and special events (PMSE)

A term that includes wireless microphones, walkie talkies and production services for radio and TV.

Public fixed wireless access (PFWA)

A shared broadband connection that is fixed, but still uses some form of wireless technology.

Public protection and disaster relief services (PPDR)

These provide immediate and rapid assistance in situations where there is a direct risk to life or limb, individual or public health or safety, to private or public property, or the environment.

Radio frequency identification (RFID)

A generic term for technologies that use radio waves to automatically identify people or objects.

Radio regulations

The regulations outline the ITU's recommendations for how spectrum bands may be used including any associated conditions. They are reviewed every three to four years at the World Radiocommunication Conference.

Radio spectrum

The portion of the electromagnetic spectrum below 300 GHz which, by virtue of its natural characteristics, is suitable for the propagation of radio waves. The radio spectrum is divided into a number of designated blocks, called bands, which are allocated to various categories of users for specific purposes (e.g. mobile services or TV broadcasting) and may be assigned by a national regulator to a particular user (e.g. a specific mobile operator).

Refarming

A concept that refers to the repurposing of assigned frequency bands, such as those used for 2G mobile services (using GSM technology) for newer technologies, including third-generation (UMTS technology) and fourth-generation (LTE technology) mobile services.

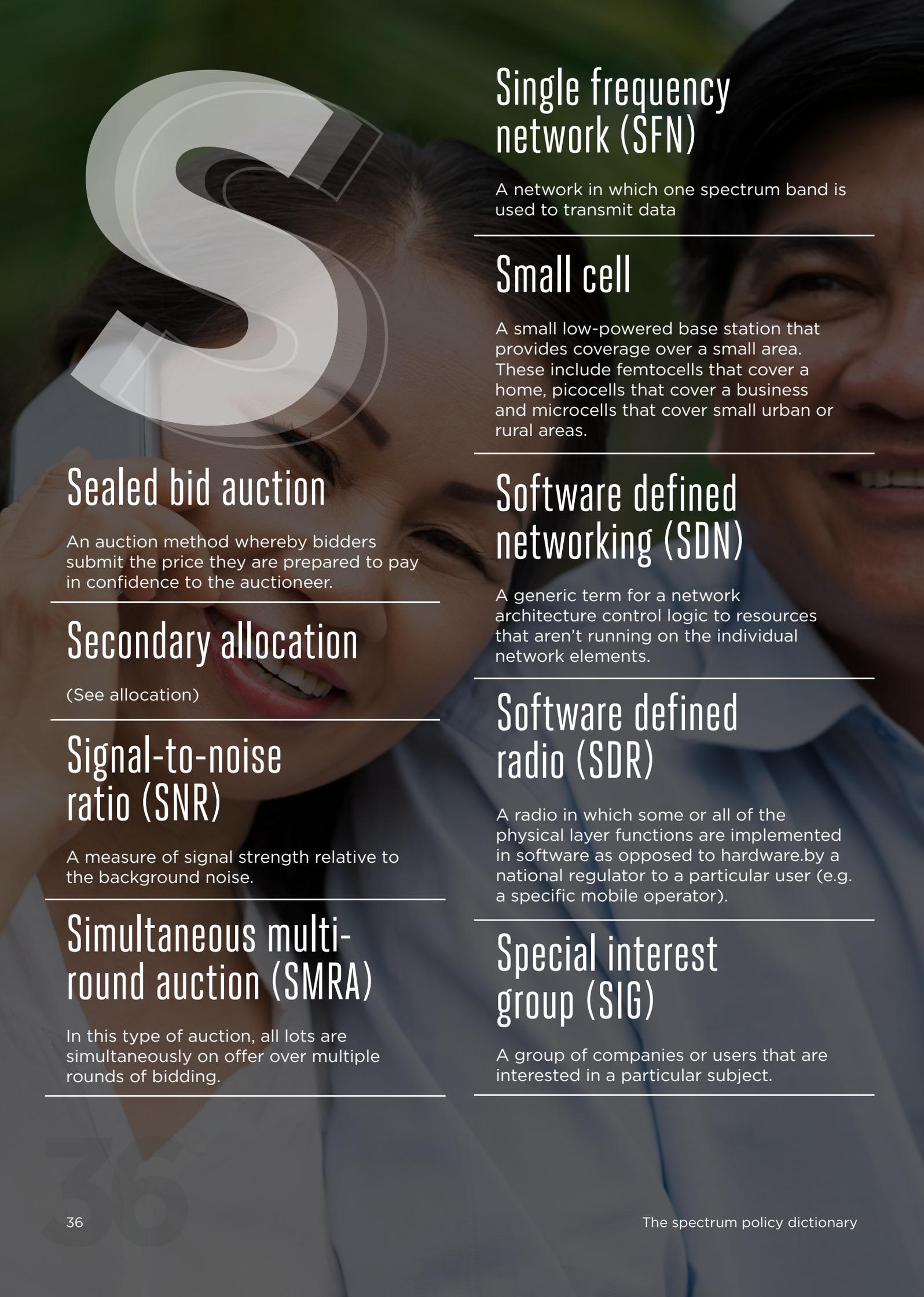


Regional Commonwealth in the Field of Communications (RCC)

An organisation that counts Azerbaijan, Armenia, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan and Ukraine as its members. It has been designed to carry out the cooperation in the field of telecommunications and the postal services on a voluntary basis, on the principles of mutual respect and sovereignty.

Reserve price

The minimum bid required to win a licence at an auction. The reserve price can materially affect the final outcome of the auction. It should be set high enough to discourage all speculative bidding, but not too high otherwise it will dissuade bidders or prevent the eventual winner from being able to invest appropriately in the resulting network – which could result in poor quality services.



Single frequency network (SFN)

A network in which one spectrum band is used to transmit data

Small cell

A small low-powered base station that provides coverage over a small area. These include femtocells that cover a home, picocells that cover a business and microcells that cover small urban or rural areas.

Sealed bid auction

An auction method whereby bidders submit the price they are prepared to pay in confidence to the auctioneer.

Secondary allocation

(See allocation)

Signal-to-noise ratio (SNR)

A measure of signal strength relative to the background noise.

Simultaneous multi-round auction (SMRA)

In this type of auction, all lots are simultaneously on offer over multiple rounds of bidding.

Software defined networking (SDN)

A generic term for a network architecture control logic to resources that aren't running on the individual network elements.

Software defined radio (SDR)

A radio in which some or all of the physical layer functions are implemented in software as opposed to hardware. by a national regulator to a particular user (e.g. a specific mobile operator).

Special interest group (SIG)

A group of companies or users that are interested in a particular subject.

Spectral efficiency

A measure of how much data can be squeezed into a certain amount of spectrum. Newer generations of mobile technology such as 4G are far more spectrum efficient than earlier 2G systems. Strictly speaking it measures the number of bits of information that can be delivered per hertz of spectral bandwidth.

Spectrum

The range of different electromagnetic waves which vary according to frequency and include radiowaves, X-rays, infrared waves and visible light rays among others. In the mobile industry it tends to refer to the portion occupied by radio waves which extend from those at low frequencies such as 10 kHz up to high frequencies such as 100 GHz.

Spectrum commons

(See unlicensed spectrum)

Spectrum harmonisation

The use of the same spectrum for the same types of service across international borders. When a number of countries have agreed to allocate a specific block of spectrum to the same use, that spectrum is said to be harmonised across those countries. Harmonising spectrum minimises interference across national borders, increases the size of mobile markets for equipment and services thereby reducing costs, and enables international roaming.

Spectrum sharing

The agreement between two or more operators to offer network access through their radio spectrum assets to each other's customers.

Spectrum trading

Sometimes known as secondary trading, it is the process whereby the usage rights for a licence can be traded.

Spectrum usage right (SUR)

A set of terms that describe how a spectrum band can be used.

Subscriber identity model (SIM)

An integrated circuit chip that is used to store the international mobile subscriber identity (IMSI) number and its related key, which are in turn used to identify and authenticate mobile subscribers. Software-based versions are starting to appear.

Super high frequency (SHF)

The ITU designation for radio frequencies in the range between 3 GHz and 30 GHz.

Technology neutrality

A spectrum policy approach that allows the use of any non-interfering technology in any frequency band. In practice, this means that governments allocate and license spectrum for particular services (such as mobile), but do not specify the underlying technology used.

Telecommunications Industry Association (TIA)

A trade association which represents Information and Communications Technology companies. In addition to the usual commercial activities of a trade association, the TIA is responsible for coordinating the policy initiatives and standards activities of member companies.

Time division duplex (TDD)

Duplex scheme for unpaired spectrum. It uses different time slots in the same frequency channel which allows for asymmetric data transmission.



Ultra high frequency (UHF)

The ITU designation for radio frequencies in the range between 300 MHz and 3 GHz.

Ultra wide band (UWB)

A technology for transmitting data using techniques which cause a spreading of the radio energy over a very wide frequency band, with a very low power spectral density.



Universal mobile telecommunication system (UMTS)

The 3G technologies that form part of the GSM family of standards and include the dominant WCDMA system used in most 3G networks and the Chinese variant TD-SCDMA.

Unlicensed spectrum

A frequency band which can be used without a licence from the national regulator on the condition that the devices used meet regulatory standards in order to minimise interference. They tend to be used for a variety of radio technologies that generally only cover short distances and therefore pose limited interference issues. The most notable band is 2.4 GHz which is used for technologies such as Wi-Fi and Bluetooth although other bands are used for cordless telephones, baby monitors, car key fobs and garage door openers, etc.

Usage rights

A collection of restrictions which effectively define a technology that can be used in a band of frequencies. Typically, these will encompass radio transmission power levels, the areas and times when it may be used, fees and charges, and any coverage or other roll-out requirements.



Very high frequency (VHF)

The ITU designation for radio frequencies in the range between 30 MHz and 300 MHz.

Wavelength

The length of a single cycle of a wave — the distance in metres measured between successive identical points on a wave — for example, from one positive peak to the next.

White Space

An expression used to define the parts of the spectrum that are not used at a given time and geographical location.

Wideband code division multiple access (WCDMA)

The dominant 3G technology used in most networks globally and often used interchangeably with the term UMTS.



Wi-Fi

An unlicensed short-range wireless networking technology that uses radio waves to provide high-speed Internet and network connections. The technology has traditionally been used in homes, enterprises and shops but is increasingly being used by mobile operators as part of heterogeneous networks.

World Radiocommunication Conferernce (WRC)

A meeting held every three to four years. It is the job of WRC to review, and, if necessary, revise the Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits.

Worldwide interoperability for microwave access (WiMAX)

An OFDM-based wireless communications standard that is similar to LTE but far less widely deployed. Although it was designed to be IMT2000 compliant — making it a 3G technology — it is commonly described as 4G.



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