



## **Electromagnetic energy and human health**

This fact sheet has been developed for the Consumer Education Program by the Communications Commission of Kenya. It was compiled by studying material from various authoritative sources and adopting what is universally acceptable and relevant to the Kenyan situation. The purpose of this fact sheet is to provide Consumers with a good understanding of important issues and empower them when making decisions regarding Information and Communications Technology (ICT) products and services.

### **Introduction**

Mobile phone use in Kenya has increased over the past few years with the number of subscribers having reached 11.5 million by January 2008. Following the widespread use, Public interest has risen over possible health issues associated with exposure to Electro Magnetic Fields (EMF) emanating from mobile phones and their Base Transmitter Stations (BTS) commonly known as base stations.

This fact sheet has been prepared to address effects of electromagnetic radiation on human health. Some terms employed here are scientific in nature and should further clarification be required, contact us through the details provided at the end of this fact sheet.

### **What is radiofrequency electromagnetic energy (RF/EME)?**

Electromagnetic wave is an invisible wave travelling through space composed of both electric and magnetic fields. Light energy travels from the sun through the use of electromagnetic waves (E/M Waves). Man made sources of E/M Waves include:

- Mobile phones and Base Transmitter Stations
- Remote Controls
- Broadcast Towers
- Electric and electronic devices

Radiofrequency electromagnetic energy is the energy carried in an electromagnetic wave in the radio frequency range. It falls under a category of radiations referred to as non-ionising radiations (NIR), which means that it is not capable of knocking off electrons from molecules.

This is in contrast to ionising radiations (e.g. X-rays and Gamma Rays) which have the capability of causing ionisation or radioactivity. This process produces molecular changes that can lead to damage of biological tissue.

### **What health risks are associated with RF/EME?**

Risks associated with radiofrequency electromagnetic energy can either result to adverse health effects or simply to biological effects. An adverse health effect causes



## *Electromagnetic energy and human health*

detectable impairments of the health of the exposed individual or his or her offspring; a biological effect on the other hand may or may not cause an adverse health effect.

Prolonged exposure to RF/EME has been observed to cause immediate health effects such as high tissue temperature resulting from absorption of the energy, shocks and burn from touching conducting objects and even nerve and muscle stimulation. A key issue to consider when evaluating possible health effects is the intensity and frequency of the field. RF/EME routinely encountered by the public are far below the levels needed to produce significant body heating or increased body temperature or any other adverse health effect.

Studies conducted by international bodies of scientists have revealed that exposure to low levels of RF/EME result to some biological effects but these effects do not pose any human health hazards even under long term exposure.

### **Which is the regulating body for RF/EME?**

Ionising radiation effects are regulated in Kenya by the Radiation Protection Board (RPB), which does not have a similar mandate for regulating health effects of RF/EME. However, a Parliamentary bill is now underway to set up the necessary legal frame that will give RPB authority to regulate health effects of RF/EME as well.

### **What standards are in place to protect consumers from the known effects of RF/EME?**

The International Commission on Non Ionising Radiation Protection (ICNIRP) has developed guidelines that define basic restrictions and reference levels for occupational and general public protection. Kenya is also in the process of developing guidelines, including standards, for determining exposure levels and their enforcement.

The ICNIRP guidelines are based on a careful analysis of scientific literature materials (thermal and non- thermal effects) and offer protection from all identified hazards of RF energy with large safety margins. Both calculations and measured values show that RF signal levels in areas of public access are far below international guidelines typically by a factor of 100 or more.

### **What radiation levels are associated with mobile phones and what is SAR.**

Mobile phone handsets are low power RF transmitters emitting maximum power in the range of 0.2 to 0.6W. RF exposure to a user of a mobile phone is far much higher than to a person living near a cellular base station. However, the RF field strength and hence the RF exposure to the user falls off with distance from the handset and exposure to nearby people is very low. In addition, the RF exposure to the user by the mobile phone though higher than that from a base station, still falls below the international set guidelines.



## *Electromagnetic energy and human health*

Specific-energy Absorption Rate (SAR) is the amount of energy absorbed by a body tissue per unit mass as a result of exposure to RF/EME. Values are averaged over six minute periods during a 24 hour period. Values of SAR are greatly dependent on the intensity of the incident radiation or frequency and also the characteristics of the exposed body i.e. its size and internal and external geometry.

Maximum allowed International exposure levels defined by ICNIRP are

- For occupational exposure - 0.4W/Kg. These are adults who are exposed under known conditions and are trained to be aware of the potential risks and to take appropriate precautions
- For the general public - 0.08W/Kg. This figure takes into account the fact that their age and health status may be different from those of occupational workers.

### **What about base stations and other radio-communications transmitter installations.**

With the ever increasing number of mobile phone users in Kenya increasing, more and more base stations are being erected to support the network growth. Other wireless networks that allow high-speed internet access and services such as WLANs are also becoming increasingly common in offices and other public areas.

Recent survey by the World Health Organisation has shown that RF exposure from base stations range from 0.002% to 0.2% of the levels of international exposure guidelines depending on the proximity to the antenna and other surrounding environmental factors. This is low or comparable to RF exposure from radio or television broadcast transmitters.

The RF exposure from base stations and wireless networks are so low that the thermal or temperature increase are insignificant and result to no adverse health effect. Consequently, the strength of the RF field is greatest at the source and diminishes quickly with distance. Access near base station antennas is often restricted where RF signal may exceed international exposure limits. Recent surveys also show that RF exposure from base stations and other wireless transmitting devices in publicly accessible places (schools and hospitals) are thousand of times below international standards.

### **Are mobile phones safe?**

Scientific research done on this field including extrapolations of experiments done on animals and how far this relates to humans have not revealed any substantial evidence that using a mobile phone causes any adverse health effects. Although there have been some biological effects being reported at low levels of exposure, there has been no indication that such effects might constitute a human health hazards even under long-term exposure.



## *Electromagnetic energy and human health*

Every mobile phone has a specific absorption rate measure and the general consensus of scientific opinion is that, provided the mobile phones do not exceed the limits of recognised standards, there will be no harmful effects.

### **How do I know whether my mobile phone is safe?**

The information relating to the SAR of commonly available mobile phones can be obtained from the Mobile Manufacturers Forum (MMF) website at [www.mmfai.org](http://www.mmfai.org) (go to wireless devices and then click on the SAR information link) where you can verify the SAR value associated with your mobile phone handset. Once you get the SAR value of your phone, you can easily compare it with the values presented above to determine its safety.

The Mobile Manufacturers Forum is an international non-profit organization founded in 1998 by a number of leading manufacturers of mobile radio equipment, including Alcatel, Ericsson, Mitsubishi Electric, Motorola, Nokia, Panasonic, Philips, Sagem, Samsung, Siemens, Sony Ericsson and TCL & Alcatel Mobile Phones.

One of MMF's main objectives is to provide funds to key research projects concerning health and mobile phones, as well as to cooperate on standards and regulatory issues. It has also an important activity in social communication with the public. The funding effort of MMF follows and acts in coordination with the recommendations of the World Health Organization's Electromagnetic Fields Project.

### **What health hazards are posed to a consumer living near a mobile phone tower?**

No adverse health effect has been observed from persons living close to the base station. Some individuals have reported that they experience non-specific symptoms upon exposure from RF fields from base stations but EMF have not been proven to cause such symptoms.

Base station antennae are typically mounted on buildings or towers at a height of 15 to 50 metres above ground. These antennae emit a fan shaped beam when transmitting that is typically very narrow in the vertical direction but quite broad in the horizontal direction.

The signal strength of the mainbeam or the beam with the highest intensity reduces considerably with distance from the base station. This beam also touches the ground at a distance far enough to have reduced the signal strength to below the recommended radiation limits. Also because of the narrow vertical spread of the beam, the RF field intensity at the ground directly below the antenna is low.

Mobile phone towers are usually sited where the carrier considers they will best meet coverage requirements. If a site is placed further from its optimal location, it may need to operate at a higher power.



## **Are there any regulations that cover installations of radio communication equipments?**

The Communication Commission of Kenya, together with other stakeholders, including network operators, is in the process of setting code of practice for setting up Base Transmitter Stations. The code will address concerns raised by residents, despite the fact that scientific findings have shown that the radiation emitted is within safe limits. It will balance coverage objectives by the networks with the sensitivity of locating the base stations at appropriate locations.

For more information about RF/EME and human health, see the following:

1. World Health organisation Website at [www.who.int](http://www.who.int)
2. ICNIRP guidelines on Guidelines for limiting exposure to time varying electric, magnetic and electromagnetic fields (up to 300GHz) available at [www.icnirp.de/documents/emfgdl.pdf](http://www.icnirp.de/documents/emfgdl.pdf)
3. Fact sheet on Mobile Phones your; Health and Regulation of Radiofrequency Electromagnetic Energy. Available on the ACMA website at [www.acma.gov.au](http://www.acma.gov.au)
4. Federal Communications Commission: *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*. Bulletin No. 65, [www.fcc.gov/oet/rfsafety/](http://www.fcc.gov/oet/rfsafety/)

Or contact the Communication Commission of Kenya on the following address:

**THE DIRECTOR GENERAL,  
COMMUNICATIONS COMMISSION OF KENYA  
P.O. BOX 14448, NAIROBI, 00800**  
Email: [info@cck.go.ke](mailto:info@cck.go.ke)  
Website: [www.cck.go.ke](http://www.cck.go.ke)

Please note that this Fact Sheet is intended as a guide only and should not be relied on as legal advice or regarded as a substitute for legal advice in individual cases.

### **Acknowledgement**

This Fact Sheet was developed in partnership with Teknobyte (Kenya) for the Consumer Education Outreach Programme by the Communications Commission of Kenya.

### **Disclaimer**

All attempts have been made in order to ensure that the information contained in this publication is accurate. However, the document is intended as guide only. Readers should ensure that they verify on their own any information contained in this



## *Electromagnetic energy and human health*

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