Potential biological effects of EMF in the UHF range

Report of COST 281 workshop in Thessaloniki

by Norbert Leitgeb

The local host Theo Samaras welcomed the participants reminding on the previous meeting in Greece (of the predecessor action COST 244) which was held in Athens exactly 10 years ago.

In the report of COST 281's working group "mobile phones and children", Joe Wiart highlighted the last year's improvements in children- specific SAR calculations including identification of and agreement on typical children-specific phone positions. He compared the different approaches how to model children heads such as linear versus nonuniform downscaling from adult's heads associated with the problem of changes in voxel sizes. Furthermore, it was discussed which should be the ages of references for children including the question as to which extend morphological and physical parameters as well as potentially different temperature increase tolerances need to be considered. Being aware of ethical restrictions, the need of MRI-based children head models was expressed.

On behalf of the working group "genetic aspects" Gerd Friedrich presented the finalized COST 281's recommendation on internationally co-ordinated research on potential genotoxic effects. With this initiative COST 281 proposes to join international efforts and to encourage different research groups worldwide to work with the same protocol and having a single laboratory in charge to expose cells under well controlled conditions and distribute them to the participating laboratories for scoring. This allows to get a sound statistical basis and results that can be pooled to a meta-analysis.

The results of the working group "Dosimetry" were presented by Joe Wiart who informed on the attempts to go beyond the SAR concept and calculate even the intracorporal temperature rise. This approach faces additional problems in regard to model heat dissipation in particular by blood vessels and capillaries. Besides this the problems of assessing the immissions were discussed including the extrapolation from e.g. ground level measurements to higher locations (3D- problem), the aspect of long distance and/or fast fading and shadowing and how to extrapolate to different traffic situations. Wiart concluded the importance of knowing the right questions to find the proper answers.

Paolo Ravazzani presented the new European Coordination Action EMF-Net which officially was started only few days ago. This action involves the most leading organizations in Europe including COST Action 281 and aims at co-ordination and dissemination of research results, linkage of existing national and international activities and elaboration of relevant interpretations for politicians, stakeholders and monitoring EMF- relevant technical and research development.

Jorgen Bach-Andersen gave a look into the future. This will be dominated by further rapid development of mobile telecommunication systems and services. High capacity "data acquisition everywhere, more of everything and multipurpose devices instead of single "killer applications" can be expected. The techni-

cal possibility to give anything, person or object, an internet address will offer new possibilities yet to be identified. Data rates and omnipresence of devices will increase, involving all parts of the population as users.

Reinhard Giraud summarized recent developments and future trends in radio technologies. He showed that development goes towards short-range high- data rate communication as already expressed by the evolution from 1G to 2G and 3G technology to WLAN with extensions for super G turbo mode bit rates beyond 100 Mbps. Software- defined radio, smart antennas and ad hoc- networks and new ultra high frequency UWB applications in the range 10 to 66 GHz are expected to be used for powerful data connections, new modulation and coding schemes will increase both spectral efficiency and data rates with new applications not yet known.

The reports on the progress in national research programs was impressing. In addition to the EMF- related parts of the 6th EU framework program national research funds actually comprise considerably more than 110 million for EMF research. This led to the question raised by Bernard Veyret, what amount of money is needed to promote the topic? Italy impressed by installing a national grid of EMF monitoring stations with alarms in case of excess of national precautionary limits and a large program on biological EMF research. National research programs were presented also from representatives from UK, Germany, France and Switzerland. It was interesting to note that there are several efforts to start with epidemiological studies on mobile telecommunication basestations and cancer or non-specific health symptoms like in UK, Germany and Switzerland. The discussions identified the need of co-ordinating the various individual approaches by nations and organizations to increase efficiency.

Norbert Leitgeb discussed the development of new technologies in respect to the resulting challenges for health risk assessment. New technologies are expected to expose more people including younger and elder people more frequently for longer durations and on different local parts of the body. This will increase the need to further develop exposure limits to account for different kinds of exposure in regard to age, exposed body parts, time duration and signal signature, to assess and monitor the exposure of the general population and to find a way to derive a health relevant measure for long- duration exposure (a “dose” parameter). Concerns and fears are expected to further increase in the future in lack of adequate risk communication making adequate strategies more and more important how to deal with uncertainties, how to assess and communicate contradictory results and opinions and how to deal with concerns of the public.

Karpowicz discussed the consequences of new technologies in regard to quantitatively characterize exposure in case it varies within a room, in frequency and time. She presented measurement results showing that already yet the ratios of ELF to RF contributions inside houses may change considerably and identified the need to identify standardised exposure conditions for biological research.

Lutz Haberland reviewed to existing literature on biological interactions of 2-3 GHz EMF in regard to different endpoints such as tumor development, blood brain barrier, genotoxicity. He identified 809 papers and raised the question how to conclude whether an endpoint has been sufficiently investigated and on which criteria reduction and/or closing research on a specific topic could be based on.

In his review of existing literature, Joe Morrissey concluded from the large body of data that previous studies are still relevant for new technologies up to 2,5 GHz and that there are enough data available for risk analysis. He identified more pressing research needs such as in regard to ultra wide band applications, implanted medical device transmitters, improved exposure assessment for better epidemiologic studies and in the frequency range above 5 GHz and in the THz range.

In his final remarks, Leitgeb concluded that COST 281 once again had chosen a very relevant topic and had acted proactive rather than due to pressure and once again highlighted the efficient role this action is playing in coordinating and stimulating research.

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