

# **Research into possible health effects**

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The aim of the contribution is to indicate the current research situation in Germany under the aspect of a strong public discussion on supposed adverse effects while using mobile telephones systems. Additionally new emerging technologies are on the way to come officially operative.

New business ideas, applications and services clearly point to the fact that tremendous technological changes will take place very soon concerning the radio frequency range. The progress to be expected in the field of telecommunications, transportation, security and identification systems as well as medical devices and applications means that new technologies, techniques and products will offer new opportunities for welfare, lifestyle and economics. On the other hand, these new developments will increase the prevalence of electromagnetic fields in human living and working environments. Where new opportunities open up, there will possibly also be new threats.

General opinion is that many of these emerging technologies will operate at higher frequency ranges (using shorter and shorter wavelengths) and/or that frequency ranges currently applied will be used even more intensively. Examples of new applications in the scientific area include UMTS (third generation wireless), wideband applications, radar systems in automotive applications, the maglev transportation systems and medical auxiliary devices.

Thus, new technological developments should be accompanied by further research into the interaction of electromagnetic fields with matter, the differentiation of RF fields outside the body and within body tissues, appropriate dosimetry measures (energy, SAR and W/m), endogenous versus inducted fields, forces, currents and thermal loads in order to provide a better understanding of whether and how such fields might affect human health.

In recent years public interest concerning the effects of electromagnetic fields on biological systems has markedly increased. Not only in the German newspapers and gazettes one can frequently find eye-catching reports about spectacular findings of new effects or some new theory of interaction between electromagnetic fields and biological systems. These reports often represent in a sensational way – as well as they are represented – nothing more than the

fact that the findings of a new study seem to indicate something which might be out of the reach of what man normally can expect, hence raising and leaving more questions than giving a proof of the experimental results.

Although at present scientists can largely answer the question whether or not such hypotheses and suspicions are unjustified, they finally cannot give a reliable reply or exclude the risk completely.

This interest is also reflected in a continually growing number of very different experiments in this area. Especially during the last ten years numerous indications have been revealed about effects of non-thermal electromagnetic fields, but many of these findings are disputed quite controversially because they could not be experimentally reproduced.

Also scientists who deal with this subject in depth can often only check the value of a new publication with great effort or frequently not at all. This is because of the fact that, apart from the complexity of the research subject, the planning, execution and evaluation of experiments is usually carried out according to very different criteria. Consequently the comparison of the results of experiments with very similar initial objectives is often impossible.

Taking that all in account the government, health administrations, network providers, manufactures and all other interested parties have strengthened their combined efforts to investigate the biological effects of electromagnetic fields. They do it with different research programs and the value of their expenses is at the amount of 7.5 Mio € a year. Several national and international research programs are running at present. Nevertheless, the increasing effort expended so far has not necessarily led to the public being better informed.

Potential effects of electromagnetic fields very much depend on the frequency, intensity and transmission mode used. The variety of options shows how complex these issues may be and how difficult it is to arrive at generally accepted results that are verifiable in a reproducible manner.

It is therefore indispensable to develop model concepts about potential effects of electromagnetic waves on organisms within an interdisciplinary group of scientists as well as to define and coordinate scientific priority issues.

At present, scientific research in general is at a crossroads: Should there be a risk assessment for each emerging technology using well-established research methods? Or should we increase our efforts towards basic research in order to gain comprehensive knowledge of possible interaction mechanisms, thus examining new technologies from a more general point of view before they are introduced and and commercially exploited. Both approaches do have their advantages and disadvantages. But maybe there is a third, even more appropriate option worth considering: to act both ways bearing in mind that time presses and that this is what basic research often needs most - time.