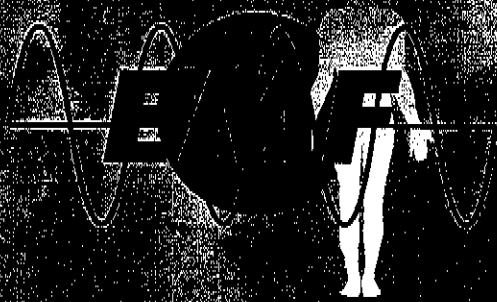


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# International EMF Project

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Health effects  
of static and time  
varying electric  
and magnetic fields

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PROGRESS REPORT  
1997-1998

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Office of Global and Integrated Environmental Health  
World Health Organization, Geneva



# THE INTERNATIONAL EMF PROJECT

## PROGRESS REPORT 1997-1998

### SUMMARY

This third progress report for the International EMF Project reflects an extremely productive year of activities and outputs. The initial scientific review phase of the Project is almost complete. RF fields were reviewed in Munich, November 1996 and static and ELF fields in Bologna, June 1997. However, a final meeting will be held in Maastricht, Netherlands 7-10 June 1999 to review the biological and health effects of exposure to EMF in the intermediate frequency range (300 Hz to 10 MHz). In these reviews, research still needed in order for WHO to make better health risk assessments is identified. The reviews have been followed by an ad hoc Research Coordination Committee meeting which compared research in progress with the research requirements that were identified following the initial scientific reviews. Research for which no known research activity is in progress formed the basis for "WHO's EMF Research Agenda". The Research Agenda has been distributed with the strong recommendation that scientists and research funding agencies worldwide use it where appropriate to focus their own research programmes. It is anticipated that this research will take up to 5 years to complete and be published in scientific journals, ready for WHO to incorporate into a formal assessment of health risk from exposure to EMF.

It has become apparent that the initial 5-year schedule to complete assessments of any possible health risks of exposure to EMF was unrealistic, mainly because the time to complete needed research will take longer than anticipated. In addition, the scope of activities requested by the International Advisory Committee (IAC) has expanded because of the complexity of the issues surrounding EMF. The EMF Project is now scheduled to be complete in 2004.

A successful meeting on EMF risk perception and communication was held in Vienna (October 1997). Working groups held during a meeting in Ottawa 31 August to 4 September 1998, produced two draft reports on EMF risk perception, communication and management that will be published by WHO in 1999.

In April 1998 the International Agency for Research on Cancer (IARC) identified EMF as a physical agent that would be formally evaluated for carcinogenicity. Carcinogen identification and evaluation meetings of IARC have been tentatively set for 2001 to assess static and ELF fields, and for 2003 to assess RF fields. These meetings have been inserted into a revised schedule of activities and outputs for the EMF Project. This important step will put the analysis of any possible relationship between EMF exposure and cancer on the same level as 800 other physical and chemical agents and allow the WHO-sponsored evaluations to concentrate on other possible adverse health effects of EMF.

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To allow incorporating EMF research that is published in Russian, and therefore not easily accessible, into evaluations conducted by the International EMF Project, an international meeting was held in Moscow 18-22 May 1998. Russian-speaking scientists summarized their findings and gave an overview of the scientific basis for EMF standards, especially as they relate to EMF emissions from mobile telephones and power lines. A report summarizing the scientific results of the meeting, as well as the proceedings of presentations will be published by WHO in Russian and English .

This progress report covers achievements and activities for the period October 1997 to September 1998. Complete details of the EMF Project, its activities and outputs can be found on the home page at: <http://www.who.ch/emf/>.

## **ORGANIZATIONAL STRUCTURE**

The Project has a management advisory arm, the International Advisory Committee (IAC), and a scientific arm, composed of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and WHO collaborating institutions. Activities of both arms are coordinated and facilitated by the WHO Secretariat.

### **International Advisory Committee**

The IAC:

1. Provides a forum for a coordinated international response on the health concerns raised by exposure to EMF.
2. Reviews scientific information related to public and occupational health, and environmental management of the EMF issue.
3. Provides oversight on the conduct of the Project.
4. Reviews outputs from the Project.

### **Collaborating Organizations**

#### **International**

International organizations participating and collaborating with WHO in the Project are:

International Commission on Non-Ionizing Radiation Protection (ICNIRP)  
International Agency for Research on Cancer (IARC)  
International Labour Office (ILO)  
International Telecommunication Union (ITU)  
European Commission (EC)  
International Electrotechnical Commission (IEC)  
United Nations Environment Programme (UNEP)  
North Atlantic Treaty Organization (NATO)

Further details on each of the above organizations are given on the home page or in the EMF Project's progress report for 1996-97.

### **WHO collaborating institutions**

Independent scientific agencies collaborating with WHO on the International EMF Project are:

**NRPB:** National Radiological Protection Board  
Chilton, Didcot, Oxon, OX11 0RQ, United Kingdom

**BfS:** Bundesamt für Strahlenschutz, Institut für Strahlenhygiene  
Ingolstädter Landstrasse 1, D-85764 Oberschleissheim, Germany

**KI:** Karolinska Institute, Institute of Environmental Medicine, Epidemiology Division  
Box 210, S-171 77 Stockholm, Sweden

**FDA:** Food and Drug Administration, Division of Life Sciences, Center for Devices and Radiological Health, 5600 Fishers Lane, Rockville, Maryland, USA

**NIEHS:** National Institute of Environmental Health Sciences, Box 12233, Research Triangle Park, North Carolina 27709, USA

**NIOSH:** National Institute of Occupational Safety and Health, Physical Agents Effects Branch  
Division of Biomedical and Behavioral Science, Mail Stop C-27, 4676 Columbia Parkway  
Cincinnati, Ohio 45226-1998, USA

**NIES:** National Institute for Environmental Studies, Environmental Risk Research Division  
16-2 Onogawa, Tsukuba City, Ibaraki, 305 Japan

### **Current list of interested countries (to June 1998).**

Argentina, Australia, Austria, Bahrain, Belgium, Brazil, Bulgaria, Canada, China, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Hong Kong (China), Hungary, Indonesia, Iran, Ireland, Israel, Italy, Japan, South Korea, Kuwait, Luxembourg, Malaysia, Malta, Mexico, The Netherlands, Norway, New Zealand, Poland, Russian Federation, Singapore, Slovenia, South Africa, Spain, Sweden, Switzerland, United Arab Emirates, United Kingdom, United States of America.

### **Secretariat**

The Project is managed from the WHO Office of Global and Integrated Environmental Health, Geneva by Dr M. H. Repacholi. The Secretariat facilitates all activities and provides coordination among the collaborating agencies and organizations. The Secretariat provides regular reports to the International Advisory Committee and contributors to the Project. WHO

Regional Offices participate where possible and facilitate communications with countries in their regions. During the year Professor Ben Greenebaum worked as a consultant on the EMF Project.

## **SCIENTIFIC WORK**

The scientific work of the Project is conducted by independent scientists and research institutions and by ICNIRP, in conjunction with WHO collaborating institutions.

## **RESEARCH AGENDA**

### **Approach to research requirements**

The International EMF Project has used a planned, step-by-step approach to determining whether EMF exposure can cause or promote cancer or other adverse health effects. Instead of conducting an unstructured evaluation of past studies for evidence of EMF-induced disease, the Project adopted the criteria and procedures established by IARC, the WHO specialized agency for determining whether a physical or chemical agent is a carcinogen. IARC has broad experience in this area and has evaluated over 800 agents. These criteria and procedures have been summarized in the paper of Repacholi and Cardis (1997). IARC surveys existing research to determine what research is necessary before agents can be confirmed as carcinogenic or not carcinogenic. Animal and human cancer studies form the essential data base of information on which IARC evaluates agents. Results of *in vitro* studies provide supporting data for a weight-of-evidence approach to the evaluation of agents as carcinogenic, probably carcinogenic, probably not carcinogenic, or with too little evidence to make a definitive judgement. The International EMF Project is applying the same approach to evaluating the potential for cancer and non-cancer health effects of EMF exposure.

The Project's initial scientific review meetings on RF fields, held in 1996 in Munich, and on static and ELF fields in 1997 in Bologna, identified what biological effects had been confirmed and what research was suggestive of an effect that could have health implications. At an ad hoc Research Coordination Committee meeting in Geneva in December 1997, ongoing research was compared with what research was needed by WHO to better assess health risk. These meetings allowed the compilation of WHO's EMF Research Agenda. The studies in the Agenda are now recommended to scientists, research organizations and funding agencies for completion. In summary, the research still needed is as follows:

### **Radiofrequency Fields**

Relatively high-intensity RF fields have been shown to cause adverse health consequences by heating tissues. No adverse health effects have been scientifically confirmed from exposure to low-level RF fields for extended periods, but certain questions have not been thoroughly studied. Current and future research should focus on the 900-2000 MHz frequency range using modulations and pulsing patterns used by mobile or cellular telephone systems.

It is essential for high quality research that accurate assessment of RF field exposure be an integral part of all future studies and that each research team include scientists skilled in RF dosimetry. It is recommended that studies have a dosimetric precision of 30% or better.

Development of instruments or assessment methods that can conveniently and accurately measure an individual's exposure to RF over an extended period is a high priority for future epidemiological studies.

(i) Several animal experiments, using various RF exposure regimens, are currently under way, and their results should add to the required database for health risk assessment. However, at least two more, large-scale standard 2-year animal bioassays, such as those typically conducted by the US National Toxicology Program, are needed to test for cancer initiation, promotion, co-promotion and progression. These experiments should expose normal animals and animals initiated with chemical carcinogens to RF fields in the mobile telephone frequency range, using one of the common mobile telephone system pulsing patterns, for 2-6 hours daily. Each study should use a range of intensities (normally four different SARs), with the highest being just below the level that may induce temperature changes.

(ii) A large study has suggested that exposure to RF fields increases the incidence of lymphomas in genetically manipulated (transgenic) mice. There is need for at least two further large studies, using designs similar to (I) above, to clarify the issues raised by this study. Follow-up research is also needed that provides information on the health implications of effects found in transgenic animals.

(iii) Additional studies are needed to test the reproducibility of reported changes in hormone levels, effects on the eye, inner ear and cochlea, memory loss, neurodegenerative diseases and neurophysiological effects. These studies can be performed on animals, but where possible, they should be conducted on human volunteers.

(iv) Analysis of current epidemiological studies of people exposed to low levels of RF has not shown any adverse health effects. However, mobile telephone use is relatively new, and further work is needed. As a general principle, studies on populations exposed to RF at higher levels, though still below the threshold of heating, are more likely to provide information regarding the existence of any health effects, even though such exposure levels may not be representative of general-population exposure. Studies of populations exposed to point sources, such as broadcast towers or mobile telephone base stations, are unlikely to be informative about the existence of health effects because of the difficulties in assessing exposure to sources producing low levels of RF. Suggestions of an increased incidence of cancer in populations around mobile telephone base stations have not been substantiated.

There needs to be conducted at least two large-scale epidemiological studies with well characterized, higher-level RF exposures to investigate cancers, particularly in the head and neck, and any disorders associated with the eye or inner ear. These studies should preferably be on mobile telephone users or on workers in industries giving high RF exposures, provided valid exposure assessments can be developed.

(v) Well controlled studies are needed to test people reporting specific symptoms, such as headache, sleep disorders or auditory effects, and who attribute these symptoms to RF exposure. Past human volunteer studies of this type have not successfully linked the symptoms

and exposure. Several more controlled investigations should be performed to investigate neurological, neuroendocrine, and immunological effects.

(vi) *In vitro* studies normally have a lower priority than *in vivo* or human studies in health risk assessment. However, such studies can be of great assistance if they are directly relevant to possible *in vivo* effects, and address the issues of RF exposure thresholds and reproducibility for reported positive effects on cell cycle kinetics, proliferation, gene expression, signal transduction pathways and membrane changes. Theoretical modelling investigations can be useful if they support *in vivo* studies by proposing testable basic mechanisms of RF field exposure.

### **ELF Electric and Magnetic Fields**

Some epidemiological studies have suggested an increased risk of leukaemia in children living near power lines. Whether this is due to exposure to ELF magnetic fields or some other factor in the environment, has yet to be determined. Other unresolved issues for health relate to studies suggesting that ELF exposure may be associated with increases in breast and other cancers in adults, neurodegenerative diseases, such as Alzheimer's, and subjective or non-specific effects, e.g. "hypersensitivity" to electricity.

There have been no published studies specifically investigating possible biological effects from exposure to transients (from switching electric currents) or high frequency harmonic fields that are normally superimposed on 50/60 Hz fields in living and working environments. On theoretical grounds, transient or high frequency harmonic fields are more likely to cause biological effects than sinusoidal 50/60 Hz fields. Additional studies identified as necessary to complete WHO's EMF Research Agenda include:

(i) Thorough surveys of transients and other perturbations of 50/60 Hz fields are needed to better characterize actual fields and to determine their prevalence in the environment. These fields are more likely to produce biological effects than pure sinusoidal 50/60 Hz since they may induce signals in cells above their normal electrical noise levels.

(ii) At least two 2-year standard bioassay animal studies, like those conducted by the US National Toxicology Program, with exposures to ELF fields that include transients (described in (i) above), that test for common types of cancer.

(iii) At least one 2-year standard bioassay animal study, similar to that described in (ii) above, using sinusoidal 50/60 Hz fields and two such studies using transient-perturbed fields, to test specifically for breast cancer.

(iv) Epidemiologists and physical scientists should discuss how to refine their methodologies and assessment of past and present exposure to 50/60 Hz fields and transients. This should be followed by pilot studies that test and validate these refinements. At least two further large, multi-centred epidemiological studies of childhood leukemia are needed that use the best available methods of exposure assessment, including assessment of transient and higher frequency harmonic fields.

(v) Large epidemiological studies are also needed to investigate possible associations between exposure to 50/60 Hz fields and breast cancer or neurodegenerative diseases. These studies should be conducted on highly exposed occupational groups using the best available methods of exposure assessment.

(vi) Human volunteer studies are needed to determine whether ELF fields affect certain hormone levels (e.g. melatonin). These studies should extend the exposures beyond the one night used in past experiments and also test both sexes. It is important that future studies test for effects caused by transients and other perturbed fields.

If results of current studies of people claiming hypersensitivity to ELF fields are confirmed, particularly studies of their responses to fields applied in controlled laboratory situations, these reports should be investigated to determine what further research is needed.

(vii) *In vitro* studies are needed that are directly relevant to possible *in vivo* effects, and that address the issues of ELF exposure thresholds and reproducibility for reported positive effects on cell cycle kinetics, proliferation, gene expression, signal transduction pathways and membrane changes.

Theoretical modelling investigations are also needed that support *in vivo* studies by proposing testable basic mechanisms on how low-intensity fields and realistic environmental transients might interact with biological systems.

### Static Fields

Research to date indicates that static electric fields do not produce deleterious health effects in humans at levels found in the environment or workplace. Therefore, further research into their possible effects is not recommended at this time.

Static magnetic fields are known to produce health effects only at very high field strengths. Technologies, such as magnetically levitated trains, medical diagnosis and treatment, and industrial applications are increasing in use or are being developed. They use intermediate or high-intensity static magnetic fields, which could increase public and worker exposure significantly. More information on possible long-term effects on health from exposure to static magnetic fields is needed. Studies needed to provide this information include:

(i) At least two standard 2-year animal bioassay studies concentrating on cancer-related effects. These studies should follow criteria used by the US National Toxicology Program.

(ii) At least two large-scale, multi-centre epidemiological studies on workers that characterize static magnetic field exposure well, minimize confounding factors, and include measurements of exposure from other sources of EMF.

(iii) Additional studies are needed that examine biological effects of exposure to combined static and time-varying fields, including transients, particularly those found in transportation systems.

### **ELECTROMAGNETIC FIELDS RESEARCH IN EASTERN EUROPE**

The international seminar that was held in Moscow from 18 to 22 May 1998, allowed Eastern European scientists to summarize their work, particularly that previously published only in Russian. The research presented covered the entire frequency range 0-300 GHz. The meeting also allowed the rationales for current EMF standards in Commonwealth of Independent States (CIS) countries to be explained. The seminar was coordinated by the WHO Project Secretariat in collaboration with Professor Nikolay Izmerov, Director of the Russian Academy of Medical Science's Institute of Occupational Health, and Professor Yuri Grigoriev, General Director of the Centre of Bioelectromagnetic Compatibility within the Institute of Biophysics. A summary of the content and results of this meeting will be published as soon as possible.

### **EMF PROJECT SEMINARS AND MEETINGS IN SUPPORT OF NATIONAL PROGRAMMES**

Over the year a number of seminars and meetings have been supported by the EMF Project to assist national authorities requiring information about EMF-induced health effects and updates on progress of Project activities and outputs. Examples of these are given below:

1. Seminar on EMF and health. Slovenian Institute of Quality and Metrology. 13 October 1997, Ljubljana, Slovenia.
2. Mobile telephony: Biological research and health effects. 20 October 1997, Marconi Foundation, Milan, Italy.
3. GSM: Health and environmental protection - regulations and research facts. 4 February 1998, Polish Ministry of Health, Warsaw, Poland.
4. WHO/EMRO/AGFUND Intercountry training workshop on EMF. 22-25 February 1998, Dubai, UAE.
5. International Conference: Mobile telephones and the community. 6 March 1998, Irish Department of Public Enterprise, Dublin, Ireland.
6. Seminar on ELF fields and health. 17 March 1998, WHO European Centre for Environment and Health, Rome Italy.
7. Postgraduate course for safety professionals. Lectures on EMF. 24-26 March 1998, Umea University, Umea, Sweden.

8. Seminar on EMF fields and health and update on International EMF Project. 27 March 1998, Dutch Health Council, The Hague, Netherlands.
9. NIEHS seminar on EMF *in vivo* studies. 6-9 April 1998, Phoenix, Arizona, USA.
10. EMF biological effects and standards. 7 April 1998, Tokyo, Japan.
11. EMF biological effects and the International EMF Project. 11 April 1998, Seoul, South Korea.
12. Review of the International EMF Project, 24 April 1998, Düsseldorf, Germany.
13. EMF biological effects and hygienic standards, 18-22 May 1998, Moscow, Russia.
14. First world congress on health and urban environment. Roundtable on EMF, 10 July 1998, Madrid, Spain.
15. International seminar on EMF risk perception, communication and management, 31 August-4 September 1998, Ottawa, Canada.
16. Workshop on epidemiology exposure metrics, 7-9 September 1998, National Radiological Protection Board (NRPB), Oxford, UK.
17. International workshop on EMF and non-specific health symptoms, 18-20 September 1998, Graz, Austria.

#### **Upcoming meetings**

1. Seminar on EMF biological effects and update of International EMF Project. 9 October 1998, Ljubljana, Slovenia.
2. NATO advanced research workshop on RF dosimetry and its relationship to biological effects of EMF. 12-16 October 1998, Gozd Martuljek, Slovenia.
3. Roundtable on EMF Standards. Associated with European Bioelectromagnetics Society meeting. 18-22 November 1998, Zagreb, Croatia.
4. International Seminar on Biological and Health Effects of Exposure to EMF in the Intermediate Frequency Range (300 Hz - 10 MHz). 7-10 June 1999, Maastricht, Netherlands.
5. International Review of the Biological and Health Effects, and Standards for Radiofrequency Fields. 20-30 November 1999, Erice, Sicily, Italy.

## **EMF RISK PERCEPTION, COMMUNICATION AND MANAGEMENT**

An international seminar was held in Vienna from 22 to 23 October 1997 to discuss application of the principles of risk perception and risk management to EMF fields. The seminar was followed by working group meetings (24-25 October 1997) that shaped a draft report on this topic. This draft was scientifically edited and subjected to further working group meetings of specialists on risk issues in Ottawa from 31 August to 4 September 1998.

The proceedings of the Vienna seminar have already been published by ICNIRP (December 1997). Further publications concerning this issue will be the proceedings of the Ottawa meeting, a WHO monograph and a Handbook. Terms of reference for the monograph are as follows:

- It is intended for use by governmental and non-governmental authorities, as well as by individuals seeking further information about this topic.
- An important objective is to foster a better understanding of governmental, non-governmental, and individual views on EMF issues, how they can be better communicated, and how fruitful discussion of disagreements can be fostered.
- It will provide an easily readable overview of the characteristics and underlying assumptions of peoples' perceptions of EMF risk, differences between scientific, governmental and popular views, and why these occur. Theoretical concepts of risk perception and risk communication will be presented and explained as necessary to provide context and understanding.
- It will be practical and provide sufficient information for agencies and organizations to examine their current approaches to EMF and to design better and more effective information and risk management programmes. Information provided should be "user friendly" and "menu-driven" (e.g. through extensive indexing) where possible.
- Its information will be useful to individuals and capable of helping them better understand the process of scientifically-based risk assessment, the approaches and assumptions involved, and their reliability.

The Handbook will be a user-friendly, how-to publication with some 40 frequently asked questions answered within a format that is easily read and practical for EMF programme managers who need basic information on EMF risk perception, communication and management.

## **HEALTH EFFECTS DUE TO PERCEPTION OF EMF HAZARD**

A meeting was held in Graz, Austria (19-20 September 1998), in conjunction with the European Union's COST 244 bis project, on health effects that are experienced by people who perceive that there is a health risk from EMF exposure. Such psychosocial or subjective health effects can take in many forms, including headaches, dizziness, sleep disturbance, etc. The effects may also be manifested as a generalized sense of hypersensitivity to electricity through

a variety of symptoms. These effects are to be distinguished from those which are caused by direct physical interactions between the body and EMF, though if EMF is shown to induce adverse effects from low-level exposure, it is possible that both types of effects may occur simultaneously. Much data concerning psychosocial or subjective health effects has already been accumulated through studies of these effects reported by residents in areas contaminated by radioactive materials from the Chernobyl accident.

In addition to the proceedings of the presentations at this meeting, a separate WHO publication is being planned containing a summary of current knowledge and recommendations for further research. This review on perception of EMF hazards will determine what further action is needed within the International EMF Project.

## **ENVIRONMENTAL HEALTH CRITERIA REVIEWS**

The International EMF Project will publish EHC reviews of the scientific literature on RF, ELF and static fields towards the end of the International EMF Project. The revised schedule of activities and outputs for the Project includes plans for EHC task groups for the static and ELF fields in 2002 and for the RF fields in 2003 or 2004. These publications have been timed to allow the research identified by the 1996 and 1997 scientific review meetings to be completed and their results reviewed and incorporated into the final EHC publication. Further, the timing of the task groups has been aligned with the carcinogen identification and evaluations of IARC, which will occur in 2001 for static and ELF fields, and 2003 for RF fields. The EHC monographs will incorporate the cancer reviews conducted by IARC, updating them as necessary, and will also provide an assessment of all non-cancer health effects of EMF exposure.

EHC publications are the result of in-depth critical reviews conducted through independent, scientific peer-review groups on various topics related to exposure of people, biological systems and the environment. The reviews will build on excellent reviews already completed and concentrate attention on the major research works already published, as well as the more recent literature. For the EMF EHC's, reviews will be conducted of the peer reviewed literature, although reports and other publications of well conducted research not in the peer reviewed literature will also be considered. Conference abstracts will not be considered.

Draft reviews of the physics/engineering, biology and epidemiology research results are being prepared by ICNIRP in conjunction with WHO collaborating institutions. When they are completed they will be sent to various agencies, institutions and individual scientists for review. Once comments have been incorporated, a combined report will be subjected to a formally constituted Task Group meeting. Membership of these Task Groups are approved by the Executive Director (Health and Environment) of WHO and will comprise representatives of the drafting committees and experts appointed by speciality, range of views, gender and geographical distribution. Following technical editing, the final document will be reviewed by the International Advisory Committee and then published as an EHC monograph by WHO.

## HOME PAGE

Over the past year, a home page on the Internet (World Wide Web) has been established at the address <http://www.who.ch/emf/>. The URL coordinates of the home page changed during the past year as part of the upgrading of the general WHO framework for the world wide web. The WHO/EMF home page provides details about the organization and scientific structure of the Project, a schedule of activities and outputs, an update on current events, copies of press releases and fact sheets in several languages, all reports of IAC and scientific meetings, publications and their availability, and details of future meetings. According to the latest statistics available before the drafting of this report, the EMF home page was accessed almost 1000 times in April 1998. The largest number of people linked to the index of Fact Sheets and press releases.

## BROCHURES

A one-page brochure about the International EMF Project was published that gives a simple description of the Project's aims and objectives, why WHO is involved, Project administrative and working procedures, national and international partners, WHO's definition of a health hazard and the distinction between this and a simple biological effect, and where to obtain further information.

An extensive booklet on Electromagnetic Fields is being drafted in conjunction with the WHO European Regional Office. It is written for the lay public and local authorities, and should be published late in 1998. This booklet gives details on the physical characteristics and biological effects of EMF, standards and protective measures, and is presented in a glossy format with many pictures and diagrams for ease of comprehension.

## FACT SHEETS

The following WHO Fact Sheets concerning EMF have been published or are being drafted:

- Electromagnetic Fields and Public Health: The International EMF Project. WHO Fact Sheet #181 Oct. 1997, reviewed May 1998. (Available in English, French, Spanish, German and Russian)
- Electromagnetic Fields and Public Health: Physical Properties and Effects on Biological Systems. WHO Fact Sheet #182 Oct. 1997, reviewed May 1998. (Available in English, French, Spanish, Italian, German and Russian)
- Electromagnetic Fields and Public Health: Health Effects of Radiofrequency Fields. WHO Fact Sheet #183 Oct. 1997, reviewed May 1998. (Available in English, French, Spanish, Italian, German and Russian)

- Electromagnetic Fields and Public Health: Public Perception of EMF Risks. WHO Fact Sheet #184 Oct. 1997, reviewed May 1998. (Available in English, French, Spanish, Italian, German and Russian)
- Electromagnetic Fields and Public Health: Mobile Telephones and their Base Stations. WHO Fact Sheet #193 May 1998. (Available in English, French, Spanish, Italian and Russian)
- Video Display Units (VDUs) and Human Health. WHO Fact Sheet #201 July 1998 (Available in English, French, Italian and Spanish).
- Electromagnetic Fields and Public Health: Extremely Low Frequency (ELF) Electromagnetic Fields. WHO Fact Sheet #XXX Being drafted

Most published Fact Sheets are now available in English, French, Italian, German, Russian and Spanish. Translation into Japanese, Dutch and Arabic is currently in progress. Translation into other languages would be considered if national authorities could assist. WHO fact sheets are available on the Project home page.

## **PRESS RELEASES**

The following press releases have been published by WHO on the Project:

- WHO Launches New International Project to Assess Health Effects of Electric and Magnetic Fields. Press release WHO/42, 4 June 1996.
- Electromagnetic fields: Experts Met in Vienna to Assess Public Perceptions of Risks. Press release WHO/75, 23 October, 1997.
- Health Effects of Electromagnetic Fields: WHO Recommends Research Priorities. Press release WHO/95, 19 December 1997.
- Scientists Meet in Moscow to Discuss Adverse Effects of Electromagnetic Fields. Press release WHO/38, 20 May 1998.

All press releases are available in English and French, and some are available in other languages, particularly the language of the city in which the release was issued. Further details can be obtained from the Programme Manager, Health Communications and Public Relations, WHO, Geneva, Tel: +41 22 791 2532, Fax: +41 22 791 4858. All WHO press releases can be obtained on the Internet on the WHO HOME PAGE <http://www.who.ch/>.

## **FINANCIAL SUMMARY**

Financial support for the Project has been received from the governments of: Austria, Australia, Canada, Germany, Hong Kong, Ireland, Israel, Japan, New Zealand, South Korea, Slovenia, Sweden, Switzerland, the United Kingdom and the United States of America. Many other governments are in the process of obtaining funds for continuing Project activities. A summary of the funds collected and expended to date and requirements of the Project is attached as Annex 1.

## PROJECT PUBLICATIONS

A complete listing of publications and reports of the International EMF Project is given below in chronological order:

- WHO Launches New International Project to Assess Health Effects of Electric and Magnetic Fields. Press Release WHO/42, 4 June 1996.
- Minutes: First International Advisory Committee meeting (30-31 May 1996) WHO/EHG/96.14.
- Progress Report (1995-1996) WHO/EHG 96.19
- Minutes: Second International Advisory Committee meeting (30-31 May 1997), WHO/EHG/97.14.
- Progress Report (1996-1997) WHO/EHG 97.19
- Electromagnetic Fields: Experts Met in Vienna to Assess Public Perceptions of Risks. Press release WHO/75, 23 October, 1997.
- Minutes: First Research Coordination meeting (4-5 December 1997), WHO/EHG/98.14
- Health Effects of Electromagnetic Fields: WHO Recommends Research Priorities. Press release WHO/95, 19 December 1997.
- WHO's Agenda for EMF Research WHO/EHG/98.13
- International EMF Project leaflet WHO/EHG/98.7
- Electromagnetic Fields and Public Health: The International EMF Project. WHO Fact Sheet #181 October 1997, reviewed May 1998
- Electromagnetic Fields and Public Health: Physical Properties and Effects on Biological Systems. WHO Fact Sheet #182 October 1997, reviewed May 1998
- Electromagnetic Fields and Public Health: Health effects of Radiofrequency Fields. WHO Fact Sheet #183 October 1997, reviewed May 1998
- Electromagnetic Fields and Public Health: Public Perception of EMF Risks. WHO Fact Sheet #184 October 1997, reviewed May 1998
- Non-Thermal Effects of RF Electromagnetic Fields. R Matthes, J Bernhardt and MH Repacholi (eds) Proceedings of Munich meeting, November 1996. ICNIRP Pub. 3/97. From: ICNIRP C/- Bundesamt für Strahlenschutz, Institut für Strahlenhygiene, Ingolstädter Landstraße 1, D-85764 Oberschleißheim, Germany. Tel: +49 89 31603288, Fax: +49 89 316 03289, E-mail R Matthes@bfs.de
- Biological effects of static and ELF fields. R Matthes, J Bernhardt and MH Repacholi (eds), Proceedings of Bologna meeting, June 1997. ICNIRP Pub. 4/97. From: ICNIRP C/- Bundesamt für Strahlenschutz, Institut für Strahlenhygiene, Ingolstädter Landstraße 1, D-85764 Oberschleißheim, Germany. Tel: +49 89 31603288, Fax: +49 89 316 03289, E-mail RMatthes@bfs.de
- Risk Perception, Risk Communication and its Application to EMF Exposure. R Matthes, J Bernhardt and MH Repacholi (eds) Proceedings of Vienna meeting, October 1997. ICNIRP Pub 5/98. From: ICNIRP C/- Bundesamt für Strahlenschutz, Institut für Strahlenhygiene, Ingolstädter Landstraße 1, D-85764 Oberschleißheim, Germany. Tel: +49 89 31603288, Fax: +49 89 316 03289, E-mail RMatthes@bfs.de.
- Repacholi MH, Cardis E (1997): Criteria for EMF Health Risk Assessment. Radiat Prot Dosim 72: 305-312.
- Munich Meeting Report: MH Repacholi (ed) (1998) Low-level Exposure to Radiofrequency Fields: Health Effects and Research Needs. Bioelectromagnetics 19: 1-19.

- Bologna meeting report: MH Repacholi and B Greenebaum (eds) (1998) Interaction of Static and Extremely Low Frequency Electric and Magnetic Fields on Living Systems: Health Effects and Research Needs. Submitted to Bioelectromagnetics.
- Scientists meet in Moscow to Discuss Adverse Effects of Electromagnetic Fields. Press release WHO/38, 20 May 1998.
- Electromagnetic Fields and Public Health: Mobile Telephones and their Base Stations. WHO Fact Sheet #193 May 1998.
- Video display units (VDUs) and Human Health. WHO Fact Sheet #201, July 1998.

**FOR FURTHER INFORMATION:**

Visit the International EMF Project World Wide Web site at

<http://www.who.int/emf/>

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## INTERNATIONAL EMF PROJECT

**Financial Statement 1996-1998**  
**Interim statement of income and expenditure as at 12 May 1998**

	Income received at WHO US\$	Expenditure US\$
	1 031 734	
Salaries (to end of 1998)		431 800
Secretarial support		199 870
Travel (WHO staff and others)		45 067
Work contracts		42 613
Consultants		83 972
Miscellaneous (postage, audiovisual & computer supplies, etc.)		12 773
Publications		2 750
Programme Support Costs		134 125
	1 031 734	952 970
Balance		78 764
Funds needed for 5-year Project:		3 330 000
Funds expected before end of 1998	196 400	
Balance at mid-May 1998	78 764	
Funds pledged (approx.)	900 000	
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		2 206 898