

## MOBILE TELEPHONY AND HEALTH

Summary of the report drafted on behalf of the OPECST  
by Mr Alain GEST, deputy

*Mr Alain GEST's report follows on from a referral to the OPECST (Parliamentary Office for Scientific and Technological Assessment) by the National Assembly Bureau which, at its meeting of 21 June 2008, had asked it to study the possible effects on health of mobile telephony. The aim of this report has been in particular to update that which Messrs. Lorrain and Raoul, senators, had presented to the OPECST in 2002 on the same subject.*

*Mr Alain GEST recalls, first, the main scientific notions at play in the interactions between the radiations of mobile telephony, relay antennas and wireless technologies, on the one hand, and the human body, on the other hand. Then he presents the present state of scientific knowledge on the effects of these various pieces of equipment before analysing the public controversies to which they are giving rise.*

### THE COMPLEXITY OF A PLURIDISCIPLINARY TOPIC

Mobile telephony, relay antennas and wireless technologies emit electromagnetic waves.

An electromagnetic wave is produced by an emission source and is composed of an electric field and a magnetic field.

These two components are closely interrelated and form the electromagnetic field. The electromagnetic wave is – inter alia – characterised by its frequency. Expressed in Hertz (Hz), it represents the number of oscillations per second at a given point. It allows waves to be classified in the electromagnetic spectrum and determine their technological applications.

This way, mobile telephony, relay antennas and wireless technologies are classified in the category of **radiofrequencies**. These are spread between 30 KHz and 300 GHz. GSM frequencies are 900 MHz and 1800 MHz, the frequency of UMTS is 2200 MHz and that of WiFi is 2400 MHz.

Unlike ionising radiations – X rays and Gamma rays – radiofrequencies are **non-ionising radiations**, because their energy is not strong enough to ionise atoms.

The interactions between radiofrequencies and the human body are analysed using three parameters:

↪ *The distinction between biological effects and health effects:* this is based, in particular, on the idea that the biological effects of electromagnetic waves are not necessarily harmful to health, as illustrated by some therapeutic applications of electromagnetic waves.

↪ *The distinction between thermal and non thermal effects:* beyond a given frequency, electromagnetic waves cause tissues to heat. Non thermal effects are said to appear, according to some scientists, at electromagnetic field levels clearly lower than those which cause heating. The existence of such effects is however controversial.

↪ *The quantification of energy absorbed by the body:* expressed in Watts per Kilo (W/Kg), the specific absorption rate (SAR) is the indicator used to quantify the level of radiofrequencies emitted by a mobile phone when operating at maximum power. Pursuant to the present regulations, the average SAR value measured for six minutes must not exceed: 0.08 W/Kg for the whole body, 2 W/Kg for the local SAR measurement in the head or the trunk and 4 W/Kg for the local SAR in the limbs.

↪ The maximum SAR values for mobile phones sold in France comply with the limit value of 2W/Kg and the majority of the phones – according to available data – are even lower than 1 W/Kg.

The level of exposure to relay antennas is not expressed in SAR but in terms of the electric field (Volt per metre, V/m), of the magnetic field (Ampere per metre) and of the power density per square metre (Watt per square metre, W/m<sup>2</sup>).

The recommendation of the Council of the European Union of 12 July 1999 based on the recommendations of the ICNIRP (International Commission on Non-Ionizing Radiations Protection) proposed to fix the limit values of exposure to the electrical field at: 41 V/m for GSM 900; 58 V/m for GSM 1800 and 61 V/m for UMTS.

## THE STATE OF SCIENTIFIC KNOWLEDGE

Whereas doubt persists regarding the effects of the radiations of mobile phones, there is, on the contrary, almost total consensus on the harmlessness of relay antennas and the appreciation of electrohypersensitivity (EHS).

Regarding the effects of mobile phones, the **Interphone** epidemiological case-control study, which was started in 1999 and concerned 13 States(1), was aimed at analysing the links between the use of mobile phones and four brain tumours: gliomas, meningiomas, acoustic neurinomas, and parotid gland tumours.

The already published partial results reveal the **absence of any demonstrated effect of mobile phones if used for less than 10 years**. For longer periods, the rarity of available data does not allow uncertainties as to some tumours to be cleared up, even if the hypothesis of a low risk prevails.

Another factor of uncertainty concerns the scale of the divergences between the results of the Interphone study and those of the Swedish epidemiologist Hardell. In effect, the latter states higher risks than the Interphone study on several points.

Both the Interphone study – of which the meta-analysis could soon be published – and Hardell's work have been criticised for the **biases** they include.



As for *in vivo* and *in vitro* studies, a high proportion of them – whether they indicate effects or not – suffer from methodological shortcomings, most often regarding the assessment of the exposure, as underscored by the AFSSET (French agency for environmental and occupational health safety) collective experts' report on radiofrequencies, published on 15 October 2009.

Turning to studies on fields other than cancer, neither are they conclusive, owing in particular to their contradictory results.

**The almost total consensus on the harmlessness of relay antennas and the appreciation of EHS** is based on the confirmation, by a very large majority of studies, of the WHO's positions.

The WHO has indeed declared that '*Considering the very low exposure levels and research results collected to date, there is no convincing scientific evidence that base stations and wireless networks cause adverse health effects*'.

Moreover the power of antennas is low. This means that the level of exposure to a relay antenna is lower than the level of exposure to a mobile phone. According to the Austrian epidemiologist Kundi, if a person uses a GSM phone with an SAR of 0.04W/Kg for 10 minutes, it would be roughly equivalent to a fortnight's exposure to a base station at an exposure level of 1mW (milliwatt)/m<sup>2</sup>.

In the second place, the level of the electric field decreases inversely to the distance. Therefore, at a distance of ten metres from an antenna, the power is ten times lower than that emitted at a distance of one metre from an antenna.

Last, according to the study led by Professor Jean-François Viel, the exposure level is lesser under an antenna than in its axis at a distance of 280 metres, thanks to what is called the *umbrella effect*.

Regarding EHS, the WHO considered in 2004 that, while creating a handicap for those affected, there are not however any clear diagnostic criteria or any scientific basis allowing EHS symptoms to be related to exposure to electromagnetic fields.

Most studies subsequent to this position adopted by the WHO have confirmed the latter, regarding, on the one hand, the lack of effects of base stations on well-being and the cognitive functions and, on the other hand, the lack of any link between EHS and electromagnetic waves.

On the other hand, the TNO study carried out in the Netherlands in 2003 and the studies undertaken by the Austrian researchers Kundi and Hutter have stated effects resulting from exposure to relay antennas. However, the TNO has not been able to be replicated. Kundi and Hutter, for their part, feel that information given in epidemiological studies suggests that exposure to radiofrequency fields affects well-being and health. Nevertheless, they observe that this information is only slightly backed up by provocation studies on humans and by a body of inconclusive evidence supplied by animal and *in vivo* studies.

## SCIENTIFIC DATA CHALLENGED BY STRONG PUBLIC CONTROVERSIES

These controversies concern the validity of the exposure limit values, on the one hand, and risk perception and management, on the other hand.

- ↳ Unlike several associations which criticise exposure limit values for barely protecting public health, Mr Alain Gest emphasises the lowness of the exposure levels measured. For instance, the measures made during the 2006-2008 period by the accredited laboratories and which these transmitted to the ANFR (French national frequencies agency)

(1) Australia, Canada, Denmark, Finland, France, Germany, Israel, Italy, Japan, New Zealand, Norway, Sweden and the United Kingdom.

show that for 76% of the indoor measurements and for 83% of the outdoor measurements, the exposure level is lower than 1V/m. This situation results from better spectrum management and technological improvements that have allowed the power of exposure sources to be decreased. For instance, the maximum emission power of the UMTS mobile phone is 250 mW (milliwatts) as against 2 Watts for the GSM 900 and 1 Watt for the GSM 1800.

A second criticism concerning the inadequacy of the exposure limit values would justify their dropping to 0.6 V/m. However, such a proposal cannot find a scientific basis in the Bioinitiative report, which, owing to the many defects with which it is marred – especially the conflict of interests for which its coordinator can be criticised – cannot be considered as a genuinely scientific experts' report.

Moreover, this proposal does not take account of the potential dysfunctionings to which its implementation would lead: an increase in the exposure level of those living alongside relay antennas, greater communication difficulties – particularly due to the increase in the number of handovers (change of cell) – and transmission difficulties because a lowering of exposure limit values could prevent DTT from operating.

↳As for the second controversy regarding risk perception and management, scientific studies and national and international experts' reports do not mention any increase in the incidence of cancers resulting from the use of mobile phones.

Moreover, the tumours concerned are diseases developing over a long period – 30 years for meningiomas and an equivalent period for gliomas – and some studies do not rule out that these tumours could have developed before the extension of the use of mobile phones, which makes it difficult to establish a causal relationship.

Nor is it admissible to put forward the risks resulting from asbestos and tobacco since, unlike the mobile telephony risk, they are proven risks.

Referring to risk management, the difficulties preventing it from being optimal result from the debates on the application of the **precautionary principle**. Whereas the Environment Charter – now included in the constitutionality block – limits its application to the environmental field, this principle has been extended, in France and across the Community, to the health field. However, the government, basing itself on national and international scientific experts' reports, has restricted its field of application to mobile phones alone, given the continuing uncertainties as to the effects of their use for over 10 years. It has therefore recommended various measures in the Grenelle II Environment Bill, such as the ban on mobile phone advertising targeting children under twelve years old. Relay antennas are, on the other hand, excluded from the application of the precautionary principle, since almost all scientific studies agree on their harmlessness.

Disputing this position, most associations speak – on the contrary – in favour of the extension of the precautionary principle to all sources of exposure, the multiplication of which would, to their mind, worsen 'electromagnetic pollution'.



Exploded of a mobile phone - Source : CNRS

Indeed, associations feel that no proof of their harmlessness has been given, an argument which very many scientists however dispute on the grounds that while epidemiology can highlight a risk, it cannot prove the absence of a risk.

Nor has putting the ALARA (As low as reasonably achievable) principle forward contributed to clarifying the debate. This principle has admittedly been considered as a forerunner to the precautionary principle owing to its requirements that are close to the precautionary approach. But, at the outset, it was applied to the radioprotection field where the risk is considered certain and proven, which is not the case for radiofrequencies.

The absence of harmonisation of jurisprudential interpretations between administrative and judicial jurisdictions also complicates the debate. Indeed, the former take account of the state of scientific knowledge and do not allow mayors to put forward the precautionary principle to ban the installation of relay antennas or order their dismantling, unlike some judicial jurisdictions. The latter have a more fluctuating approach pending a judgement by the Court of Cassation which has not yet had the opportunity to give a ruling.

In any case the few decisions by judicial jurisdictions ordering the dismantling of relay antennas and the central place these decisions have granted to the Bioinitiative report, give them an exceptional nature. In none of the countries whose mobile telephony experiences are related in the report have the courts taken such decisions.

## CONCLUSIONS AND RECOMMANDATIONS

### I - PURSUING THE RESEARCH AND INNOVATION EFFORT

#### A - The research effort

##### 1. Increasing scientific knowledge

###### a) *In the field of epidemiology*

- Effects of the long term use of mobile phones ;
- Risk of brain tumours among children ;
- Health effects of wireless technologies on children and adults ;
- Effects on workers of exposure to radiofrequencies.

###### b) *In the field of electrohypersensitivity (EHS)*

Research on the causes of problems encountered by persons stating they are electrohypersensitive and payment of subsidies to associations representing these persons.

##### 2. Provide for means on a par with the stakes

- Renew, beyond 2009, the mandate of the Fondation Santé et Radiofréquences (Health and Radiofrequencies Foundation) to allow the roll-out of an ad hoc structure and an adapted means of funding ;
- Lay down that the future structure shall take account of the research conducted by private laboratories and even, where applicable, shall take part in it ;
- Grant the future structure a budgetary allowance funded by a tax of 0.50 € on each mobile phone sold, part being allocated to the funding of exposure measurements.

#### B- Exploiting sources of innovation

- Encourage manufacturers to produce a mobile phone with a retractable earpiece, patents having already been filed for such products ;
- Exploit already existing technologies that allow WiFi radiations to be focused on the sole objects we need, so as to limit radiations.

### II - ROLLING OUT EFFECTIVE GOVERNANCE

#### A- Adopting a rational approach to risks

1. Reaffirm the distinction between exposure to a mobile phone and exposure to relay antennas. This is the prerequisite for a good risk management policy applying the precautionary principle to mobile phones alone and employing a principle of paying attention to the concerns of those living alongside relay antennas.

2. Setting in place a strong communication policy on risks.

###### a) *Facilitating the access of citizens to transparent and full information, especially by means of:*

- Inscription of the specific absorption rate (SAR) on mobile phones ;
- Improvement of the CARTORADIO site ;
- An assurance of being able to rapidly have a measurement of the exposure level carried out, free of charge

###### b) *Encourage scientists to take part in debates with civil society.*

#### B- Strengthening concerted action

- Subject relay antenna installation applications to the building licence procedure ;
- Strengthen the prerogatives of mayors ;
  - Allow them to have measurements of exposure levels carried out before and after the filing of an application to install a relay antenna ;
  - Lay down that they can carry out an annual measurements campaign. A follow-up committee comprising local elected representatives and citizens drawn by lot among volunteers shall be set up for this purpose at the communal or intercommunal level.

The report is available at the following address:

<http://www.assemblee-nationale.fr/13/pdf/rap-off/i2005-tl.pdf> and <http://www.assemblee-nationale.fr/13/pdf/rap-off/i2005-tll.pdf>