Mobile Technology, Health and the Environment

LTE: Technology and Health

LTE Technology and Health

Mobile Broadband typically refers to providing customers with high speed data while on the move. There are several technologies capable of delivering commercial Mobile Broadband services. The GSM Association (GSMA) has produced this brief to describe key features of the technology and address some of the questions related to exposure to radio signals from LTE antennas and devices.

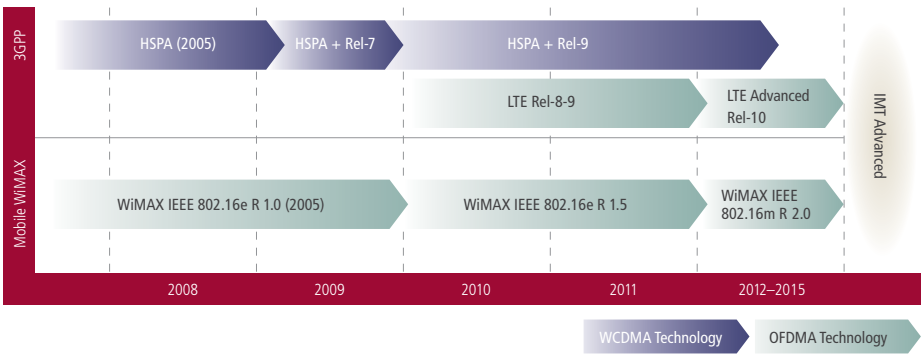
What is LTE, and what benefits does it provide?

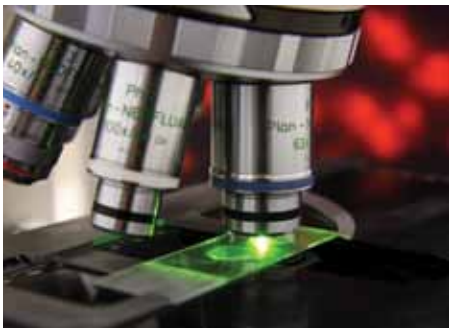
Long Term Evolution (LTE) is designed to deliver very fast data speeds of up to 100 Mb/s (megabits per second) downlink and 50 Mb/s uplink (peak rates) – this is faster than most home broadband services. LTE has the advantage of being backwards compatible with existing GSM and 3G technologies, enabling mobile operators to deploy LTE and continue to provide a seamless service across existing networks.

URL: www.gsmworld.com/mbb

The figure below shows data rates for Mobile Broadband technologies. 3G/WCDMA is a third generation mobile system. High Speed Packet Access (HSPA) technology is already delivering Mobile Broadband services and HSPA+ is a technical enhancement. LTE is the next step on the GSM technology road map after HSPA. The first commercial LTE networks were launched in Oslo, Norway and Stockholm, Sweden in December 2009. WiMAX (Worldwide Interoperability for Microwave Access) systems typically offer limited mobility services.

URL: www.gsmworld.com/technology





When LTE is launched will it replace existing mobile networks?

Mobile operators need to provide a range of voice and data services in order to meet the expectations of consumers. As consumers expect to be able to use their mobile phone virtually everywhere, LTE will initially be deployed in parallel with existing mobile services. This also means continuity of service for customers who can continue to use their phones on existing networks. The first LTE devices have been Mobile Broadband modems (USB 'dongles') that plug into laptops but soon other mobile devices will incorporate LTE.

If governments allocate low frequency spectrum from the Digital Dividend, LTE has the potential to deliver mobile broadband coverage to rural and urban areas. This will enable high speed Internet access regardless of where people live.

The GSMA generally supports spectrum liberalisation, essentially the removal of technology restrictions to enable new mobile technologies to be deployed within the same band or bands as existing technologies. For example, 3G or HSPA could be deployed in spectrum bands where traditionally GSM has been used.

Where governments allow flexibility in the choice of technology, network operators may deploy LTE in the frequencies currently used to provide mobile services. In some cases this may be a replacement for GSM or 3G and in other cases it will be an additional radio technology.

The spectrum allocations for mobile services are not the same in all countries. The chart below shows the major current and planned spectrum allocations for mobile technologies. In the future operators may deploy LTE in other frequency bands where government licences permit.

URL: www.gsmworld.com/spectrum

Frequency Band	700MHz	800MHz	850MHz	900MHz	1800MHz	1900MHz	2100MHz	2600MHz
GSM								
3G/HSPA								
LTE								

What kind of research exists regarding LTE and possible health effects?

The essential characteristics of LTE-signals in respect to the exposure are comparable to those of existing mobile technologies. These similarities refer especially to the transmission power and also to the relevant frequency range. Indeed, the frequency bands which will be used by LTE were previously allocated to other radio services, for example TV. The key difference is that the coding and modulation of the user information for LTE allows higher data rates to be supported. This means that existing scientific research and safety standards are relevant to health risk assessments of LTE.

In April 2010 the German Federal Agency for Radiation Protection assessed LTE in response to a question in the German Bundestag (parliament) and concluded:

'These frequencies adjoin the frequency bands previously used for mobile communication and researched in the German Mobile Telecommunication Research Programme (DMF). Therefore, no significant differences to previously used mobile communication frequencies are to be expected regarding possible biological effects: The German Mobile Telecommunication Research Programme has shown that there were no indications of a damaging effect of mobile communication within the effective limit values.'

URL: www.bfs.de/en/elektro

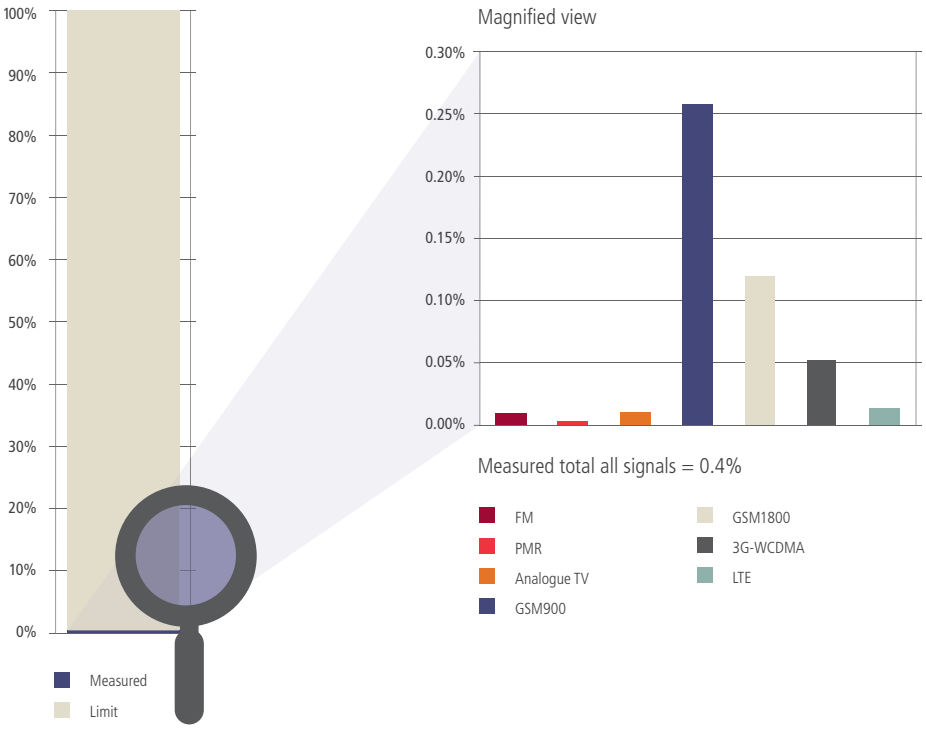
Are new safe exposure limits needed for the LTE system?

No, because current international safety guidelines for radio technologies are valid for the whole frequency range planned for LTE deployments. These guidelines are recognised by the World Health Organization (WHO) as providing protection for all persons against all established health effects.

In the diagram, the bar chart on the left shows that the highest total of all measured signals was about 0.4% of the ICNIRP public exposure limit.

On the right the relative contributions of each service are shown: FM, Frequency Modulation; T-DAB, Terrestrial–Digital Audio Broadcasting; TETRA, Terrestrial Trunked Radio; PMR, Private Mobile Radio; DVB-T, Digital Video Broadcasting–Terrestrial; GSM, Global System for Mobile Communications; 3G-WCDMA, 3G Wideband Code Division Multiple Access; DECT, Digital Enhanced Cordless Telecommunications; HSPA, High Speed Packet Access; WLAN, 802.11 and LTE, Long Term Evolution.

URL: www.who.int/emf



How do the exposures from LTE antennas compare to other mobile and radio services?

Measurements in 2010 on one of the first commercial LTE networks operating in the 2.6 GHz band showed that the LTE signals were about 4% of all the measured radio signals and more than 6,000 times below the recommended safety limits. Further measurements are planned for LTE systems in other frequency bands and to examine the influence of call traffic.

The measurements found that typical exposures are similar to current wireless networks, and other sources, such as TV and radio. The level of exposure in a particular position will depend on many factors including antenna height, transmitter power and distance to the antenna.

The WHO has concluded that for mobile and wireless networks:

'Considering the very low exposure levels and research results collected to date, there is no convincing scientific evidence that the weak RF signals from base stations and wireless networks cause adverse health effects.'

URL: www.who.int/mediacentre/factsheets/fs304/en/index.html

LTE promises faster data rates than current mobile technologies, does that mean higher exposures from the antenna sites and will this grow with more data traffic?

LTE will improve data speeds and network capacity by carrying data more efficiently. This is needed to meet the high expectations and demands customers place on mobile communication applications and services both in their professional and private life. The power from an LTE base station will vary in response to the amount of data traffic. The maximum exposure levels will be similar to other mobile services using similar transmitter powers.

Are there safety standards for LTE devices?

Yes, LTE devices have to comply with the same type of safety limits as mobile phones. LTE devices are currently in the form of data modems (such as USB 'dongles') but in the future will include conventional mobile phones and other applications such as those embedded in laptops. Exposure guidelines for mobile phones and devices used close to the head or body specify the maximum level of RF energy that can be absorbed with a large safety margin. The term for the amount of RF energy absorbed by the body is the Specific Absorption Rate or SAR. SAR is expressed in units of watts per kilogram (W/kg).

The maximum SAR level for a mobile phone used against the head or body in accordance with the international guidelines is 2 W/kg measured over a 10 gram averaging mass. Mobile phones (including LTE devices) are tested for SAR compliance at the highest certified power level in laboratory conditions.

URL: www.emfexplained.info/?ID=25584

Do I need to take any precautions when I use my LTE dongle?

All equipment transmitting radio signals must comply with national or international safety requirements, which also applies to LTE dongles. Some devices are designed to have a small minimum separation from the body when in use, typically 15–25 mm depending on the device. This is to ensure that the device operates more efficiently and also meets the SAR requirements. If a separation is required this will be described in the documentation accompanying the device and is normally produced by the manufacturer. No other precautions are required.

In May 2010, the WHO stated:

'A large number of studies have been performed over the last two decades to assess whether mobile phones pose a potential health risk. To date, no adverse health effects have been established for mobile phone use.'

URL: www.who.int/mediacentre/factsheets/fs193/en/index.html

I am concerned, how can I reduce my exposure?

Mobile phones are low-powered radiofrequency transmitters with peak powers in the range of 0.1 to 2 watts. The device only transmits power when it is turned on. LTE devices are tested for compliance with exposure standards at their highest certified power level in laboratory conditions.

The power (and hence the radiofrequency exposure to a user) falls off rapidly with increasing distance from the mobile device. A person using a mobile phone 30–40 cm away from their body – for example when text messaging, accessing the Internet, or using a "hands free" device – will therefore have a much lower exposure than someone holding the handset against their head.

To increase distance with a laptop put it on a table. Using the LTE device in areas of good reception also decreases exposure as it will transmit at reduced power.

Is the amount of power affected by how much data I send?

All mobile technologies adapt their transmitted power to operate at the lowest level possible by taking account of the type of service (voice or data) and the quality of the radio link between the mobile device and nearby antenna sites. This also minimises interference to other nearby mobile devices. More data is sent when transmitting an image than a text message. Remember that an LTE device is only transmitting small amounts of data when viewing an Internet site as it is mostly receiving information.

URL: www.gsmworld.com/our-work/public-policy/health/mobile_devices.htm

Will you need to put up new antenna sites for LTE, like you have for 3G?

As LTE has different frequency requirements to those of existing mobile services new antennas will generally be required. Where possible an operator will place these antennas at an existing site and at other times new locations will be required. In some countries mobile operators are working together to jointly deploy LTE networks. This means fewer sites, saving on cost of equipment and operating the network.

Site sharing with other radio installations or existing structures, where technically feasible and in line with competition law and licensing conditions, is factored into decisions on the most environmentally appropriate base station solution. Appropriate siting and design may reduce the visual profile of antennas.

How do LTE data rates affect the size of the compliance zones around network antennas?

Mobile networks are designed to use only the power needed to provide quality services. Too much power would cause interference and affect all users. One of the features of LTE is that it is able to allocate different data rates to different users, in order to use the total capacity most efficiently. This means that the transmitted power will vary in response to the amount of mobile call traffic.

Compliance zones are assessed using the planned maximum power for the base station and typically extend about 3 metres in front of the antenna and about 5 centimetres above, below and behind the antenna. If an antenna could be accessible to the public, then there are signs and barriers to advise them of the antenna, and how to proceed safely. The antennas are positioned so the public cannot access these areas.

How does the compliance zone for LTE antennas compare to that for 3G?

Mobile network operators position antennas high up on poles or rooftops or on the side of buildings so that the exposure limits are not exceeded in areas accessible by the public. The size of the compliance zone for LTE antennas will be similar to that of other mobile services using similar transmitter powers. In order to allow for situations when workers need to access rooftops for maintenance activities, procedures are agreed between the mobile operator and the rooftop landlord when the antenna is installed.

URL: www.gsmworld.com/our-work/public-policy/health/working_near_antennas.htm

Where to go for more information

GSMA: **www.gsmworld.com/health**

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