Press Kit

Update of the “Radiofrequencies and health” expert appraisal

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Press liaison: Elena Séité – +33 (0)1 49 77 27 80 – elena.seite@anses.fr
www.anses.fr

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Press Release

Faced with the rapid development of wireless technologies, ANSES issues recommendations for limiting exposure to radiofrequencies, especially for the most vulnerable populations

ANSES today publishes the results of its assessment of the risks related to exposure to radiofrequencies based on a review of the international scientific literature, thereby updating the report on the state of knowledge published in 2009. This update has not brought to light any proven health effect and does not result in any proposed new maximum exposure limits for the population. However, limited levels of evidence do point to different biological effects in humans or animals. In addition, some publications suggest a possible increased risk of brain tumour, over the long term, for heavy users of mobile phones. Given this information, and against a background of rapid development of technologies and practices, ANSES recommends limiting the population's exposure to radiofrequencies – in particular from mobile phones – especially for children and intensive users, and controlling the overall exposure that results from relay antennas. It will also be further developing its work on electro-sensitive individuals, specifically by examining all the available French and international data on this topic that merits closer attention.

Radiofrequencies have been the subject of considerable health, environmental and societal concerns in France for several years. On the one hand, the development of new wireless communication technologies has been accompanied by a permanent change in the radio signals used and the nature of the communication terminals. On the other hand, the increase in the number of users and types of use is leading to rapid changes and a potential increase in exposure to radiofrequencies.

In this context, in 2011 ANSES set up a specific scheme that sought to answer the many questions concerning health and safety: the creation of a permanent expert group on "Radiofrequencies and Health" and the establishment of a dialogue committee involving the main stakeholders. In this framework, ANSES issued an internal request in order to update its 2009 situation report.

Today, after two years of work, ANSES is publishing the results of its assessment of the risks related to exposure to radiofrequencies. It drew on the widest possible review of the international studies published since 2009. The issue of hypersensitivity to electromagnetic waves will in turn be addressed in a specific expert appraisal due to begin at the end of this year.

All the potential health effects of radiofrequencies, carcinogenic or not, were studied and their levels of evidence classified on the basis of an assessment method inspired by that of the WHO's International Agency for Research on Cancer (IARC).

The findings of the risk assessment have not brought to light any proven health effects. Certain publications nonetheless mention a possible increase in the risk of cerebral tumours, in the long term, for heavy mobile phone users. The findings of this expert appraisal are therefore consistent with the classification of radiofrequencies proposed by the World Health Organization's International Agency for Research on Cancer (IARC) as "possibly carcinogenic" for heavy users of mobile phones. In addition, the expert appraisal nevertheless shows, with limited levels of evidence, different biological effects in humans or animals, some of which had already been reported in 2009: these can affect sleep, male fertility or cognitive performance.

Biological effects corresponding to generally reversible changes in the inner functioning of the body can thus be observed, as is also found in the case of exposure to different *stimuli* of everyday life. However, the Agency's experts were unable to establish any causal link between the biological effects described in cell models, animals or humans, and any possible resulting health effects.

Given this evidence, proposing new exposure limits for the general population on health grounds does not seem justified. However, the Agency notes that the risk assessment for various potential effects cannot yet be conducted due to the lack of available data in humans or animals, and that the potential impact of the communication protocols used (2G, 3G, 4G) seems to be poorly documented.

The Agency also highlights the massive growth in applications of radiofrequencies in indoor or outdoor environments, leading to an increase in population exposure.

Moreover, although recent work conducted at national level shows low overall exposure in relation to the exposure limits currently used for the geographical areas that were investigated, it nevertheless demonstrates the existence of areas where exposure is significantly higher and could be reduced by technical means.

In this context, although mobile phones are the main source of exposure for users, environmental exposure in the general population, and its variations over time, needs to be better documented.

Therefore, to limit exposure to radiofrequencies, especially in the most vulnerable population groups, the Agency recommends:

- for intensive adult mobile phone users (in talk mode): use of hands-free kits and more generally, for all users, favouring the purchase of phones with the lowest SAR[1] values;
- reducing the exposure of children by encouraging only moderate use of mobile phones;
- continuing to improve characterisation of population exposure in outdoor and indoor environments through the use of measurement campaigns;
- that the development of new mobile phone network infrastructures be subject to prior studies concerning the characterisation of exposures, and an in-depth study be conducted of the consequences of possibly multiplying the number of relay antennas in order to reduce levels of environmental exposure;
- documenting the conditions pertaining at those existing installations causing the highest exposure of the public and investigating in what measure these exposures can be reduced by technical means.
- that all common devices emitting electromagnetic fields intended for use near the body (DECT telephones, tablet computers, baby monitors, etc.) display the maximum level of exposure generated (SAR, for example), as is already the case for mobile phones.

Finally, in order to resolve the various uncertainties it identified when conducting this work, and in addition to the research projects already undertaken under the National Plan for Research on Environmental and Occupational Health, the Agency is also making a series of research recommendations.

Press liaison: Elena Séité – +33 (0)1 49 77 27 80 - elena.seite@anses.fr. - **www.anses.fr** All ANSES's press releases and kits. Find us on Twitter too: @Anses_fr

[1] Specific Absorption Rate

1. Context and objectives of the work carried out by ANSES

Wireless technology using radiofrequencies is a fast-growing sector with many novel applications constantly being developed, and this is reflected by the new uses for mobile telephony. These new technologies are likely to increase exposure of the general population via new fixed transmitters, and exposure of users via new mobile devices or new types of user behaviour. There are two facets to these technological changes. On the one hand, the public welcomes these new products, but on the other, people are apprehensive about the electromagnetic waves needed to make these devices function. These issues cause even greater concern when exposure is involuntary, as in the case of relay antennas. As a result, radiofrequencies have aroused health and environmental concern for several years, both in France and abroad.

At the request of the authorities, the Agency[(2)] published opinions and collective expert reports in 2003, 2005 and 2009. In its most recent opinion concerning radiofrequencies, dated 14 October 2009, the Agency highlighted the need to implement continuous surveillance of any new scientific work produced in this constantly changing field.

It is in this context that ANSES issued an internal request on this topic on 14 June 2011, and set up a comprehensive expert appraisal system to pursue its scientific monitoring of these technologies and assessment of the possible risks, involving the creation of:

- a permanent working group on “Radiofrequencies and Health” tasked with regularly updating the collective expertise appraisal on the health effects potentially related to exposure to radiofrequencies; answering questions raised by the development of new technologies using radiofrequencies and responding to requests for the Agency to carry out collective expert appraisals on this subject; making annual recommendations for avenues of research; and informing stakeholders of the new results of research and thus contributing to the public debate on the topic of radiofrequencies.
- A “Radiofrequencies and Health” Dialogue Committee, a forum for discussion with the stakeholders, established in 2011, and whose mission is to inform the Agency on the expectations of society with regard to risk assessment and research.
- a call for research projects specifically on the theme of “Radiofrequencies and Health” within the National Plan for Research on Environmental and Occupational Health (PNR-EST), coordinated by the Agency.

Other scientific articles on the effects of radiofrequencies or research into likely mechanisms of action have continued to be published since 2009, despite the cessation of major national research programmes, especially at European level. France is an exception in this context, however, having maintained a system for financing research on the health effects of

[2] AFSSET (the French Agency for Environmental and Occupational Health Safety) and AFSSA (the French Food Safety Agency) merged on 1 July 2010 to form the French Agency for Food, Environmental and Occupational Health & Safety (ANSES).

radiofrequencies, as recommended by the Agency's Opinion of 2009 and formalised in the Finance Act of 2011.

Two major events occurred in 2010 and 2011, with the publication of the combined results of the Interphone epidemiological study on the link between exposure to radiofrequencies and the onset of cerebral tumours (Interphone Study Group, 2010) and the classification of radiofrequencies as "possibly carcinogenic to humans" (2B) by the International Agency for Research on Cancer (IARC), on 31 May 2011.

Lastly, the experiments carried out in France by the COMOP Operational Committee and subsequently by the COPIC Steering Committee[3], set up to study the feasibility of lowering exposure to electromagnetic waves emitted by relay antennas while maintaining coverage and service quality, have recently produced data enabling the characterisation of population exposure (Report of 31 July 2013, published after completion of the ANSES Working Group's expert appraisal).

For the expert appraisal published today, and as for the previous report (AFSSET, 2009), the ANSES Working Group decided to focus on the health effects potentially related to the wavelengths used by the new or developing technologies, i.e. those between 8.3 kHz and 6 GHz (TV, radio, telecommunications, etc.). Particular attention was paid to seeking out evidence with which to identify their impact on the exposure of the general public. However, as most of the articles published concern exposure to the GSM or UMTS signals characteristic of mobile telephony, the report deals principally with mobile telephony.

Finally, the Working Group sought to study the potential health effects of radiofrequencies as thoroughly as possible: both non-carcinogenic effects (on the brain, foetal development and sleep, for example) and carcinogenic effects.

There are many issues concerning the risks related to radiofrequencies which justify the work currently in progress, concerning the exposure of children and other population groups, such as workers, and also the phenomenon of hypersensitivity to electromagnetic waves.

Considering the number of recent publications and the expected publication of results from studies currently underway, and the need to grant particular attention to the issue of hypersensitivity to electromagnetic waves which has been widely discussed, ANSES decided that the subject would be dealt with in a special report from the expert Working Group on Radiofrequencies and health, on which work will start before the end of this year.

[3] The COPIC was formed from the operational committee (COMOP) on models and experiments concerning exposure and attempting to reach a concerted approach to issues raised by mobile telephony. It was set up in 2009 as a result of the undertakings made at the "*Grenelle des Ondes*" consultation, following the roundtable discussions on "Radiofrequencies, health and the environment" held between 23 April and 25 May.

2. How did ANSES proceed?

In order to update its scientific knowledge of the risks related to the effects of radiofrequencies on health, ANSES followed the usual procedures for such cases: characterisation of the hazards, determination of exposures and finally assessment of the risk. However, in each of these phases, the Agency applied innovative processes enabling it to make extremely detailed risk assessments and to calculate the level of evidence for each potential radiofrequency-related health effect studied.

The expert assessment fell within the competence of the Expert Committee (CES) on Assessment of the risks related to physical agents, new technologies and development areas and was undertaken by a dedicated working group, the WG on Radiofrequencies and health.

This WG was set up following a public call for applications from experts issued on 1 December 2010. The experts were recruited on the strength of their expertise in the fields of metrology and dosimetry of electromagnetic fields, epidemiology, medicine, biology and the human and social sciences. Sixteen independent experts were appointed for a period of three years.

The working group was created on 30 June 2011. It met for a total of 13 plenary sessions with 23 meetings by its subgroups. During these meetings, nine hearings were held to obtain contributions from stakeholders and other scientists. In addition to these hearings, the Working Group also requested written contributions from the French Telecommunications Federation on more specific issues. The “Radiofrequencies and health” Dialogue Committee[4] set up by the Agency was kept regularly informed of the progress of the expert appraisal.

Review of the scientific literature

The expert appraisal was updated over the period from 1 April 2009 (the end of the review period for the bibliography taken into account for the previous report) to 31 December 2012 (end date for the bibliographic review).

Scientific publications (original articles, reports, grey literature, etc.) were identified with the help of several search engines (PubMed, Scopus, etc.), as well as the bibliography lists from other reports and those supplied by certain members of the “Radiofrequencies and health” Dialogue Committee.

The experts of the WG shared their complementary skills to produce a collective analysis of the selected studies on the effects of radiofrequencies on human health (epidemiological and clinical studies), including both biological models (*in vivo* and *in vitro* studies), and the effects observed in society.

In each case, it was the quality of each study, i.e. the relevance and thoroughness of the study protocol and the analysis of the results by the authors (especially as regards

[4] ANSES’s "Radiofrequencies and health" Dialogue Committee is a forum for discussion, reflection and information on scientific issues related to the potential health effects of radiofrequencies and associated risk assessments. It was set up in June 2011 in the light of the experience acquired by the "Health and Radiofrequencies" Foundation. It includes representatives of associations, labour unions, mobile phone operators and broadcasters, institutions, local authorities and elected officials, with a view to achieving a balance between interest groups.

statistical analysis), that determined the degree to which it would be taken into account when assessing the level of evidence of the effect studied, and not the result itself.

Assessing the level of evidence

For the present expert assessment, the experts focused on the construction of an appropriate method for assessing the level of evidence for each potential health effect of the radiofrequencies studied.

This was achieved by taking into account both work published since April 2009 and the conclusions of the previous report (AFSSET, 2009), so that the assessment process became an integral part of the accumulation of knowledge.

The degree to which the data concerning humans and laboratory animals provided an indication of the effect studied was assessed by means of terminology heavily influenced by that used to study an agent's carcinogenicity in IARC Monographs.

Data indicating the presence of the effect studied for laboratory animals were classified as being: "sufficient", "limited" or "inadequate", or alternatively "indicates a lack of effect".

Data relative to the effect studied taken from epidemiological and clinical studies in humans were classified by the degree of indication of the existence of an effect in one of the following categories: "sufficient", "limited" or "inadequate", or alternatively "supports a lack of effect".

In total, all the evidence for assessment drawn from the findings of studies on animals and from epidemiological and clinical studies, as well as other relevant information, were examined from every aspect, in order to arrive at an overall assessment for humans of the impact of the relevant radiofrequencies on the effect studied. Each effect studied was placed in one of the following categories (based on the carcinogenicity classification for agents used in the Monographs of the IARC):

- Proven effect on humans
- Probable effect on humans
- Possible effect on humans
- Effect for which the level of evidence is inadequate to conclude that there is a real effect on humans
- Probably no effect on humans

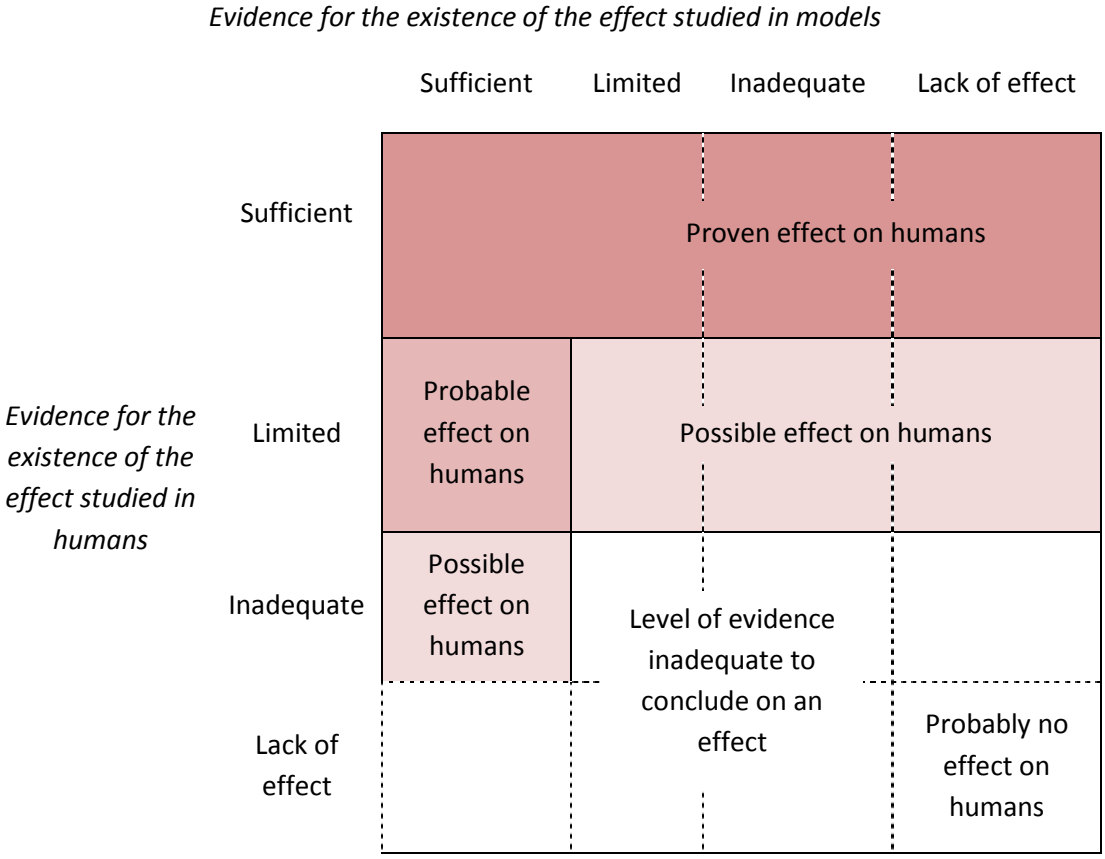


Figure 1: Assessment of the level of evidence for a given effect depending on the evidence in favour of the existence of an effect on humans and animals

3. What are the principal sources of exposure to radio emissions?

Radiofrequencies fall within a particular waveband of non-ionising electromagnetic fields. They cover the frequencies between 8.3 kHz and 300 GHz. They are used for radio and television broadcasting, but also for the burgeoning new communication technologies such as mobile telephony (2G, 3G and now 4G), Wi-Fi, Bluetooth and RFID[5] applications. The development of these new technologies is likely to increase the exposure of the general population (via new fixed transmitters, or relay antennas) and users (via new mobile devices or by creating new behaviour patterns).

Calculating exposure levels and regulatory limit values

The legal framework for exposure levels is designed to limit the absorption of electromagnetic energy, which can raise temperatures in the tissues of the human body. This framework, created by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), involves two types of limit values:

- Concerning "environmental" exposure, from distant sources (mostly television, radio and mobile telephony antennas, Wi-Fi hotspots, etc.), exposure is measured in terms of the intensity of the electric and/or magnetic field induced by the different sources at a given spot. It depends on the power of the surrounding antennas (in Watts) and the distance involved. The value of the electric field is expressed in volts per metre (V/m). The regulations stipulate that the intensity of the electric field resulting from the installation of antennas should not exceed a reference level, established between 28 and 61 V/m, depending on the technologies (FM radio, TV, 2G, 3G or 4G). Measurements taken in France by the COMOP Operational Committee and later by the COPIC Steering Committee show that environmental exposure is well below these limits, in most cases falling between 0.3 and 2 V/m.

- Concerning the exposure of mobile phone users, measurements of exposure must take account of the very close proximity of the emitting device to a part of the human body, with highly localised effects. Exposure is measured in terms of the Specific Absorption Rate (SAR), which reflects the quantity of energy that human tissues can absorb when close to the device. It is measured in Watts per kilogramme of human tissue (W/kg).

The SAR must be displayed systematically on every mobile phone so that consumers can check it before purchase. It must not exceed 2W/kg for the head.

The impact of constantly developing technologies

[5] Radio-frequency Identification

A study published by Ericsson in June 2012 entitled “Traffic and Market Report” forecasts that Internet traffic on mobile phone networks will increase by a factor of 15 worldwide between 2011 and 2017. It states that “voice” traffic is expected to account for less than 5% of total traffic on mobile networks in 2017.

After the deployment of 2G, followed by 3G, 4G is now arriving on the market with the allocation of wavebands around 800 MHz and 2.6 GHz. Other wavebands will be allocated. 4G requires the implementation of a new technology, known as “LTE”, which is an upgrade of the UMTS standard used for 3G.
With improved signal processing, 4G is capable of considerably increasing the transmitted data rate compared to 3G. The appearance of 4G, in addition to 2G and 3G, will lead to an increase in exposure. However, it is difficult to predict with any accuracy the impact of these developments on the exposure of the general or working populations.

4. Exposure measurement data (terminals, the indoor and outdoor environment)

Sources of radiofrequencies

The following table shows the typical emitted powers of certain sources of radiofrequency transmissions with the corresponding exposure.

Sources near the body			Distant sources (in the environment)		
Application	**Power emitted**	**Exposure (SAR)**	**Application**	**Power emitted**	**Exposure (electromagnetic field)**
Mobile telephone	2 W max	< 2 W/kg	Radar	Up to several million Watts	Extremely high at 5 m
Walkie-Talkie	0.5 W max	<< 2 W/kg	AM radio transmitter	1,000,000 W	Extremely high at 5 m
DECT cordless phone	0.25 W max	< 0.1 W/kg	Television transmitter	Up to 780,000 W	Very high at 5 m
RFID	Between 0.01 W and 2 W max	<< 2 W/kg	FM radio transmitter	Up to 300,000 W	Very high at 5 m
Wi-Fi	0.1 W max	< 0.2 W/kg	Mobile phone antenna(1)	Up to 40 W(2)	Low (at 5 m: E < ≈ 10 V/m)
Baby monitor	Typically 0.01 W(4)	< 0.1 W/kg	WiMax	Up to 30 W(3)	Low (at 5 m: E < ≈ 10 V/m)
Bluetooth	Between 0.001 and 0.025 W max	< 0.01 W/kg	Wi-Fi	Up to 1 W	Very low (at 5 m: E < 0.1 V/m)

(1) The power emitted can be higher in LTE.

(2) Up to 2 kW (63 dBm) if antenna gain is taken into account.

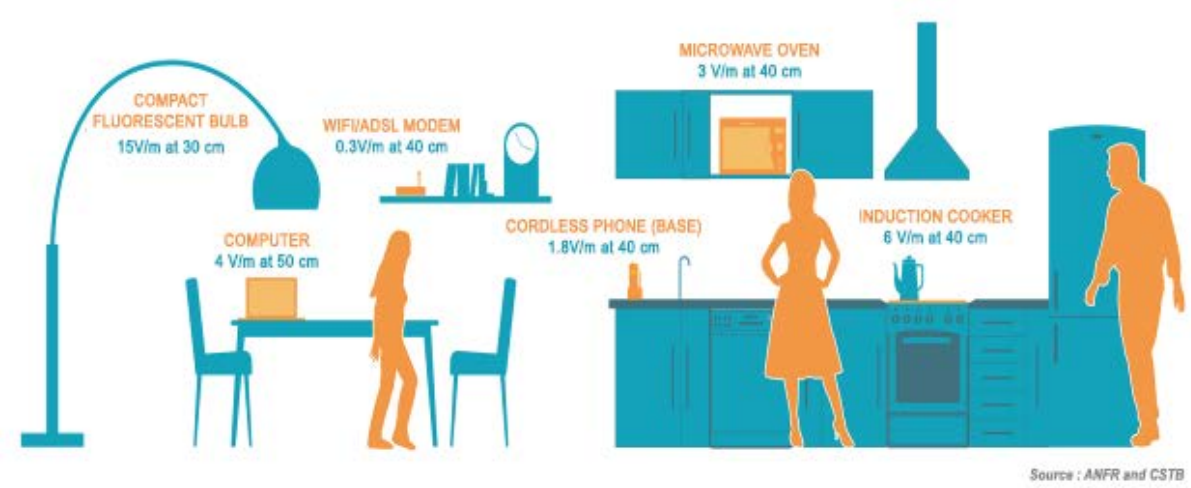
(3) Without taking antenna gain into account.

(4) Can be higher depending on the new technologies used.

Indoor sources

The following diagram gives examples of exposure to radiofrequencies inside the home. The values given correspond to measurements made on everyday devices and in realistic use configurations.

The diagram shows sources from radiocommunication systems such as Wi-Fi (computer and ADSL modem) and cordless phones (DECT), as well as involuntary sources such as compact fluorescent lamps and induction cookers, which emit at the beginning of the radiofrequency spectrum (from a few tens of kiloHertz to a few tens of megaHertz) and microwave ovens which emit at 2.4 GHz.



SAR of mobile phones and tablet computers

Results of SAR measurements for different smartphones

SAR value in W/Kg	0.20 ≤ SAR < 0.50	0.50 ≤ SAR < 0.80	0.80 ≤ SAR
Smartphones using the Android operating system	11 devices	8 devices	9 devices
Smartphones using the iOS operating system (Apple)	-	-	5 devices
Smartphones using the BlackBerry *operating system*	-	-	10 devices
Smartphones using the Windows Phone operating system	3 devices	4 devices	4 devices

Source: http://www.experip.com

Results of SAR measurements for different tablet computers

SAR value in W/Kg	0.20 ≤ SAR < 0.50	0.50 ≤ SAR < 0.80	0.80 ≤ SAR
Tablet	1 tablet	1 tablet	8 tablets

Source: http://www.experip.com

5. ANSES's recommendations

Concerning studies and research

The Agency highlights the specific funding of the study of the potential effects of radiofrequencies on health in France through the National Plan for Research on Environmental and Occupational Health (PNR-EST) coordinated by ANSES. A special call for research projects makes it possible to fund structural projects on an annual basis in the context of expert assessments supported by ANSES's Working Group on Radiofrequencies and health

In addition to the projects underway within this framework, ANSES issues certain complementary research recommendations.

Thus, considering the methodological shortcomings in the characterisation of exposure or in the experimental protocols observed in many of the studies, the Agency recommends initiating a debate with a view to drawing up methodology guidelines for carrying out experimental studies on the potential effects of radiofrequencies, based on the experience of the many reports of expert appraisals published in different countries.

Considering the constant progress in wireless communications technologies, the Agency recommends stepping up studies of the effects of electromagnetic fields on living things in those wavebands that have not been extensively studied to date, especially those above 6 GHz, potentially associated with emerging uses concerning "smart objects".

Considering the continuing uncertainties in the results of research into the possible long-term health effects of radiofrequencies, the Agency adopts the recommendations of the Working Group to:

- facilitate the access of research teams to data held by mobile telephony operators, to improve the characterisation of the exposure of humans and, more generally, to be able to quantify the actual exposure of populations as precisely as possible in epidemiological studies;
- undertake new studies and continue those currently underway on the possible long-term effects of exposure to radiofrequencies, especially regarding mobile telephony;
- encourage large-scale cohort studies in the general population, international if possible, collecting validated data on exposure in order to study the possible long-term effects of radiofrequencies;
- monitor trends in pathologies over time and investigate aggregated spatial and temporal data using data from validated registers (such as cancer registers).

Furthermore, the Agency recommends reinforcing identification of population groups potentially more susceptible to electromagnetic fields generated by radiofrequencies (children, pregnant women, etc.), as well as extending our knowledge of the effects of exposure on these groups.

Considering the substantial disparity between the results of research carried out to explore the biological and health effects of radiofrequencies (regarding experimental models, systems and levels of exposure, types of signals used, etc.), the Agency recommends encouraging a consistent approach for studies to be carried out, via international discussions for defining major avenues for coordinated research, taking into account confirmed knowledge, current uncertainties and remaining gaps in knowledge.

Regarding the characterisation of exposures

Considering the complex and rapidly changing nature of the electromagnetic environment, and also the substantial work carried out recently by the COPIC, the Agency recommends:

- continuing to improve the characterisation of public exposure to various sources of surrounding electromagnetic fields, especially for the purpose of monitoring any changes over time, in the indoor and outdoor environment;
- undertaking work comparing a spatial description of the levels of electromagnetic fields with the geographical distribution of the population, with a view to providing an initial characterisation of residential exposure.

Regarding information and control

Considering that:

- Decree No. 2002-775 of 3 May 2002 on "exposure limits for the general public to electromagnetic fields emitted by equipment used in telecommunication networks or by radioelectric facilities" does not concern radiation emitted by other sources of electromagnetic fields to which the general public may be exposed;
- the Decree is based in particular on Recommendation 1999/519/EC[6] by the Council of the European Union of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz);
- the aforementioned Recommendation 1999/519/EC by the Council of the European Union specifies that:
    - (7) Actions on limiting the exposure of the general public to electromagnetic fields should be balanced with the other health, safety and security benefits that devices emitting electromagnetic fields bring to the quality of life, in such areas as telecommunications, energy and public security;
    - (11) Such basic restrictions and reference levels should apply to all radiations emitted by electromagnetic fields with the exception of optical radiation and ionising radiation […];
    - (19) The Member States should take note of progress made in scientific knowledge and technology with respect to non-ionising radiation protection, taking into account the aspect of precaution, and should provide for regular scrutiny and review with an assessment being made at regular intervals in the light of guidance issued by competent international organisations, such as the International Commission on Non-Ionising Radiation Protection;
- regulatory obligations for displaying the SAR (Decree No. 2010-1207 dated 12 October 2010) only concern mobile telephones intended for use in networks open to the public;

ANSES recommends, without prejudice to the need to respect reference values in force concerning electromagnetic compatibility, that:

- current regulations concerning exposure of the general population to electromagnetic fields emitted by equipment used in telecommunications networks or by radioelectric installations (Decree No. 2002-775 of 3 May 2002) be extended to cover other artificial sources of emissions of radiofrequency radiation for which compliance with exposure limit values cannot be established *a priori*;

[6] 1999/519/EC: Council Recommendation, of 12 July 1999, on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz), *Official Journal No. L 199 of 30/07/1999 p. 0059 – 0070*.

- devices emitting electromagnetic fields intended for use near the body (DECT telephones, tablet computers, baby monitors, etc.) display the maximum level of exposure generated (SAR, for example), as is already the case for mobile phones.

Regarding control of exposure levels

Considering the current or future deployment of new mobile communication technologies (LTE, 4G, etc.), in parallel with the existing services, and the uncertainties concerning the long-term effects of exposure to radiofrequencies, the Agency emphasises the need for these technological developments to go hand in hand with control of personal exposure (whether exposure is environmental or related to terminals).

ANSES recommends:

- reducing the exposure of children by encouraging only moderate use of mobile phones, ideally with hands-free kits and mobile terminals with the lowest SAR values;
- carrying out an in-depth study of the consequences of possibly multiplying the number of relay antennas in order to reduce levels of personal environmental exposure to radiofrequencies emitted by mobile phones;
- that the development of new network infrastructures be subject to prior studies concerning the characterisation of exposures, taking into account the accumulation of existing levels with those that would be generated by new installations, in order to favour concerted discussion regarding new installations or modifications of transmitters;
- documenting the conditions pertaining at those existing installations causing the highest exposure of the public and investigating in what measure these exposures can be reduced by technical means.

6. Electromagnetic fields: a comprehensive scheme for expert appraisal and research at ANSES

Bluetooth, Wi-Fi, RFID, mobile telephony, etc. are all examples of radiofrequency technologies that have seen strong growth in the past 20 years. As a result, the sources of electromagnetic fields in our environment are constantly increasing. This has raised concern over the last few years, in France and abroad, about the possible health and environmental effects of these fields. There are constant scientific and political developments in this area, as well as intense media coverage.

The Agency has conducted expert appraisal activities in almost all areas involving the ionising electromagnetic spectrum, from extremely low frequencies to millimetre waves. As a result it has published several Opinions and Reports on this subject, as well as a special report on Radio Frequency Identification (RFID) systems:

- Radiofrequencies, mobile telephony and cordless technologies in 2003, 2005 and 2009;
- Compact fluorescent lamps in 2009 and 2013;
- Extremely low frequency electromagnetic fields in 2010;
- Body scanners in 2010 and 2012;
- Radio Frequency Identification (RFID) systems in 2009.

At the same time, new regulatory provisions that were adopted largely as a result of the "*Grenelle 2*" legislation make it possible to increase efforts to study human exposure to electromagnetic fields, both in low frequencies and radiofrequencies.

In order to pursue its scientific monitoring of these technologies and assessment of possible health and environmental risks, ANSES created a permanent Working Group on Radiofrequencies and health in 2011. The expert appraisal activities of the group rely on close liaison with research partners (recommendations for the call for research projects on radiofrequencies), and with stakeholders (reporting of results to the Dialogue Committee on Radiofrequencies and Health). This Working Group carries out regular updating of the expert assessment of the potential risks of radiofrequencies, in collaboration with the Expert Committee (CES) on Physical agents.

In parallel with this permanent working group, the Dialogue Committee on Radiofrequencies and Health, established in 2011, serves as an interface between the representatives of associations, operators and labour unions, and the Agency's scientists, in full accordance with their respective roles. In this way, the questions raised by civil society can provide input for expert appraisal activities, whose results are communicated to the Committee. The participation of the Committee in drawing up the specifications for certain studies is also an innovative approach to dialogue between scientific experts and the public.

With regard to research, the Agency has mobilised specific funding since 2011 on this topic in the context of the National Plan for Research on Environmental and Occupational Health (PNR-EST) which it coordinates. The goal of PNR-EST is to bring research and expert appraisal together as well as, in the case of the "Radiofrequencies and health" topic, to expand the research community. Thus, for the four successive calls for projects

(2011-2012-2013), 15 dossiers were selected, involving 42 research teams, for a total of €2.8 million in funding. The scientific issues the research teams worked on came from research recommendations born of the findings of the 2009 expert assessment. For the 2014 call for projects, the topics selected will take into account the new questions which have emerged through the knowledge update published today. In addition, “Radiofrequencies and health” is now the topic of a specific call for projects to more effectively account for the specificities of this area. Thus, a call for research projects was launched in late 2013 on the subjects which have been insufficiently handled in the current projects, such and electromagnetic hypersensitivity.