

THE INTERNATIONAL EMF PROJECT

Minutes of the 11th Meeting of the International Advisory Committee 7-9 June 2006 Geneva, Switzerland

*Note that all presentations made at the IAC meeting are available at:
http://www.who.int/emf/meetings/archive/iac_geneva_june2006/en/index.html*

At the opening of meeting, Dr. M. Neira, Director, PHE, and Dr Michael Repacholi, WHO Coordinator, Radiation and Environmental Health Unit, welcomed the participants to the 11th Meeting of the International Advisory Committee (IAC) of the WHO International Electromagnetic Fields Project. Prof Barney de Villiers (South Africa) was elected Chairman and Dr Oleg Grigoriev (Russian Federation) was elected Vice Chairman.

Retrospective and update on the International EMF Project

Dr Michael Repacholi then presented the Project's organization and update of activities. This year, there were more than 65 attendees at the IAC meeting. Outlined topics of his presentation included a review of meetings and activities with international agencies, activities with collaborating centers, funding, risk assessments of static fields, ELF fields and RF fields, scientific reviews, research coordination, risk management activities, risk communication activities, WHO publications, peer reviewed publications, current and future activities and future meetings. He pointed out that Dr. E. van Deventer will succeed in the leadership of the WHO International EMF Project after he retires from WHO at the end of June 2006.

Report on NIR activities from collaborating institutions and international organizations

International Electrotechnical Commission (IEC)

Dr Michel Bourdages reported that the work of the IEC Technical Committee (TC) 106 is focused on measurement and calculation methods to assess human exposure to electric, magnetic and electromagnetic fields in the frequency range from 0 Hz to 300 GHz. TC 106 does not have the mandate to establish exposure limits or to include specific exposure limits in its standards. TC 106 develops standards on measurement and calculation methods of physical quantities specified in exposure standards (electric field strength, magnetic flux density, SAR and power density) for purposes of compliance. Compliance with exposure limits ensures compliance with basic restrictions.

The TC 106 is organized into five Working Groups (WG). Each WG has oversight over one or more Project Teams. WG1 and WG3 develop basic standards covering respectively the low (0 Hz to approximately 100 kHz) and high (100 kHz to 300 GHz) frequency range, respectively. Similarly, WG2 and WG4 cover the low and high frequency range but develop product standards. WG5 covers the whole frequency range (0 Hz to 300 GHz) and develops generic standards that can be used to demonstrate the compliance of a product when no dedicated product standard exists. Additional information can be found on the IEC Internet site: www.iec.ch

International Committee for Electromagnetic Safety (ICES)

Dr Ralf Bodemann reported that a major goal of ICES/IEEE standardization is to facilitate international standards harmonization (e.g. closer cooperation with ICNIRP) in an open, transparent, and consensus oriented process where participation of all interested parties is welcome. IEEE recently revised safety levels with respect to human exposure to radio frequency electromagnetic fields, i.e. 3 kHz to 300 GHz (C95.1-2005). The basic restrictions in the present draft of the revised RF standard are in agreement with those of ICNIRP while MPE values for general public exposure up to 100 GHz harmonize with ICNIRP's reference

values. Since June 2005, the following ICES standard documents were approved or published; IEEE C95.1-2005 "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", IEEE C95.7-2005, "IEEE Recommended Practice for Radio Frequency Safety Programs", IEEE 1528a, "Amendment 1: Include CAD File for Human Head Model (SAM Phantom)" to IEEE 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques". Two ICES summer meetings in 2006 will be held on 9-11 June, at Cancun, Mexico (TC-95 subcommittee 4 and TC-95 subcommittee 4) and on 28-30 August, at Piscataway, NJ, USA (TC-95 parent committee and TC-95 subcommittees 1, 2, 3, 5).

International Commission on Non-Ionizing Radiation Protection (ICNIRP)

Dr Paolo Vecchia reported that ICNIRP conducts activities in the whole range of the non-ionizing frequency spectrum. Dr Vecchia presented the composition of the new Commission and of its Standing Committees. Present activities of ICNIRP in the area of EMF include a comprehensive review of the literature on RF fields (physics and dosimetry, biological studies, epidemiology), a revision of guidelines on static magnetic fields, and a statement on health issues related to emerging technologies emitting EMF. Task Groups for static and ELF EMF guidelines were established in 2005 and the first draft of static EMF guidelines was discussed in May 2006.

A revision of guidelines on RF electromagnetic fields (100 kHz – 300 GHz) is also planned for the future. ICNIRP organized an international workshop on "EMF Dosimetry and Biophysical Aspects Relevant to Setting Exposure Guidelines", 20 - 22 March 2006, in Berlin, Germany, which covered the whole frequency range, from static to terahertz fields. Internationally recognised experts presented lectures on those topics and discussed the relevance of recent research findings with regard to exposure limits for workers and the general public. An ICNIRP/EMF-NET/WHO Workshop on Occupational Exposure to EMF will be held in Italy, Spring 2007.

Radiation Protection Division of the UK Health Protection Agency (HPA-RPD)

Dr. Alastair McKinlay summarized ongoing EMF scientific studies at HPA-RPD. These include computational dosimetry, experimental dosimetry and biological studies. In computational studies, hybrid voxel-mathematical models of a pregnant female have been produced. Mathematical models of the developing fetus at 8-, 13-, 26- and 38-weeks gestation were converted into voxels and combined with the adult female model, NAOMI. Calculations have been carried out and a paper written on the frequency dependence of SAR in seated adult and scaled child models of the male voxel phantom NORMAN. A new combined electromagnetic and thermal model of the human head has been developed to compute temperature rises in the human eye due to irradiation by near-field radiofrequency sources (see: Dimbylow P J (2006). "Development of pregnant female, hybrid voxel-mathematical models and their application to the dosimetry of applied magnetic and electric fields at 50 Hz". *Phys. Med. Biol.* **51** 2383-94., Findlay R P and Dimbylow P J (2006). "FDTD calculations of specific energy absorption rate in a seated voxel model of the human body from 10 MHz to 3 GHz". *Phys. Med. Biol.* **51** 2339-52.). Assessing the compliance of emissions from BBC MF and HF broadcasting transmitters with exposure guidelines is included (http://www.ebu.ch/en/technical/trev/trev_305-contents.html and http://www.ebu.ch/en/technical/trev/trev_306-contents.html). In experimental dosimetry, residential (magnetic field) sources study and microcell and picocell base station exposure assessments (see: Cooper TG, Mann SM, Khalid M and Blackwell RP. "Public exposure to radio waves near GSM microcell and picocell base stations". *J. Radiol. Prot.* **26** (2006) 199-211). Biological studies include the following; An in vitro study of genotoxicity in human lymphocytes due to exposure to 935 MHz EMF, Chromatid damage in human lymphocytes exposed by 50Hz EMF, genotoxic effects of intermittent 50 Hz EMF on human fibroblasts and exposure effects of 935 MHz EMF on apoptosis in cultured human and mouse brain cells.

Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)

Dr Colin Roy reported that the government continues to provide \$1M pa for their EME Program (renewed until 2009). . This program supports research and provides information to the public on health issues associated with EMF. The EME program is coordinated by the Committee on Electromagnetic Energy Public Health Issues (CEMPHI) and is run by ARPANSA. This program supports research into and provides information to the public about health issues associated with mobile phones, their base stations

and other communications devices & equipment. The Australian research program is managed by the National Health & Medical research Council (NHMRC), funding of \$0.7M p.a. to charter to conduct research into EME issues of relevance to Australia and to complement overseas research activities including the establishment of the Australian Centre for Radiofrequency Bioeffects Research (ACRBR).

Recently completed research projects include the Australian component of the INTERPHONE study, investigation of human physiological responses (brain reactions, sleeping patterns, biological clock) to exposure to mobile phone type radiation, investigation of the effects of radiofrequency radiation from long term mobile phone use on vision and hearing (part of Blue Mountains Eye Study) and sensitivity of human event-related potentials to mobile phone emitted electromagnetic fields. Fact sheets in the ARPANSA CEMEPHI EME series are available on the ARPANSA web site at: www.arpansa.gov.au/eme_pubs.htm.

National standards/policies update

Russia

Dr. Oleg Grigorev presented the current state of the EMF safety standardization in Russia. Maximum permissible levels (MPL) presented in the WHO standards database have not changed since 2003. Basic MPL were introduced more than 10 years ago. Standards (SanPiN), which regulate occupational and general public EMF exposure: New standard SanPiN 2.5.2/2.2.4.1989-06 "Electromagnetic fields on swimming vessels and marine structures. Hygienic safety requirements", approved by the Ministry of Health, is in force since May, 2006. The draft of the power frequency (50 Hz) magnetic field general population exposure standard was approved by the Ministry of Health. The RNCNIRP will discuss it in September 2006. The legislation mechanism for the safety standardization has been changed since 2003. According to the Federal law "On technical regulation" since 2010 all sanitary norms (SanPiNs) must be changed to technical regulations.

According to the Ministry of Health, current EMF safety standards ensure sufficient general public protection and are technically achievable. This is why there is no need for a revision.

New Zealand

Mr Paul Predergast presented New Zealand's EMF exposure standards. There has been no change in exposure standards and guidelines used in New Zealand since last year. While the government continues to follow progress of the project initiated by Standards Australia to review the Australian RF measurement Standard (which is identical to NZS 6609:1990 Part 2), enthusiasm is muted as the Australian document may end up with many features specific to Australian requirements. There has been little progress on a revised Radiation Protection Act (which would allow the introduction of regulations to control potentially hazardous sources of non-ionising radiation if needed) but drafting has finally begun in earnest. The New Zealand Ministry for the Environment (MfE) has largely completed preliminary work on the feasibility of developing National Environmental Standards (NES) covering radio transmitters and transmission lines. These Standards would have the status of regulations under the Resource Management Act. It is likely that both Standards will include exposure controls if further development is approved by Government. Government anticipates that forthcoming International EMF project publications such as the EHC on ELF fields and the framework guiding public health policy in the face of scientific uncertainty will form key inputs to the development of these Standards.

Israel

Dr Stelian Gelberg presented a new Non-Ionizing Radiation Law (No. 5766) which has approved on 20 December 2005. The aim of this law is to protect the public and the environment from the effects of exposure to non-ionizing radiation, and to regulate radiation sources, their installation and operation, and the provision of radiation measurement services, amongst others, by determining prohibitions and obligations in accordance with the precautionary principle. Based on ICNIRP guidelines, the "Upper Exposure Level" of 1000 mG will be adopted in Israel, in parallel to the need to implement the precautionary principle for magnetic fields from the electricity network. This would mean reducing, to the extent possible, at reasonable cost and using accepted means, the magnetic fields produced by different components of the electricity network, to which the public in Israel is exposed, to values below the "Upper Exposure Level" of 1000 mG, which was defined by ICNIRP, WHO and other bodies for short term exposures and effects. Adoption of the precautionary principle is largely derived from the apprehension, even if not sufficiently founded, about long-term health damages. The Law consists of the following 6

chapters and Addendum: chapter A; Aims of the Law, chapter B; Definitions, chapter C; Permits, chapter D; Inspection, chapter E; Removal order and Penalties, chapter F; Different provisions. Unofficial English translation of the law is available from Israel Ministry of Environmental Protection website at http://www.sviva.gov.il/Environment/Static/Binaries/Articals/non-ionizing_radiation_law_1.pdf.

Communication activities

WHO/NIOSH document

Dr Emilie van Deventer presented a draft document on occupational exposure to EMF developed by the US National Institute of Occupational Safety and Health (NIOSH) in collaboration with WHO... The scope of the document is to provide information and guidance for appropriate occupational applications and interventions and to develop strategies to prevent occupational harm resulting from such exposures. The topics in the document include: Introduction, interaction mechanisms (for static and time-varying fields), exposure measurements (ELF and RF), occupational exposure guidelines on EMF (ICNIRP and IEEE), description of typical exposure situations (examples of many sources), basic concepts of exposure control (engineering, administrative, precautionary, etc), EMF exposure management plans (Responsibilities, authorities and administrative plan, Exposure assessment, Exposure controls, Medical surveillance, Training and Plan review). A first draft was completed in January 2006 and the final document is expected by Spring 2007.

Brochure for local authorities on wireless networks

Dr. Colin Roy reported on a new wireless communications brochure for local authorities. The draft of brochure includes the following topics: Overview, Telecommunication Technology, Health Effects, Addressing Public Concerns-Risk Communication, Key Messages and Questions & Answers. In its present state, it includes following 4 technical annex: International Exposure Standards, Exposure, Base Station Siting - Case Studies and Further Information.

Review of Fact Sheets

Dr Chiyoji Ohkubo gave a review of the fact and information sheets. The WHO International EMF Project has published many fact sheets and information sheets regarding electromagnetic fields and public health. WHO fact sheets on electromagnetic fields and public health have already been published and translated in as much as 15 different languages. Over the past year, 3 fact sheets have been published on the Project web site at <http://www.who.int/peh-emf/publications/facts/factsheets/en/index.html>. These include "Electromagnetic Hypersensitivity (Fact Sheet No. 296)", "Static Electric and Magnetic Fields (Fact Sheet No. 299)" and "Base Stations and Wireless Technologies (Fact Sheet No. 304)".

Historical survey on ELF regulation

Ms Shaiela Kandel presented an international survey on "Regulation of Extremely Low Frequency Electromagnetic Fields in the Last Two Decades". The aim of the survey is to study the dynamics of regulation in all member countries of the WHO International EMF Project over the last two decades to explain the current state of regulation. It evaluates policy diffusion across countries, and in particular, focuses on policy convergence among countries with similar characteristics and identifies triggers of policy changes over time. As the lead author of this survey, she asked IAC members to fill this survey.

Update on WHO web site

Dr Emilie van Deventer gave an update of the WHO publications and web site. Three scientific papers were published over the past year (L Kheifets, M Repacholi, R. Saunders, T.E. van Deventer, Sensitivity of Children to Electromagnetic Fields, *Pediatrics* (August 2005), L Kheifets, J Sahl, R Shimkhada, M Repacholi, Developing policy in the face of scientific uncertainty: interpreting 0.3 μ T or 0.4 μ T cut points from EMF epidemiologic studies, *Risk Analysis* (August 2005), L Kheifets, T. E van Deventer, G. Lundel, J. Swanson, Le principe de précaution et les champs électriques et magnétiques : mise en oeuvre et évaluation, *Environnement, risques et santé*, (Jan-Feb. 2006)). One book chapter will be published (T.E. van Deventer, D. Simunic, M Repacholi, EMF standards for human health, in *Handbook of Biological Effects of Electromagnetic Fields*, 3rd ed., F. Barnes and B Greenebaum, eds., (expected publication Sept. 2006).

Other recent publications include translations of the Risk handbook into Bulgarian and Portuguese. Two new publications, "Framework for Developing Health-based EMF Standards" and "Model Legislation for Electromagnetic Fields Protection" have been printed and are available for download from the EMF Project's website. Resulting from activities over the past year, information regarding national contact and national activities of each member states are periodically updated on the web site.

Web-based distance learning program for children about EMF

Dr Kwan Ng presented a web-based distance learning program for children about EMF. This initiative aims to provide scientific and health information to children and teenagers (aged 5 to 16 years) about EMF. An ongoing global online survey was started to compile information on the understanding of EMF and mobile phone technology amongst school children (<http://radiology.um.edu.my/emfsurvey>). The findings of this survey provide the baseline for determining the pre-instructional knowledge and subsequent subjects of focus in constructing and developing this Web-based distance learning program. Computer-based technology (CBT) has been shown to improve how and what children learn in the classroom. The design of the Web-based learning program takes into account four key areas to enhance learning effectiveness: (1) active engagement, allowing the user to control the pace and sequence of the learning material, (2) frequent interaction and feedback via the animated demos and self-assessment quizzes, (3) connections to real-world contexts by providing analogies and examples to common mechanisms or household items, and (4) group participation through the inclusion of forums or talkback pages. In the design and development stage, the language and stylistic qualities used are chosen to be attractive to the target audience, without neglecting scientific value. The features to be included in the Web program include interactive animation and sound, educational games, quizzes, cool facts, resources and a readers' forum. A work-in-progress of the Web learning program can be viewed at <http://radiology.um.edu.my/emf/>.

Educational web site

Dr Bernard Veyret presented a web-based learning program for young scientists that embark in Bioelectromagnetics research. The goal is to promote the development and conduct of studies that will be useful to health risk assessments. This work is aimed at setting up an E-learning package for the website of the International EMF Project and will span across the whole spectrum from DC to GHz. The contents include experimental approach (i.e., laboratory research but no epidemiology), health risk assessment and exposure standard setting. The content is based in part on existing material (e.g. Erice course, various university courses in Europe). The website could also include a forum where young scientists can ask questions and share their experience. It will be finished in 2007.

Discussion on Research Database, FEMU

Dr Chiyoji Ohkubo reported on the WHO Research Database (<http://www.who.int/peh-emf/research/database/en/index.html>). The database has been assembled as a service to the research community. Its purpose is to inform researchers worldwide about projects relevant to WHO's EMF Research Agenda that still need to be conducted or those that are in progress. In cooperation with FGF (The Research Association for Radio Applications, Germany), the research database is regularly updated. The database is divided into 8 research categories, and it was pointed out that social sciences should be added to the database as a new category. He explained that the German "EMF Portal" has been recently linked and is a very useful research database of published papers, complementary to WHO's database of ongoing studies. The EMF-Portal has been realised by the Research Center for Bioelectromagnetic Interaction (FEMU) at the University Hospital of Aachen University and co-funded by Research Association for Radio Applications (FGF). Currently the database comprises approximately 10,000 studies.

Update of the worldwide Standard Database

The EMF project has compiled an EMF worldwide standards database a few years ago, with the help of Professor Dina Simunic, who gave an update (<http://www.who.int/docstore/peh-emf/EMFStandards/who-0102/Worldmap5.htm>). Over 50 countries in all continents are included. Three quarters of all the countries have introduced the ICNIRP guidelines (1998). Countries were requested to add their original documents on EMF standards, and possibly with English translation, to the WHO web site. Approximately half of the countries in the database have developed supplementary information in the form of an EMF handbook, reports, pamphlets or fact sheets.

Meeting adjourned on June 7 at 17:30

Meeting reconvened on June 8 at 09:00

Standards and Policies

The WHO Framework for Developing EMF Standards, the Policy Framework and Model Legislation

Dr Emilie van Deventer mentioned the recently published booklets, "The WHO Framework for Developing Health-Based EMF Standards" and "Model Legislation for Electromagnetic Fields Protection". [Because](#) these documents have been reviewed on several occasions by the IAC and the printed documents were now available, she passed the floor to Dr Repacholi for an in-depth discussion of the more controversial Policy (formerly known as Precautionary) Framework.

The Policy framework had been circulated for comments in May and a large number of remarks were received. A new draft was prepared for the IAC meeting and distributed on June 7. Because of the shortness of time to review it thoroughly prior to the scheduled discussion on June 8, it was decided that comments would be sought from the IAC members by July 15 2006. The framework aims to encourage the development of reasonable and realistic options in areas of scientific uncertainty. It includes consideration of cost-effectiveness instead of cost-benefit because of the difficulty in defining benefits in areas of scientific uncertainty and calls for iterative evaluations of policies and broad stakeholder participation.

Ongoing Research

Research review of the past year

Dr Bernard Veyret presented a research review of EMF studies published in peer reviewed journals over the past year. He reviewed studies over the NIR frequency range, except for epidemiological studies and studies on hypersensitivity. He concluded that most of the recommendations in the WHO research agenda are being addressed. Improvement in the quality of RF-EMF exposure systems is continuing. About half of laboratory investigations are replication studies. Studies on therapeutic effects of EMF are increasing.

Update on the INTERPHONE study

Dr Elizabeth Cardis gave an update of the INTERPHONE study. Data collection and validation (mobile phone sections only) has been completed. Data of cases include 2,700 glioma cases, 2,400 meningioma cases, 1,100 acoustic neurinoma cases, and 400 parotid gland tumour cases. Analysis and publications are under way. Several national studies have already published as the followings: Denmark: Christensen et al, 2004,

Sweden: Lonn et al, 2004, Nordic countries: Schoemaker et al, 2005, Denmark: Collatz Christensen et al, 2005, Sweden: Lonn et al, 2005, Germany: Schuz et al, 2005 and UK: Hepworth et al, 2006.

She also proposed a new cohort study, "INTERPHONE kids", for children using mobile phones. A pilot study needs to be developed and implemented prior to a full cohort being conducted.

COSMOS: an update on the international cohort study on mobile phone use

Dr Mireille B. Toledano presented the COSMOS project. The aims of the project are to establish an international cohort of mobile phone users aged more than 18, to characterise exposure to mobile phone use and to follow cohort for 25+ years in terms of symptoms, mortality, cancer incidence, and other health outcomes. Four countries (Sweden, Denmark, UK and Finland) participate in the project. Large-scale cohort studies can be conducted that allow the study of a wide range of health endpoints. Moreover, in a cohort study, new endpoints brought up by other research activities can be included even during the conduct of the study, and the effects of evolving technologies (e.g. digital, 3G, and new modulation patterns) can be naturally integrated (or tracked). Prospective cohort studies therefore provide a "surveillance" tool and have the advantages of avoiding the recall and selection biases common to case-control studies. Recruitment of international cohort needs to begin now because international team have been assembled and pilot studies have been undertaken, exposure is rapidly changing which requires

assessment before current experience is lost. Regardless of the INTERPHONE findings, outstanding questions will need to be addressed and international collaboration will be required to increase cohort size to investigate possible associations with rare diseases.

Update on the French-Russian research project

Dr Bernard Veyret presented the French-Russian research project (Bordeaux-Moscow Project: Confirmation studies of the Russian data on immunological effects of microwaves) for which WHO provides oversight. The objectives of the project are to evaluate the effects of long-term low-level exposure to microwaves on immunological parameters in the brain of exposed rats, to determine the mechanisms of the effects on cerebral tissues and to evaluate teratogenic effects of long-term low-level exposure to microwaves. The Project follows up on studies conducted in the former Soviet Union which suggested that microwave irradiation of rats disrupted the antigenic structure of brain tissue. These studies formed the basis for the Soviet microwave standard and still do for the Russian and Chinese standards.

Replication of the studies will be carried jointly by Russian and French researchers commenced 2005 and take a year to complete and a protocol of the replication studies has been agreed between PIOM Laboratory, ENSCPB (Bordeaux, France) and State Research Centre, Institute of Biophysics (Moscow, Russia) and funding obtained.

Future Research

EMF research entities

To avoid unnecessary duplication of research effort and to make sure that all important questions are being studied, EMF research coordination on a global level is important. To that end, the International EMF Project, in collaboration with major national and multinational research funding institutions, has been providing such an umbrella for worldwide coordination and exchange of information about planned and ongoing projects. Many large research funding agencies use the WHO Research Agendas as a basis for their funding research. Since 1997 over \$200million of funding for research has been provided for studies highlighted in the WHO Research Agendas. Questions of an advisory nature posed to the IAC included: "How to promote the WHO Research Agenda?", "How to measure the impact of the WHO research agenda?" and to what extent "Do we need to harmonize research priorities?"

Because of the scientific questions and the public concern regarding the potential health effects from electromagnetic fields, several countries have funded research programmes and, in some cases, set up foundations to sponsor studies relating to this topic. Dr Emilie van Deventer reviewed some of the EMF research entities, for example, MTHR in the United Kingdom (<http://www.mthr.org.uk/>), the Fondation Santé et Radiofréquences in France (<http://www.sante-radiofrequences.org/>), a couple of programmes in Germany (<http://www.emf-forschungsprogramm.de/>, <http://www.fgf.de/english/index.html>) and in Switzerland (<http://www.mobile-research.ethz.ch/>).

WHO Research Agenda (Static, ELF and RF)

Dr Chiyoji Ohkubo presented the WHO Research Agenda. In 1997, the WHO International EMF Project developed a Research Agenda in order to facilitate and coordinate research on the possible adverse health effects of electromagnetic fields (EMF). In subsequent years, Research Agendas dedicated to different parts of the EMF frequency range underwent periodic review and refinement. In June 2003, a revised RF Research Agenda was developed at an ad hoc meeting of experts. A topical research agenda addressing the possibility that children may be more sensitive to EMF than adults was compiled following a WHO workshop held in Istanbul, Turkey, in June 2004. Research needs on the topic of electrical hypersensitivity were compiled following a WHO workshop in Prague in October 2004. Research needs on the topic of base stations and wireless networks were compiled following a WHO workshop in Geneva in June 2005. At an ad hoc meeting of specialists in Geneva in October 2005, a composite RF Research Agenda was developed and published on the website. A Research Agenda for static fields was published in April 2006, stemming from the Static Fields Environmental Health Criteria (EHC). A Research Agenda for Extremely Low Frequency (ELF) fields will be published following the publication of the WHO ELF health risk assessments.

Other programmes

Dr Paolo Ravazzani presented current and future research in Europe. He provided an overview of: results of ongoing and recently completed European RTD research projects on EMF exposure and health, Interpretation reports on research results on EMF and health and Research needs on EMF and health. EC Projects and activities include ADVICE PULSED FIELDS, CEMFEC, GUARD, INTERPHONE, PERFORM A, RAMP, REFLEX, THZ-BRIDGE, TEST-PRO-SAFETY LIFE (EMF), EMFnEAR, EMF-NET and COST Action 281. Total costs RTD Projects (excluding EMF-NET and COST 281) are about 23.5 MEuro and the total EC contributions are about 13.5 MEuro.

EMF-NET is a Coordination Action that aims to provide a framework for the coordination of results of the research activities related to the biological effects of electromagnetic fields, considering also the potential risks related to exposure in the working environment (occupational exposure). The EMF-NET Consortium involves 41 participants, including all the coordinators of the EC (FP5) on-going projects, coordinators of research projects at European national level (Finland, France, Germany, Greece, Hungary, Italy, UK), and representatives of other EC and international activities, such as EC COST ACTION 281 and the WHO EMF project, associations of industries and manufactures, regulatory bodies, scientific associations, and trade union associations. He explained EMF-NET Interpretation Reports on EMF and Health and Highest Priority Research Needs. Full reports and documents available at: <http://emf-net.isib.cnr.it>.

Professor Norbert Leitgeb presented COST 281. COST is the acronym for "European Cooperation in the Field of Scientific and Technical Research". It is a framework for international research and development cooperation at the European level. COST does not fund research as such, but coordination of research. COST includes as member states countries from the European Union, and a number of other European countries. COST 281, an action within COST, has for main objective to obtain a better understanding of possible health impacts of emerging technologies, especially related to communication and information technologies that may result in exposure to electromagnetic fields. Some secondary objectives are to provide a scientific evaluation of the available data for use by various decision makers involved in risk management of electromagnetic, a basis for risk communication efforts related to emerging technologies, electromagnetic fields and possible health risks and data on electromagnetic field exposures related to emerging technologies on a European level. For the time being, 25 signatory countries decided to actively participate and about 250 institutions are involved in this action. Besides this, contacts have been made with international bodies such as WHO, ICNIRP and EBEA and authorities and research organizations like Japan, Korea, Australia, South Africa and the USA.

Administrative business

Dr Michael Repacholi reported on administrative business. Ten future meetings will be expected by the end of 2006. Several booklets are planned for the coming year. Other future activities include distance learning programs. Finally, he explained the current status of funding. There is a small reserve of funds which will soon be depleted. A concerted funding drive is needed to complete the Project activities already started. The next IAC meeting will be held about June 2007 at a time to be determined. Dr Repacholi will retire at the end of this month and leadership of the WHO EMF Project will pass to Dr Emilie van Deventer.

Meeting adjourned on June 8 at 17:00

Meeting reconvened on June 9 at 09:00

WHO Health Risk Assessments

Process and Procedures

Dr Emilie van Deventer outlined the process and procedures of WHO health risk assessments. WHO's assessment of any health risks produced by EMF emitting technologies falls within the responsibilities of the International EMF Project. One of the goals of the International EMF Project is therefore to carry out health risk assessments of RF, ELF and static fields, published in the Environmental Health Criteria (EHC) monograph series. The EHC monographs are intended to assist national and international authorities in making risk assessments and subsequent risk management decisions. They represent a thorough evaluation of risks and are not, in any sense, recommendations for regulation or standard setting. These latter are the

exclusive purview of national and regional governments. However, the EMF EHCs do provide bodies such as ICNIRP with the scientific basis for reviewing their international exposure guidelines.

Static Fields

Dr Eric van Rongen summarized the recently published EHC monograph on Static Fields. This EHC addresses the possible health effects of exposure to static electric fields and exposure to static magnetic fields. However, only a few animal and human laboratory studies have investigated the effects of exposure to static electric fields. The majority of studies reviewed here concern the effects of exposure to static magnetic fields. For completeness, studies of the effects of exposure to magnetic resonance imaging (MRI) fields have also been reviewed. The Static Field EHC includes the following contents: physics, biophysics, biology, risk analysis and recommendations. The available evidence from epidemiological and laboratory studies is not sufficient to draw any conclusions with regard to chronic and delayed effects. IARC (2002) concluded that there was inadequate evidence in humans for the carcinogenicity of static magnetic fields, and no relevant data available from experimental animals. Their carcinogenicity to humans is therefore not at present classifiable. Short-term exposure to static magnetic fields in the tesla range and associated field gradients induce a number of acute effects. Although not experimentally verified, it is important to note that calculations suggest three possible effects of induced flow potentials. It is recommended that national authorities implement programs that protect both the public and workers from any untoward effects of static fields. A program is needed to protect against established acute effects of static magnetic fields. Because sufficient information on possible long-term or delayed effects of exposure is currently unavailable, cost-effective precautionary measures such as those being developed by WHO (www.who.int/emf) may be needed to limit the exposures of workers and the public.

Extremely Low Frequency Fields

Dr Eric van Rongen summarized the status of the EHC monograph on Extremely Low Frequency Fields and focused on the ELF Risk Characterization. The purpose of risk characterization is to support risk managers by providing essential scientific evidence and rationale about risk that they need for decision-making. The most common means of characterizing risks from epidemiological data for a single endpoint is to use the attributable fraction. The assumption of a causal relationship is critical to the evaluation. There are numerous limitations to the epidemiological data on childhood leukaemia and ELF magnetic field exposure that make it difficult to accept this assumption for these data. If it is incorrect and the fields are indeed not causing childhood leukaemia, the risk of ELF magnetic fields at environmental levels is effectively zero and should not be considered a threat to public health. On a worldwide scale, the calculated attributable fractions lead to a range of 100 to 2400 childhood leukaemia cases per year that can possibly be attributed to ELF magnetic field exposure, representing a small proportion of the total number of leukaemia cases that was calculated at about 49,000 worldwide in 2000.

Protective measures for ELF

SAGE (Stakeholder Activity Group on ELF and EMF)

Because there is a scientific uncertainty on possible health effects due to chronic exposure to low levels of ELF-EMF. There is a question as to whether any precautionary measures should be taken in case there are effects at levels below the exposure guidelines. As this is a contentious question and one that, to date there has been a wide spectrum of opinion on, this process has been set up to involve key stakeholders to advise government on what they could do. This Stakeholder Advisory Group has become known as SAGE (Stakeholder Advisory Group ELF EMF). Dr Hilary Walker described SAGE Group, which was set up in late 2004 and has a remit for the whole of the UK. It is funded equally by the Department of Health, the charity Children with Leukaemia, and the electricity industry. The aim of the process was agreed by stakeholders in November 2004 as: "To bring together the range of stakeholders to identify and explore the implications for a precautionary approach to ELF EMF (electric and magnetic fields) and make practical recommendations for precautionary measures" There are about 40 Stakeholders including government (health, housing and electricity), industry (power lines, builders and manufacturers), markets regulators, professional institutions (surveyors and engineers), social interest groups, university academics and members not appointed by government directly involved in the process. Stakeholders participating in the process have agreed to consider options in the spirit of openness and transparency by: generating common understanding of issues, problems and solutions, developing a mutual understanding of all stakeholder

perspectives, identifying where consensus exists and where it doesn't, why, developing links with other dialogues and proactively engaging with other initiatives and forming a working group or groups as needed to meet regularly to carry out detailed work. The latest estimate of timetable for the report from SAGE to Government is Autumn 2006 (<http://www.rkpartnership.co.uk/sage/>).

Economic impact assessment for the Australian ELF standard

Dr Colin Roy presented EMF protective measures in Australia. ARPANSA, an Agency in the Federal Government portfolio of Health and Ageing, is currently reviewing the interim guidelines and aims to replace them with an ELF Standard in the frequency range of 0-3000 Hz. The aim is to develop a scientific limits-based approach to restricting human ELF exposure considering both occupational and general public exposure categories; and to ensure protection against established adverse health effects. Affected parties are mainly industries producing/using high voltage/current electrical apparatus.

Throughout the world there has been a growing movement inside and outside of government to adopt "precautionary approaches" for the management of health risks in the face of scientific uncertainty. Even after fully allowing for the legitimate desire by society to err on the safe side, it seems likely that only very low-cost measures will be justified. Option assessment for known risks is based on scientific, economic and technical information. Option assessment for known risks is undertaken using a health-economics analysis to identify the most efficient way to achieve a particular exposure reduction or health protection goal. He showed a case study based on cost benefit approach. He assumed that incidence rate of (ALL) leukaemia in Australia of children aged 0 – 14 years is about 4 per 100,000 (death rate of ALL is about 20%) and if link causal, then assign a risk of $0.2 \times 4 \times 10^{-5}$ to TWA exposure of 6 mG for 3 years or 0.44×10^{-6} per mG child year. As the result from this calculation, at \$10 M per life saved, they would expect to be prepared to pay \$4 to avoid exposing a child to each mG for a year. He also showed a case study by methods designed to produce reductions in exposure and their costs.

The Dutch ELF measures: analysis and decisions

Dr Eric van Rongen explained the recent ELF protective measures introduced in the Netherlands. Based on a "sensible approach" to risks, a memorandum from the Ministry of Environment was issued with a focus on making decisions with awareness for insecurities include power line, mobile phone base stations and radon was approved by parliament. In October 2005, a letter of State Secretary of Environment with recommendations issue to local authorities that "new situations in which children experience long-term exposure to magnetic fields from overhead high voltage power lines should be avoided as often as is reasonably achievable" and "social advantages and disadvantages must be taken into account and further interpretation of this policy should take place after consultation with those directly involved". However, people in existing situations might feel less protected. In a recent court case, local authority was forced to pay € 27000 compensation for loss of property value because a power line had been moved closer to the house. Although they were not the main reason for the ruling, possible health effects were indicated to have played a role.

The next IAC meeting will be held in June 2007 at a time to be determined.

Meeting closed on June 9 at 12:00