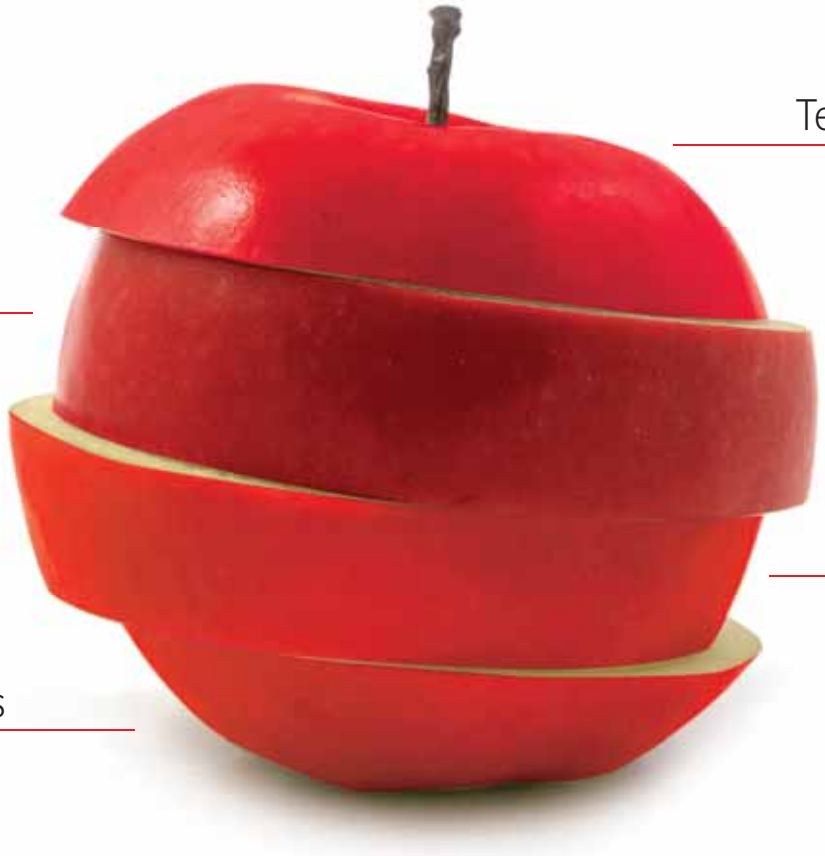
Apple of discord



vodafone

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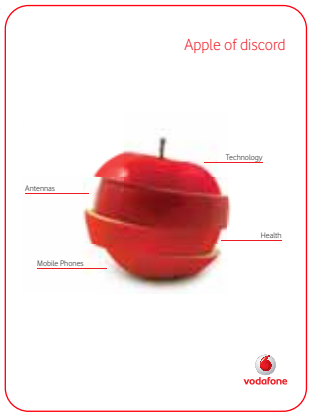


Daily use of mobile phones has familiarised us with handsets but not with the technology that underlies their operation and the way mobile networks function. Often the result is that the network, and antennas in particular (which transfer our conversations, messages, photographs, and music by utilising electromagnetic waves) are the apple of discord, among interested parties and the agencies concerned.

In reality however, the situation is different since our mobile phones are only a single 'piece' of the mobile technology puzzle, which cannot operate without the network of antennas and the digital switching centres.

This booklet seeks to assist readers in understanding the technology involved by offering basic information about:

- how mobile networks operate
- how mobile phones operate
- electromagnetic fields and their use in mobile technology
- the global, European and national context within which mobile telecommunications operate
- studies on health and electromagnetic fields.

At the same time, this booklet includes a list of relevant biographical references and material for those readers who want to learn more, as well as tips on responsible use of your mobile phone.

Finally, this booklet is based on the views of the World Health Organisation (WHO) and other relevant international organisations.

Should you require any clarifications or additional information, please feel free to contact us at the following email address: EMFinfo@vodafone.com or send SMS to 1004 free of charge (only for Vodafone subscribers).

People
Communication
Progress

Mobile phones have now become an integral part of our everyday life, radically changing the way we communicate, work and creatively engage in activities.

More than 2 billion users worldwide use their mobiles phones at work, in their free time, for their personal safety and in emergencies.

In Europe, mobile telephony services have been available for more than 20 years. All Member States of the European Union have issued licences for the development and provision of second and third generation mobile telephony services.

In each EU Member State, mobile licences granted to mobile operators, set a minimum obligation regarding the national rollout of the networks (both in terms of geographic and population coverage), as well as a specified time frame for achievement.

Due to the high-tech required[1], putting a mobile network in place presumes major investments in terms of money and time, so that geographical coverage for the entire country and the necessary capacity can be ensured for the constantly increasing use of mobile phones by ever multiplying numbers of subscribers.

Already in its second decade of operation in Greece, the mobile telecommunications sector has made investments in excess of €5 billion to put modern infrastructure in place, while it employs around 35,000 people directly or indirectly.

Mobile telecommunications continue to be one of the most dynamic sectors in the global economy, constantly developing new products and services, as well as mobile networks in countries which until recently did not have telecommunications infrastructure.

World GSM coverage map (GSM Association 2006)

- more than 2 billion users worldwide
- more than 210 countries
- more than 680 networks
- more than 1,000 new connections a minute[2]

[1] More information on how mobile telephony networks operate can be found in the following chapters of this booklet
[2] From the GSM Association (http://www.gsmworld.com/index.shtml)

Technology

How mobile technology operates

Mobile networks operate by transferring voice (conversations), text (messages) and data (photographs, music, videos, etc.) via electromagnetic waves (also known as radio waves).

Wireless transmission of electromagnetic waves makes network deployment easier and faster compared to fixed networks, since it requires the installation of antennas without cable connections in every point of the country.

Mobile technology in effect liberates telecommunications of the geographical difficulties encountered when deploying a fixed line cable network. One direct result of this has been that residents in large cities as well as remote areas who had been waiting years for a phone connection have acquired a phone immediately.

Wireless transmission of voice and data via electromagnetic waves has also meant designing a new mobile network that enables communication while in motion. This is achieved by installing fixed transmitters, in other words antennas, at key locations around the country and the use of wireless handsets, in other words mobile phones, which communicate with each other by transmitting and receiving electromagnetic waves.

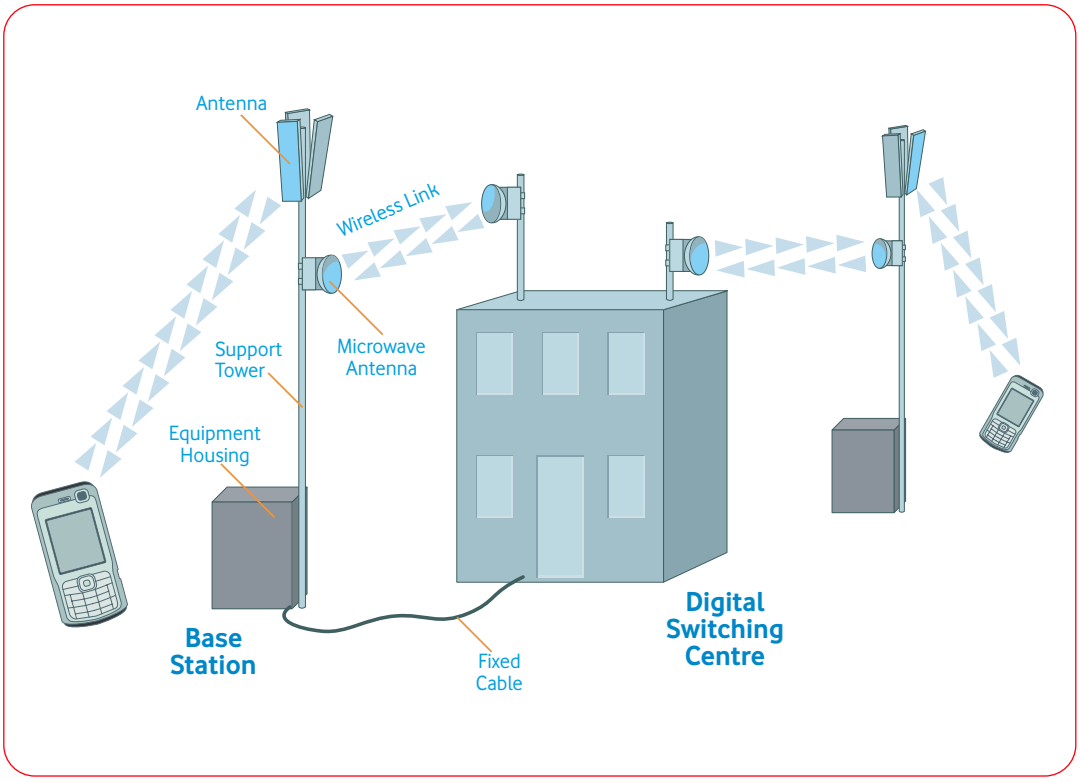
What is a mobile network comprised of

A mobile network is comprised of base stations, mobile phones (or terminal equipment) and digital switching centres (also known as Mobile Telephone Exchange centres) which connect the base stations to one another.

Every time we place a call, our mobile phone sends a signal to the closest base station antenna in the area we are located. The base station processes the signal and then via cables or wireless means -via microwave antennas (microwave dishes) - transmits it to the closest digital switching centre. From there, again via cables or microwave antennas, the signal reaches the base station, which covers the area where the called subscriber is located.

In this way, communication is constant and two-way across the network, permitting subscribers located at different geographical points to communicate. Where some 'link' in the network 'breaks', communication between the two subscribers terminates.

A mobile telephony network is comprised of base stations (antennas) at fixed locations, mobile phones and call control and digital switching centres (MTX).



Mobile network

What is a base station comprised of

A **base station** is comprised of a number of **antennas**, a number of **microwave antennas (microwave dishes)**, their support tower and an **equipment housing**.

The **antennas** are always located at the top of the tower and measure approximately between 15 - 30 cm wide and 0.5 - 2 m long, depending on their type and technical features such as operating frequency.

The **support tower** is a metal structure as tall as needed, so that the antenna can transmit the signal without disruption to the area it covers.

Technological equipment necessary for base station operation is placed in the **equipment housing** (cabinet or small hut) to protect it from damage.

Base stations are connected to each other via cables or wireless means, such as **microwave antennas** (microwave dishes) so as to establish a mobile network and thus provide coverage to specific geographical areas. Microwave dishes usually have a diameter between 0.3 - 0.6 m, but can reach up to 2 m in cases where a large number of users need to be covered.

Technology

The radio signals that these antennas emit are primarily transmitted from the centre of the antenna outwards. This means that the antennas need to be placed in locations where there are no obstructions, such as tall buildings or natural obstructions, such as hills, which could have an adverse effect on signal coverage. In rural areas with rough terrain (such as hills and mountains) it is likely that many antennas will be required to cover towns and streets located in the 'shadow' of surrounding hills and mountains. In towns, antennas are placed on tall buildings with smaller support towers, since the buildings themselves offer the height needed to provide signal coverage.

To ensure coverage in flatter areas, the antenna tower should either be raised or a second antenna be installed

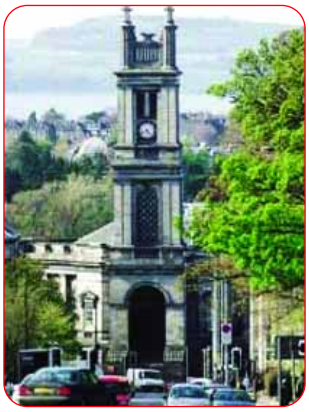
Base station in urban area

Base station in rural area

Base station blended into the environment in Greece

Base station blended into the environment in Greece

Base stations blended into the environment abroad



Base stations blended into the environment abroad

Efforts are made to install base stations on existing structures, such as buildings, pylons, or water tanks, and to design them in such a way that they have the least possible impact on the environment. These planning considerations apply both to the overall construction of the base station and to the colours and materials used in construction.

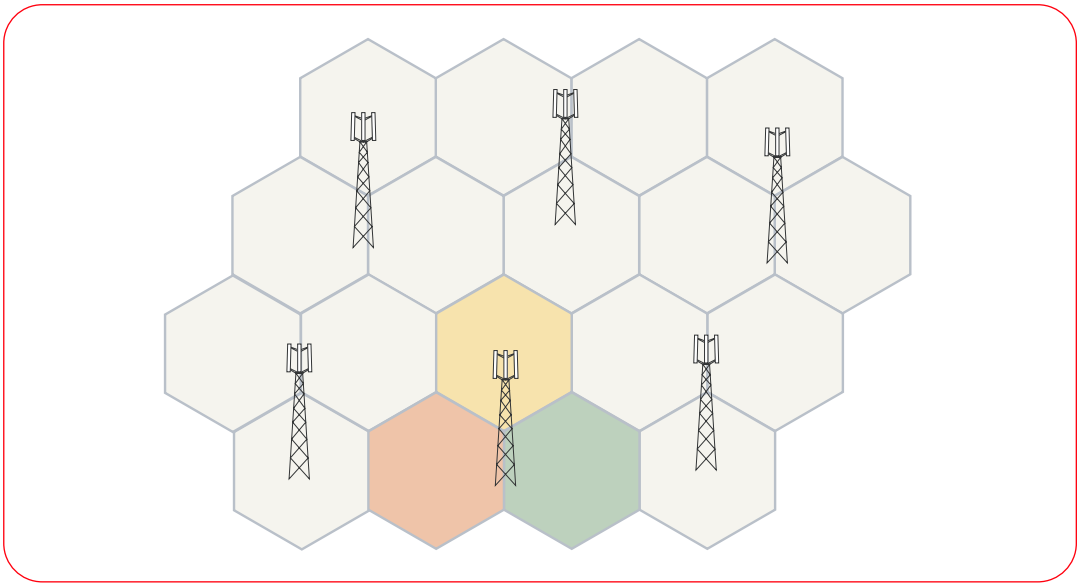
In many countries there are set guidelines from the competent national authorities on how base stations should be designed so as not to create an adverse visual impact on the environment.

How do mobile antennas operate

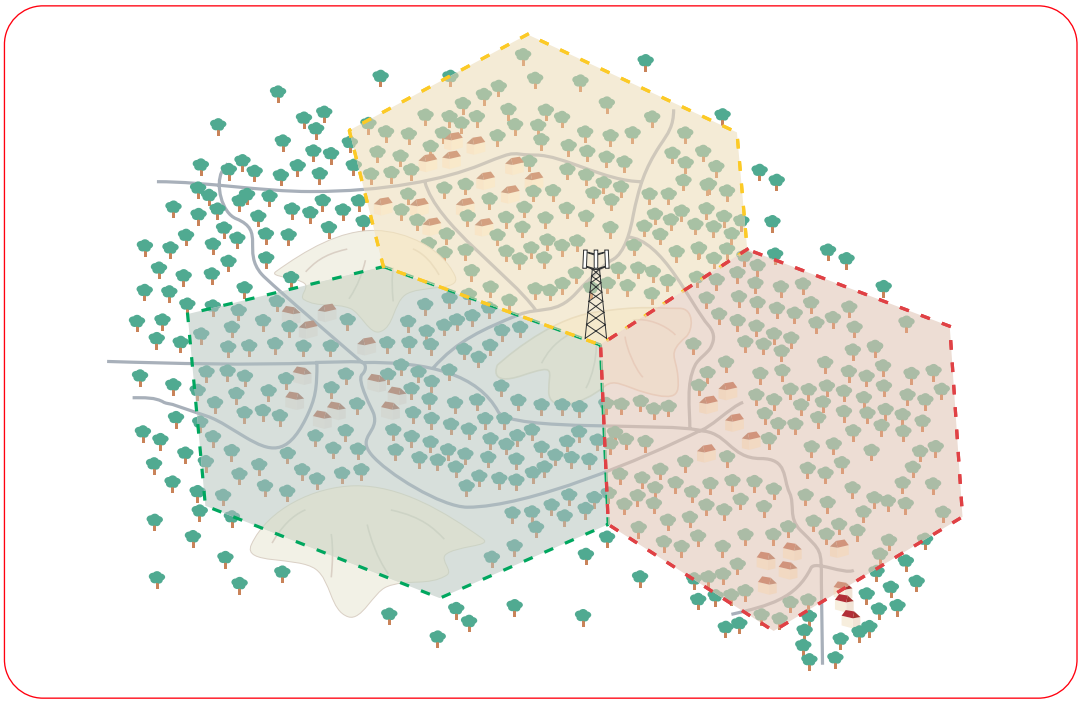
Each base station, which is comprised of between 1 and 4 antennas (3 being the norm), transmits a signal, in other words provides telecom coverage, to a specific geographical area. When the base station is comprised of 3 antennas, it creates three coverage zones in a perimetric pattern . Due to their shape, these zones are known as 'cells'. The size of each cell depends on the local terrain (buildings, mountains, plains) and the number of mobile telephony subscribers in the area. Each antenna can only "handle" a specific number of calls at one time (usually between 10 and 50 calls). As the number of calls being handled by a base station increases, the antenna capacity overloads. In this case, the cell needs to be divided into smaller cells; that is to say a second or even a third antenna is installed in the area depending on the traffic [of calls] to be handled.

Due to the numerous tall buildings and the large number of subscribers in towns and cities, cells are very small and do not exceed more than a few hundred meters in size. For a mobile network to operate with efficiency in a town or in a densely-populated district, the geographical area to be covered must be divided into numerous smaller cells, in other words many small-range antennas must be installed. These antennas operate at particularly low power levels, which usually does not exceed 40 watts (it is worth noting that many household appliances, such as hairdryers, television sets and refrigerators operate at a higher power levels). In rural and sparsely populated areas cells are larger, since they have fewer physical obstacles and are required to handle fewer calls.

Technology



Base stations are installed at locations, which allow them to overcome geographical and other limitations and provide coverage to specific areas



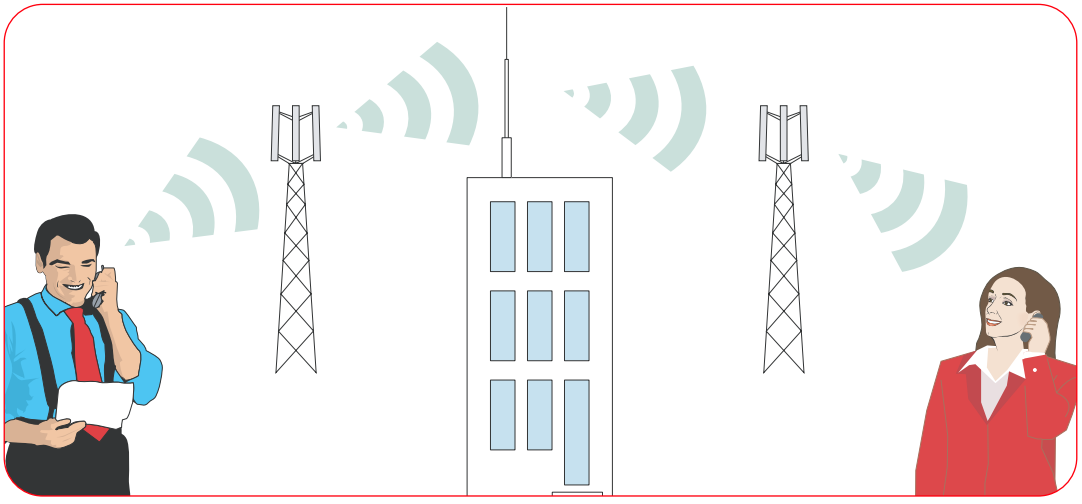
Base Station area coverage

How mobile handsets work

When a mobile handset is switched on, it periodically communicates with the antenna which provides coverage in the specific area where they are located. In this way, the mobile phone sends its position to the mobile network so that the user can make or receive a call from any point in the country. If the subscriber is on the move then the signal transmitted by the mobile phone is identified by the respective antennas in the area in which he or she is moving.

Each time we make or receive a call using our mobile phone, electromagnetic waves are transmitted from our handset to the closest antenna, in other words the antenna providing us signal coverage. Following that, the antenna dispatches those waves to a digital switching centre and from there to another antenna and then to another mobile phone or fixed phone. If during the call the caller or called subscriber moves, the mobile network transfers the call from one antenna to another, so that the conversation is not interrupted.

A mobile phone works when a base station is located in the area where it is been used.

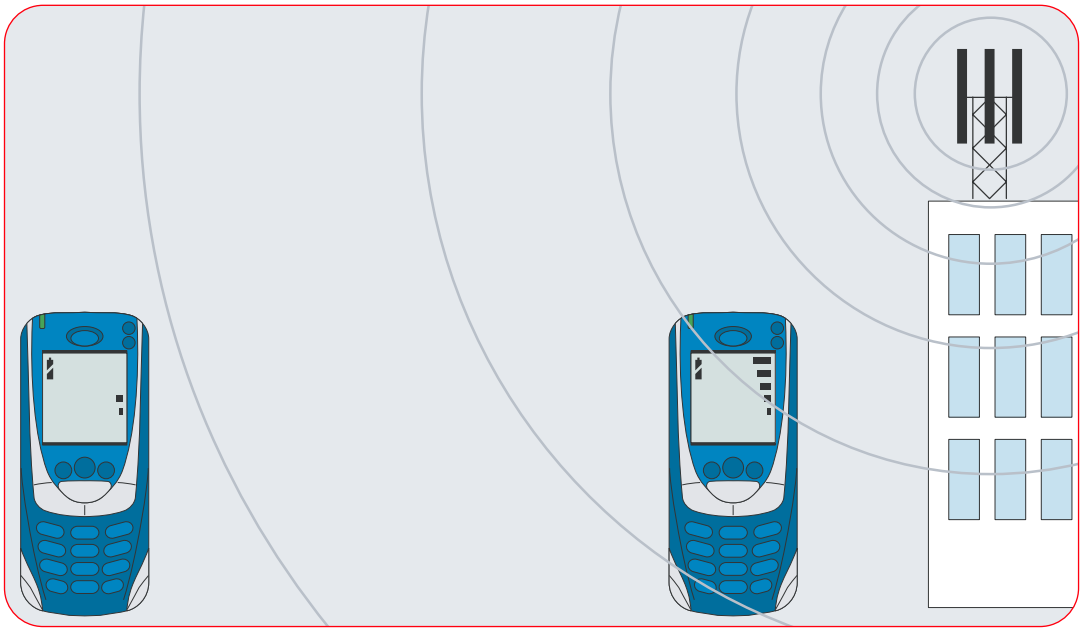


The base station receives radio signal from the mobile phone, transfers it to a digital exchange which then connects to the number called (either on a fixed network or on another mobile base station, depending on whether the call is intended for a fixed or mobile phone).

When do mobile handsets emit less electromagnetic energy

Developments in technology allow mobile phones to be able to automatically control their power levels, in other words to increase or reduce the quantity of electromagnetic energy emitted during a call. The maximum operating power of a mobile phone is 0.25 watts, however, the operating power during a call depends on the signal level received, in other words on the distance from the antenna. When a mobile phone receives a "strong" signal (in other words it is near an antenna) it emits the minimum possible energy, that is to say much less than the maximum value of 0.25 watts. On the contrary, when there is "weak" signal in an area (i.e. when there is no antenna close enough) the mobile handset emits more energy to communicate with the antenna.

A mobile handset operates using the least possible power level, when it receives a "strong signal", in other words when it is near a mobile antenna.



The mobile handset has strong signal when it is close to a base station, hence it operates at a power level much below the maximum power of 0,25 watts. On the contrary, when the mobile handset is far away from a base station, its signal is low, the coverage is poor or there is no coverage at all and consequently, the mobile handset operates at its maximum power level.

Use of electromagnetic waves by mobile technology

To place a call from our mobile handset, both our handset and the base station antenna send and receive electromagnetic waves. Electromagnetic waves are the medium carrying the conversations (voice), messages (SMS), photographs, music or videos (data) we want to share with another person.

Mobile telecommunications operate via a network of antennas, which exist across all of Greece, and via handsets. Antennas and handsets receive and send information (voice, SMS, photographs, videos and email) via electromagnetic waves.

What are electromagnetic waves

In the environment there are many sources of electromagnetic energy (or electromagnetic radiation), in other words energy transmitted in wave form. The majority of electromagnetic waves are invisible and travel at the speed of light. Only one part of this type of radiation can be identified by the human eye, and that is the visible light, which produces the various colours of the rainbow.

What are electromagnetic fields[3]

Every source of electromagnetic waves produces an electromagnetic field, which is transmitted through space (thus the term electromagnetic radiation is frequently used). Electromagnetic fields are present everywhere in our environment. They can be of natural sources or can be human-made. **Electromagnetic fields** are created by electric and magnetic fields, which result from the existence of alternating currents.

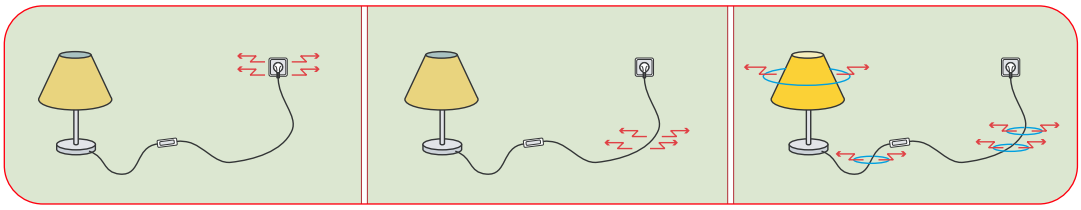
Plugging an electrical appliance into an outlet creates electric fields in the air surrounding the appliance. **Electric fields** are created by differences in voltage; the higher the voltage, the stronger will be the resultant field.

Magnetic fields are created when the electric current flows; the greater the current, the stronger the magnetic field.

There is always an electric field around an appliance, which is plugged in, even if no current is flowing. That is to say electric field exists even if the appliance is not turned on but is simply plugged in. When the appliance is turned on a magnetic field is generated, the strength of which varies with power consumption. The electric field strength is constant.

[3] World Health Organisation (WHO): What are electromagnetic fields – 1999, pp. 2-3

Use of electromagnetic waves by mobile technology



Electric and magnetic fields generated by household appliances

Sources of electromagnetic fields in everyday life

Electromagnetic fields exist everywhere in the environment, at home, at work and are generated either by **natural** or **human-made** sources.

Natural sources of electric and magnetic fields

The Earth's magnetic field makes a compass needle point north and at the same time is a valuable aid to birds and fish helping them orient themselves[4]. Lightning generates electromagnetic fields. The human body has its own natural electromagnetic fields, which carry messages along the nervous system. Heart function is based on the existence of weak electrical currents – signals that cause electrical stimulation of the heart muscle.

Human-made sources of electromagnetic fields

Electromagnetic fields are generated by the operation of many electrical appliances we use daily. The vacuum cleaner, refrigerator, hairdryer, computer and air-conditioner all generate electromagnetic fields when they operate.

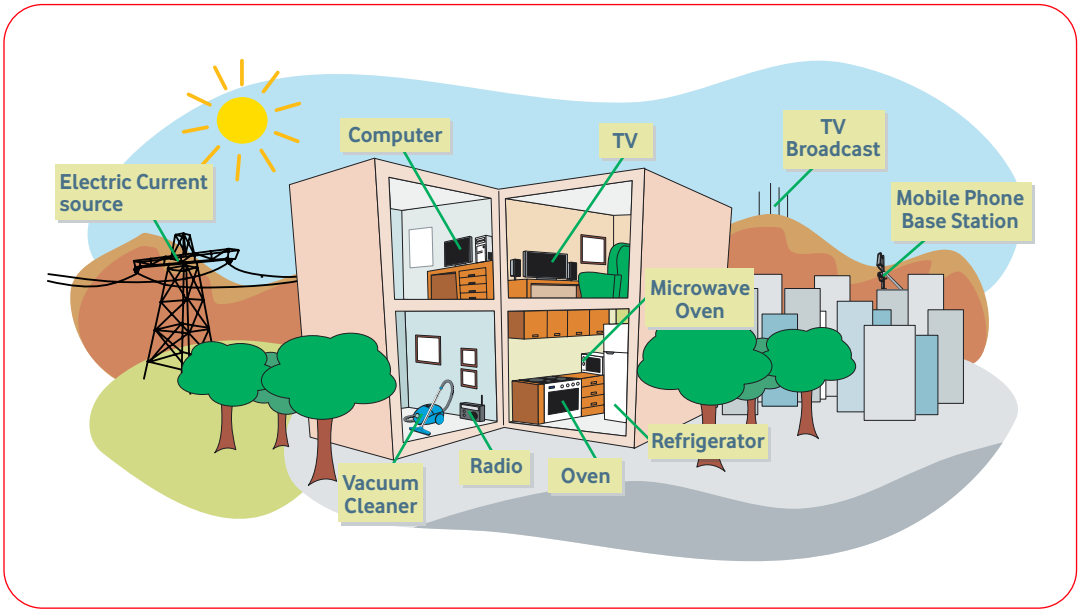
Other appliances, such as TV, radio, wireless phones, remote control devices for household appliances, baby monitors, and microwave ovens not only generate electromagnetic fields but also rely on them to function. In other words, the TV and radio programmes we see and hear are transmitted to our homes via electromagnetic waves. The wireless telephone in your home transmits your voice to the base unit using electromagnetic waves. The TV/stereo remote control changes the TV or radio channel using electromagnetic waves.

[4] http://www.who.int/peh/emf/about/whatisemf/en/

Use of electromagnetic waves by mobile technology

Electromagnetic fields are also used in the communication systems employed by the fire brigade, police, ambulance service and in radars. The most recent application of electromagnetic fields is their use in mobile and satellite communications.

Many people are surprised when they learn about the various levels of electromagnetic fields generated by different household appliances. The field strength does not depend on how large, complex, powerful or noisy the appliance is, but as mentioned above, on the strength of current flowing through it. Even among similar appliances, magnetic field strength can vary greatly. For example, some hairdryers generate strong magnetic fields while other generate almost zero magnetic fields. These differences are due to product design.



Sources of electromagnetic radiation in everyday life

Use of electromagnetic waves by mobile technology

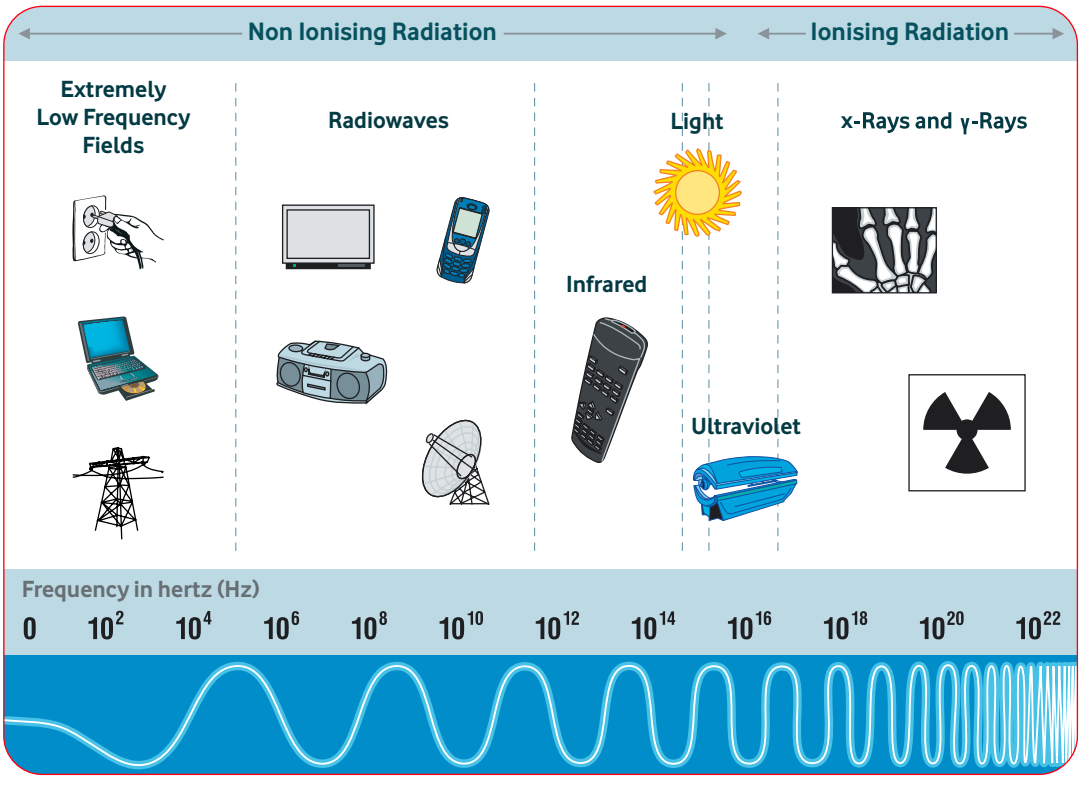
Different forms of electromagnetic fields

There are many forms of electromagnetic fields and the differences between them are very important. Their features depend on the type of electromagnetic waves that generate them.

The main features, which define an electromagnetic field, are its **wavelength** and **frequency**.

Imagine electromagnetic waves as a series of regular waves, which travel extremely rapidly at the speed of light. Frequency means the number of oscillations (or cycles) the wave achieves per second. Wavelength indicates the distance between two successive waves. Frequency and wavelength are interrelated concepts: the higher the frequency the shorter the wavelength.

Wavelength and frequency also determine another significant feature of electromagnetic fields: the energy they carry. The higher the frequency of a wave the larger the quantity of energy carried.



The electromagnetic spectrum

Use of electromagnetic waves by mobile technology

Electromagnetic fields come in an immense number of frequencies, known as the **electromagnetic spectrum**. The electromagnetic spectrum (i.e. frequencies) is divided into two distinct zones:

- **ionising** and
- **non-ionising radiation**.

Ionising radiation

Some electromagnetic waves carry such large quantities of energy that they can ionise particles of matter and consequently break down the chemical bonds between molecules. X-rays used for both diagnostic and therapeutic purposes (radiotherapy), gamma-rays (emitted by radioactive materials) and cosmic radiation, all have this ability and are known as **ionising radiation**.

Non-Ionising radiation

Electromagnetic fields which cannot break down molecular bonds are called **non-ionising radiation**. Artificial sources of electromagnetic fields, by which we are surrounded daily (microwaves and radio frequencies), belong to the non-ionising radiation zone. In other words, the quantity of energy they carry cannot break down chemical bonds.

The operation of mobile technology is based on the use of non-ionising electromagnetic radiation.

International standards, guidelines and monitoring of human daily exposure to electromagnetic fields

Human daily exposure to electromagnetic fields

Human exposure to electromagnetic fields is not a new phenomenon. However, during the 20th century a gradual increase in human exposure to electromagnetic fields from artificial sources was noted, since increasing demand for electricity, developing technologies and changes in social conduct (primarily due to technological developments) contributed to the creation of ever increasing numbers of artificial sources. Both at home and at work, all of us live in a complex environment of low strength electric and magnetic fields.

Exposure to electromagnetic fields from antennas and mobile handsets

Antennas and mobile handsets generate electromagnetic fields and their operation is based on this fact. Research has been underway since the 1970s on human exposure to electromagnetic fields generated by the operation of wireless communication systems, antennas and mobile handsets. Based on this research the international scientific community has issued guidelines to protect public health from exposure to electromagnetic fields.

How is the human body affected by exposure to electromagnetic fields

The human body absorbs a part of the electromagnetic fields emitted by some electrical appliances. The energy absorbed results in a small increase of human body temperature. The human body is capable of reducing this increase by itself using natural thermoregulatory processes (e.g. reducing heat via blood circulation).

What is the Specific Absorption Rate and how is it related with mobile technology

The International Commission on Non-Ionising Radiation Protection (ICNIRP) has issued guidelines to limit public exposure to radio frequency fields. The limits in these guidelines have been set based on the energy absorbed per kilogram of body mass that is expressed by the Specific Absorption Rate or SAR. SAR value relates to both whole body and localised exposure. The internationally recommended limit for public exposure is 0.08 watts per kilogram. Therefore, a person weighing 50 kg can absorb up to 4 watts of electromagnetic fields energy for his/her whole body and still be within the guidelines. This figure is very low compared to the heat naturally produced by a 50 kg person while at rest, which is around 50 watts, in other words 1 watt per kilogram.

Moreover, the guidelines constitute limits for maximum localised SAR values for specific body parts. For example, the value for the head alone is 2 watts per kilogram. In this way, even if mobile handsets meet the guidelines' criteria for the whole body, they should also meet the maximum localised SAR values so as to limit possible localised temperature increases.

All mobile handsets have to comply with the radio frequency exposure guidelines.

International standards, guidelines and monitoring of human daily exposure to electromagnetic fields

Mobile handsets and the Specific Absorption Rate

Mobile handsets are at the same time both low strength radio signal receivers and transmitters. When activated, they emit low levels of electromagnetic energy (also known as radio waves or frequency fields).

Mobile handsets are designed to operate within strict limits laid down in the **ICNIRP (International Commission on Non-Ionising Radiation Protection)** guidelines. These guidelines specify a safety margin, which guarantees the safety of all people, regardless of age or state of health.

Mobile handsets are manufactured so as to use the least possible power to communicate with the network. Consequently, the closer one is to a base station the more likely SAR levels are to reduce.

Learn about the SAR value of your mobile handset by consulting the user manual provided when you bought it.

International standards and limits on human exposure to electromagnetic fields

To protect human health from possible impacts of electromagnetic radiation and in particular radiofrequencies (i.e. frequencies range between 0 to 300GHz), international standards have been adopted establishing exposure limits to electromagnetic fields.

Each country sets its own national standards and limits for electromagnetic field exposure. However, the majority of international standards and limits are based on guidelines issued by the **International Commission on Non-Ionising Radiation Protection** (ICNIRP)[5] . ICNIRP is a non-governmental independent group of experts, officially recognised by the World Health Organisation. ICNIRP evaluates the state of knowledge about the effects of non-ionising radiation on human health and well-being, and, where appropriate, provides scientifically-based advice on non-ionising radiation protection including the provision of guidelines on limiting exposure. The ICNIRP guidelines are reviewed periodically and updated if necessary.

According to the **World Health Organisation** the ICNIRP guidelines are highly protective and are based on all the available scientific evidence. They take into account all known impacts and offer protection against all confirmed risks from exposure to electromagnetic fields[6]. Moreover, the ICNIRP guidelines incorporate large safety factors, 50 times below the limit value, at which no effects on the human body have been reported.

[5] For more information visit the ICNIRP's website: www.icnirp.de
[6] For more information visit the WHO's website: http://www.who.int/peh-emf/en

International standards, guidelines and monitoring of human daily exposure to electromagnetic fields

What limits apply today within the European Union

On 12 July 1999, the EU Council adopted the ICNIRP guidelines and issued a Recommendation on the limitation of exposure of the general public to electromagnetic fields (0Hz to 300GHz) (1999/519/EC)[7]. The above Recommendation has been adopted by most Member States including the new ones. Certain countries, such as Greece, have lowered the limits even further.

The safety of base stations and mobile handsets/terminal equipment is governed by a series of European Council Directives such as the **R&TTE** Directive of 9 March 1999. This ensures a high level of protection, safety and health for users within the internal market. In order to ensure that European citizens are not exposed to radiation beyond the safety limits in the Council's Recommendation, European standardisation organisations such as CENELEC have also been called upon to develop product-related standards.

What limits apply today in Greece

Based on the EU Council Recommendation, in 2000 the Greek Government issued Joint Ministerial Decision No. 53571/3839 on public protection safeguards from the operation of land-based antennas (Government Gazette 1105/B/6-9-2000). Under this Joint Ministerial Decision a 20% reduction in the exposure limits compared to those in the EU Recommendation was adopted.

Law 3441/06 on electronic communications and other provisions (Government Gazette 13/A/3.2.2006) adopts new, even stricter limits for safe public exposure. This law, countersigned by the Ministers of the Interior, Defence, Environment Physical Planning & Public Works, Finance & Economy, Health & Social Solidarity, Development, Education & Religious Affairs, Justice and the State, reduces the ICNIRP limits by 30%. In other words, the limits enacted in Greece are 30% stricter than those contained in the international guidelines, which have been adopted by the European Union, and thus are considered to be among the strictest in Europe. Moreover, the law sets a minimum distance from schools, kindergartens, old people's homes, hospitals, within which the limits are further reduced by another 10%. In these cases the limits are just up to 60% of those recommended by the EU and ICNIRP.

Who ensures compliance with the limits in Greece

The Greek Atomic Energy Commission (GAEC) is the authority responsible for public and environmental protection from electromagnetic radiation[8]. Mobile telecommunications companies submit a radio emission study to GAEC for each base station they plan to install. The radio emission study should prove that the installation of the specific base station complies with the electromagnetic radiation emission limits laid down in national law. Once the study has been approved GAEC issues its opinion.

Moreover, GAEC, by itself or through authorised associates, is obliged by law to ensure compliance with the limits of safe public exposure to electromagnetic radiation on a random basis, without prior warning, for at least 20% of base stations located in residential areas within towns, yearly. Moreover, the law allows any person to submit an application to GAEC for measurements to be taken at any point of interest.

[7] For more information visit the EU website: http://ec.europa.eu/health/ph_determinants/environment/EMF/emf_en.htm
[8] For more information visit GAEC's website: www.eeae.gr and browse the booklet issued relating to mobile telephony

International standards, guidelines and monitoring of human daily exposure to electromagnetic fields

Systematic electromagnetic radiation monitoring projects in the environment

In addition to the Greek Atomic Energy Commission, as part of their research activities, Greek Universities, such as the National Technical University of Athens and the Aristotle University of Thessaloniki, have designed and are implementing electromagnetic radiation monitoring projects, like the HERMES Programme, which has been underway since November 2002.

The HERMES Program: 24-hour monitoring of electromagnetic radiation in the environment

The HERMES Program is a system for continuous monitoring and recording of electromagnetic radiation in the environment. It was designed and is being implemented by the National Technical University of Athens (NTUA) and the Aristotle University of Thessaloniki (AUTH). The two Universities are responsible for scientific oversight of the project: they check and certify technical equipment and ensure the transparency of measurements and their results. Vodafone has provided the HERMES Program's technical equipment.

The HERMES Program consists of area monitors, which the Universities have installed at various locations in towns, which measure the electromagnetic radiation emitted by all radio frequency sources such as television and radio stations and mobile antennas. Installation sites for monitors are chosen in cooperation with local authorities using specific criteria such as high population concentration and the special features of the site, such as schools, shopping centres and hospitals.

Periodically the monitors send all measurements from a 24hour period via the mobile network to the Universities' central computers (NTUA for southern Greece and AUTH for northern Greece). Specially-trained scientists at the Universities check the results and post them in diagram form on the Program website: www.hermes-program.gr

According to the Universities, the results of measurements taken from the start of the program in November 2002 to date, show that even the highest recorded values are tens of times lower than the strict limits applicable in Greece.

Research and studies on electromagnetic energy and health

The radio technology, which is also used by mobile phone networks, is not new. It is illustrative that the UK National Radiological Review Board's 1993 advice cited a paper from 1896. Of course, most health research referenced in major reviews has been completed over the last thirty years or so. Considering research results collected to date, there is no convincing scientific evidence that the weak radiofrequency signals from base stations and wireless networks cause adverse health effects.

International standards, guidelines and monitoring of human daily exposure to electromagnetic fields

International Organisations' Views & Research Projects

World Health Organisation (WHO), May 2006[9]

"Over the past 15 years, studies examining a potential relationship between RF transmitters and cancer have been published. These studies have not provided evidence that RF exposure from the transmitters increases the risk of cancer. Likewise, long-term animal studies have not established an increased risk of cancer from exposure to RF fields, even at levels that are much higher than produced by base stations and wireless networks".

"From all evidence accumulated so far, no adverse short- or long-term health effects have been shown to occur from the RF signals produced by base stations".

"Some people perceive risks from RF exposure as likely and even possibly severe. Several reasons for public fear include media announcements of new and unconfirmed scientific studies, leading to a feeling of uncertainty and a perception that there may be unknown or undiscovered hazards".

"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".

"While no health effects are expected from exposure to RF fields from base stations and wireless networks, research is still being promoted by WHO to determine whether there are any health consequences from the higher RF exposures from mobile phones".

WHO International EMF Project[10]

In 1996 WHO launched the International EMF Project to assess the scientific literature on health and environmental effects of exposure to static and time varying electric and magnetic fields in the frequency range 0-300 GHz. The project is expected to be completed by 2007.

International Commission on Non-Ionising Radiation Protection (ICNIRP), 2004

""We have undertaken a comprehensive review of epidemiologic studies about the effects of radiofrequency fields (RFs) on human health in order to summarize the current state of knowledge, explain the methodologic issues that are involved, and aid in the planning of future studies.

Results of these studies to date give no consistent or convincing evidence of a causal relation between RF exposure and any adverse health effect."

[9] World Health Organisation: "Electromagnetic fields and public health. Base stations and wireless technologies", Fact Sheet No 304, May 2006
[10] http://www.who.int/peh-emf/project/en

Tips on responsible use of mobile handsets

Undoubtedly, mobile communications provide many benefits, including convenience, flexibility and personal security. However, there are cases when the use of a mobile handset can be intrusive to others, just like any human activity which is not carried out in a responsible way[11].

Use of hands-free devices

Compliance with strict rules ensures that mobile handsets placed on the market operate properly and are safe. However, people who want to further reduce their exposure to RF fields can use hands-free devices[12].

In addition to being easy to use, these devices allow the handset to be kept away from the body. Independent tests confirm that these devices when used can reduce the quantity of RF energy absorbed by the body.

Moreover, when purchasing and using accessories such as hands-free devices, belt clips, etc. users should carefully read the mobile handset instructions to ensure that the accessories purchased are suitable, fit well and are used properly.

Use of protective devices on mobile handsets

Mobile networks are designed in such a way that the handset operates at the minimum power level required to provide the service, thus reducing user exposure to electromagnetic fields. Accessories such as these can in reality increase the operating power emitted, reduce battery duration and affect the quality of service provided to the user. Moreover, many of these accessories have not yet undergone independent studies or been subjected to government regulation[13] [14].

Interference from radio signals

What is interference from radio signals

Electronic equipment which has been manufactured in line with national and international standards is unlikely to be affected by interference.

In electromagnetic terminology, interference is a perturbation in normal operation of an electrical or electronic device due to an unwanted reaction from radio signals emitted from an external source. As far as mobile handsets are concerned, this may be perceived as a short sound burst on the radio or PC just a few seconds before the handset rings. However, these sounds do not cause interference to the operation of the radio, PC or handset.

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(11) For more information visit our website: www.vodafone.gr/The Company/ Corporate Responsibility
(12) Health Council of the Netherlands, January 2002
(13) Health Council of the Netherlands, January 2002
(14) UK's Independent Expert Group on Mobile Phones (IEGMP), May 2000

Tips on responsible use of mobile handsets

In 1989, the European Commission issued Directive 89/336/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. This Directive relates to all forms of electronic equipment in relation to interference caused and its immunity to external interference. Devices which comply with this Directive are unlikely to be subject to interference.

Hospitals & medical equipment

In most places within hospitals mobile handsets do not cause interference problems.

However, if a mobile handset is used very close to sensitive electronic devices it may cause some interference. For this reason some hospitals recommend for precautionary reasons that visitors turn off their mobile handsets to avoid any interference with sensitive medical equipment.

In addition, Vodafone recommends that you turn off your mobile handset where you have doubts about this use.

Cardiac pacemakers, implanted defibrillators & other implanted medical devices

It is possible that some mobile handsets and terminal equipment could cause interference with specific types of pacemakers or implanted medical devices if used very close to that device. Also seek medical advice for each specific type of device.

In all events, always seek medical advice for every type of transplant. Companies in the Vodafone Group faithfully follow the guidelines of the competent national health authorities and recommend a distance of at least 15 cm between implanted medical devices and the mobile handset and terminal equipment.

Use of mobile handsets & terminal equipment aboard aircraft

Aircrafts contain a vast array of complex electronic equipment and sophisticated communications systems.

That is why airlines restrict the use of mobile handsets during flight. Please respect the airlines' expertise and hence support adherence to their advice as to where and when mobile handsets, terminal equipment and other electronic devices may be used.

Note that some aircraft provide special mobile handsets for passenger use. These handsets have been specially designed to rule out any possibility of interference.

Use of mobile handsets & terminal equipment in petrol filling stations

In line with the advice of the UK Institute of Petroleum, when conducting a potentially hazardous activity such as filling a vehicle with fuel, distractions should be minimised and thus one should follow all applicable safety instructions/signs to switch off handsets.

Tips on responsible use of mobile handsets

There have been a number of reports of fires at petrol stations attributed to mobile handsets. However, the proceedings of the seminar organised by the Institute of Petroleum entitled 'Can mobile phone communications ignite petroleum vapour?' held on 11 March 2003 states:

"The seminar showed the findings of research undertaken to date demonstrating that although the majority of mobile phones are not specifically designed and constructed to prevent them igniting a flammable atmosphere (in accordance with standards for "protected equipment"), the risk they present as a source for ignition is negligible. The Institute of Petroleum is not aware of any fire incident that has been substantiated as having been caused by a mobile phone anywhere in the world."

Tips for parents

If our child has access to mobile services, below you will find some tips on what we can do as a parent to help our child use his/her mobile handset in a responsible way:

On content and services

- Discuss with our child what services they use on their mobile, for example they might download ringtones, wallpaper or games directly from their mobile by asking him/her which is his/her favorite
- Find out whether our child has access to the internet or e-mail through his/her mobile
- Make sure our child is aware of the cost of any service before using it
- Discuss with our child the use of chatrooms and inquire whether they are communicating with friends or whether they are making contact with strangers by SMS
- Stress out the importance of not responding to any SMS or MMS received from strangers
- Confirm that he/she understands how important it is never to give out personal information to strangers, and never to meet with people he/she does not know
- Encourage our child to tell us about anything received via mobile handset that makes him/her feel uncomfortable (such as inappropriate images or SPAM messages)
- If such SMS or MMS are constantly being received from unknown senders, we should inform the police. Make sure that we have stored the specific messages and/or the sender's number
- At regular intervals we should check the services he/she has access to and determine whether it is fitting to retain them or not
- Contact Vodafone's Greece Customer Services Department and ask for the deactivation of specific services, if we consider this appropriate.

Tips on responsible use of mobile handsets

About images

- Make sure that our child knows how to use a mobile handset with a built-in camera, and that in some places using a camera is prohibited
- Encourage our child to tell us, if someone else's use of a handset with a built-in camera, makes him/her feel uncomfortable
- Encourage responsible use i.e. stress the importance of not sending images that might upset or offend other people.

About the mobile handset

- Advise our child to be careful to whom he/she gives his/her mobile handset and never to give it to strangers
- When buying a handset, it is useful to note down the IMEI (key in *#06#) and keep that information in a safe place, since if the handset is stolen the IMEI code can be used to deactivate it
- In case of handset theft, we first report this to the police, then we visit a Vodafone Shop in order to take the necessary steps to deactivate the specific handset. The deactivation mechanism is designed by Vodafone, the International Telecommunications Union (ITU) and other Vodafone Group local operating companies.

About mobile handset usage and children's health

According to WHO, the ICNIRP guidelines for general public have been developed to offer protection to all population groups including children. In particular WHO states that: "Present scientific information does not indicate the need for any special precautions for use of mobile handsets. If individuals are concerned, they might choose to limit their own or their children's' RF exposure by limiting the length of calls, or using "hands-free" devices to keep mobile handsets away from the head and body."[15]

In 2004, the UK Health Protection Agency-Radiation Protection Division (formerly the NRPB), in its report 'Mobile Phones & Health' concluded: "The Board concludes that in the absence of new scientific evidence, the recommendations made in the Stewart Report on limiting the use of mobile phones by children remains appropriate as a precautionary measure. The Board also welcomes an initiative by the World Health Organisation in its EMF programme to focus attention on research relevant to the potential sensitivity of children."

In 2002, the Health Council of the Netherlands reached the same conclusion: "It is unlikely from a developmental point of view that major changes in brain sensitivity to electromagnetic fields still occur after the second year of life. The Committee therefore concludes that there is no reason to recommend that mobile telephone use by children should be limited as far as possible. "The Committee concludes that the scientific information concerning non-thermal effects discussed in this report provides no reason to apply the precautionary principle and lower the SAR limits for partial body exposure."

[15] World Health Organisation, Fact Sheet No.193, June 2000

Tips on responsible use of mobile handsets

Whilst no adverse effects from the use of mobile phones by children have been established, Vodafone's policy is that it does not market direct to children. In this context, it does not have any specific propositions for children and does not engage in marketing activities in schools.

However, it has been clearly established that mobile handsets can and do provide personal safety benefits particularly in relation to maintaining contact with parents and accessing help in emergency situations.

Parents may choose to balance the decision on access and the extent of usage of mobile handsets by children with the safety and security benefits they provide.

Mobile handsets and driving

Apart from being illegal under the Greek law, using a mobile handset while driving is truly dangerous because it distracts driver's attention and endangers both themselves and others.

Useful tips for drivers

- Never use a mobile handset while driving. Apart from being illegal, it distracts one's attention and is therefore dangerous
- If necessary, stop driving and park in a safe place to make or receive a call
- It is not always necessary to answer the phone when it rings. When driving, use the messaging service and call back later at a more convenient time
- Using a hands-free kit with voice-activated dialling and answering in the car is a good idea, but the driver's primary responsibility must always be the safe control of the vehicle
- Tell the caller that we are driving and that we will call him/her back later
- Avoid stressful calls. Discontinue any difficult conversations while driving and call back when the car is safely parked
- Ask our passengers to handle our calls while we are driving.

How to behave in public, in the street, at work

In public

Mobile handsets ringing in cinemas, theatres, museums, churches and other public places can be annoying to people around you.

Tips on responsible use of mobile handsets

Ideally:

- Turn off our mobile handset and listen to your voice messages later
- Set our mobile handset to silent and/or vibrating mode.

In the street

When we are in a crowded street or public place, we make sure that we keep our handset in a secure pocket or bag to minimise the possibility of theft.

Vodafone Greece in collaboration with the International Telecommunications Union (ITU) and other Vodafone Group local operating companies, has set up a mechanism to deactivate stolen mobile handsets using the IMEI code upon request from the subscriber and confirmed owner of the mobile handset.

In case of theft, we should report the incident to the police and then, visit a Vodafone shop to activate the locking mechanism for our mobile handset.

To avoid unpleasant incidents when using a mobile handset out and about, it is preferable to:

- Stay alert to what is going on around us
- Pay attention to the traffic
- Pay attention to other pedestrians
- Keep our mobile handset in a safe place.

At work

In order to avoid disrupting people around us while at work, it is a good idea to:

- Adjust the ringing volume of our handset
- Set our mobile handset to silent and/or vibrating mode.

When using handsets with built-in cameras

Some people -even entire cultures- are not particularly fond of having their photograph taken. When using a mobile handset with a built-in camera, we should remember that:

- In some venues the use of cameras is prohibited
- It is important to respect other people's rights
- It is important not to intrude on other people's privacy.

When our mobile handset becomes obsolete

Visit a Vodafone shop and place the mobile handset, battery or accessory in the recycling bin so that it can be sent for recycling by Vodafone Greece.

Learn more about mobile telecommunications

You can find more information about mobile telecommunications on our websites www.vodafone.com & www.vodafone.gr and at the following websites:

International organisations

- The World Health Organisation (WHO), The electromagnetic fields Project: www.who.int/peh-emf
- The International Commission on Non-Ionising Radiation Protection (ICNIRP): www.icnirp.de
- International Agency for Research on Cancer: www.iarc.fr
- European Unions' pages on Electromagnetic Fields and Public Health: http://ec.europa.eu/health/ph_determinants/environment/EMF/emf_en.htm

National bodies abroad

- UK Health Protection Agency - Radiation Protection Division (UK HPA-RPD – formerly NRPB): www.hpa.org.uk/radiation
- US Federal Communications Commission: http://wireless.fcc.gov/

Independent bodies abroad

- Independent Expert Group on Mobile Phones (Stewart Enquiry): www.iegmp.org.uk
- Institute of Electrical and Electronic Engineers: www.ieee.org
- Radio Communications Agency: www.ofcom.org.uk
- Health Council of the Netherlands electromagnetic fields Annual Update 2005: www.gr.nl/index.php?phpLang=en

Greek organisations

- National Telecommunications and Post Commission (EETT): www.eett.gr
- Greek Atomic Energy Commission: www.eeae.gr
- Ministry of Transport & Communications: www.yme.gr
- Ministry of Health & Welfare: www.mohaw.gr
- Ministry of the Environment, Physical Planning & Public Works: www.minenv.gr
- National Technical University of Athens & Aristotle University of Thessaloniki, HERMES Programme: www.hermes-program.gr

Learn more about mobile telecommunications

International commercial associations

- GSM World Information Pages: www.gsmworld.com
- Mobile Operators Association: www.mobilemastsinfo.com
- Mobile Manufacturers' Forum: www.mmfai.org

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