



# Overview of European Commission and EU research

Paolo Ravazzani



Consiglio Nazionale delle Ricerche



Istituto di Elettronica, Ingegneria dell'Informazione e Telecomunicazioni IEIT

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# The European Commission Projects on EMF and Health



EFHRAN (2009-2012)



SEAWIND (2009-2012)



ARIMMORA (2011-2015)



COST ACTION EMF-MED (2014-2018)



OTHER EC FP7 EMF PROJECTS



# The EFHRAN project: an European experience of EMF Health Risk Assessment

- European Commission DG SANCO
  - Executive Agency for Health and Consumers EAHC
  - Health 2008 Programme - Second programme of community action in the field of health (2008- 2013)
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- Starting date: February 1, 2009
  - Ending date: July 31, 2012



# The EFHRAN Project

- Consiglio Nazionale delle Ricerche, Istituto di Ingegneria Biomedica – Italy - *Paolo Ravazzani*
- ICEMB – Italy - *Guillermo D’Inzeo*
- Fundació Centre de Recerca en Epidemiologia Ambiental (CREAL) – Spain - *Elisabeth Cardis*
- Institute of Nonionizing Radiation – Slovenia - *Peter Gajšek*
- Kraeftens Bekaempelse (Danish Cancer Society) – Denmark - *Aslak Harbo Poulsen & Joachim Schüz*
- Health Protection Agency – United Kingdom - *Zenon Sienkiewicz*
- National "Frédéric Joliot-Curie" Research Inst. for Radiobiology and Radiohygiene – Hungary - *Gyorgy Thuroczy*
- Laboratoire de l'Intégration du Matériau au Système, UMR 5218 CNRS – France - *Bernard Veyret*



# Activities

## **Risk Analysis**

- Report on the analysis of risks associated to exposure to EMF: in vitro and in vivo (animals) studies [July 2010]
- Risk analysis of human exposure to EMF [July 2010 – revised October 2012]

## **Exposure Assessment**

- Report on the level of exposure (frequency, patterns and modulation) in the European Union. Part 1: Radiofrequency radiation [August 2010]
- Report on the level of exposure (frequency, patterns and modulation) in the European Union. Part 1: Low frequency fields [June 2011]

## **Dose-response assessment and risk characterization**

- Reports on health impact [October 2012]

## **Input to the future**

- Report on inputs to future risk management processes [October 2012]

## Inputs to future risk management and communication actions 1/2

- Investment in the collection of data on the actual levels of EMF exposure among the European population, for all frequency ranges.
- Investment in the study of biophysical and biological mechanisms of interaction, using innovative theory and techniques, such as quantum mechanics (QM) molecular simulations, systems biology and proteomics.
- Investment in studies related to specific novel uses of EMF-emitting devices, in particular at Intermediate Frequency technologies (radio frequency identification systems (RFID), anti-theft gates), and specific population subgroups, such as children.
- Building upon existing epidemiological resources with improved exposure assessment and exposure validations to provide answers to outstanding questions on EMF health effects (reproductive, behavioral, cancer, etc.) in relation to RF and IF wherever possible.

## Inputs to future risk management and communication actions 2/2

- Evaluating, where possible, joint effects of EMF and of other environmental agents to which humans are exposed in the general environment and at work.
- Investment in (technical and non-technical) methods for reducing exposure of the population, and to improve and facilitate health risk communication to the general public.
- Improvement in health risk communication to reduce the gaps between relevant scientific evidence and European citizens' health risk perception.

### PUBLICATIONS

- Grellier J, Ravazzani P, Cardis E: Potential health impacts of residential exposures to extremely low frequency magnetic fields in Europe. *Environment International*, vol. 62, p. 55-63, 2014
- Gajšek P., Ravazzani P., Wiart J., Grellier J., Samaras T. and Thuróczy G.: Electromagnetic field (EMF) exposure assessment in Europe. *Radio Frequency Fields (10 MHz - 6 GHz). Journal of Exposure Science and Environmental Epidemiology*. 2013 Aug 14; [Epub ahead of print].

<http://efhran.polimi.it>





## SEAWIND

# Sound Exposure and Risk Assessment of Wireless Network Devices

12/2009 – 11/2012



# Partners

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- Foundation for Research on Information Technologies in Society, Switzerland (Coordinator)
- Interdisciplinary Institute for BroadBand Technology, Belgium
- University of Aalborg, Department of Electronic Systems, Denmark
- Aristotle University of Thessaloniki, Department of Physics, Greece
- Fraunhofer-Institute of Toxicology and Experimental Medicine, Germany
- University of Basel, Department of Biomedicine, Switzerland
- Dialogik GmbH, Germany
- Schmid & Partner Engineering AG, Switzerland

# Background

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- Public exposure to RF EMF has increased dramatically in the last two decades.
- There is an exponential growth of wireless network device usage in homes, offices and schools including
  - Data via Mobile Networks
  - WLAN/WiFi
  - WPAN/WiMax
  - RFID
- Insufficient studies on the effects of the pervasive and prolonged EMF exposure of wireless network device usage on human health

# Objectives

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- Investigation of exposure of wireless technology by
  - providing comprehensive measurements of public exposure
  - determining the fields induced inside the body
  - screening for potential biological sensitivities at the molecular, developmental and functional levels in cells,
  - evaluation of the safety and risks of the investigated technologies.

# Main Results

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- Identification of the most relevant exposure technologies, which is currently dominated by the systems integrated in smart phones and tablet computers (GSM, UMTS, LTE, and WiFi).
- Development of methodologies (novel propagation models inside rooms) and instrumentation (measurement protocols, novel calibration methods) for assessing the maximum and typical exposures to the primary RF sources inside buildings.
- Generation of a translation matrix from incident fields (external to the body) to induced fields (internal to the body) in the various tissue types from more than 7000 simulations.

# Main Results

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- Development of exposure systems for cells and animals and a live-cell imaging system. The latter is the first-ever reported system to provide real-time analysis of cellular responses.
- Previously reported DNA damage after exposure to specific wireless EMF signals was not reproducible. However, the experimental results indicated novel modulation-specific electromagnetic effects and interference with cellular homeostasis, potentially serving as a launching pad for future investigations.
- The project results provided significant input for several international standards for assessing the wireless network device exposures.



## Advanced Research on Interaction Mechanisms of electroMagnetic exposures with Organisms for Risk Assessment

# ARIMMORA - Consortium

- Foundation for Research on Information Technologies in Society, Switzerland (Coordinator)
- University of Basel, Department of Biomedicine, Switzerland
- Weizmann Institute of Science, Israel
- Fraunhofer-Institute of Toxicology and Experimental Medicine, Germany
- Stiftung Tierärztliche Hochschule Hannover, Germany
- Schmid & Partner Engineering AG, Switzerland
- Agencia Estatal Consejo Superior de Investigaciones Cientificas, Spain
- Centre International de Recherche sur le Cancer, France
- Consiglio Nazionale delle Ricerche, Italy

# Background

- Epidemiological evidence supports an association between residential exposure to extremely low frequency magnetic fields (ELF MF) and childhood leukaemia.
- ELF MF have therefore been classified as possibly carcinogenic to humans.
- However, the evidence for a causal relationship between ELF-MF at the microtesla level and malignant disease based on laboratory studies in animals and cells is weak and is unsupported by biophysical studies.



# ARIMMORA - Objective

- Maximization of the likelihood of detecting **interaction mechanisms of ELF-MF with organisms** or, alternatively, showing their absence to clarify a possible causal relationship between ELF MF exposure and cancer, especially childhood leukaemia by
  - developing and applying novel experimental and computational techniques to close knowledge gaps in the exposure assessment to ELF MF
  - applying advanced biological *in vitro*, *ex vivo* and *in vivo* models and techniques under well-defined exposure conditions to test likely interaction mechanisms
- Performing **risk assessment** and providing EU policy makers and health authorities, the scientific community, standardization bodies and all other concerned stakeholders with the scientific basis for assessing risks and associated uncertainties

# ARIMMORA

- Application of the **most advanced tools** in a broad and comprehensive approach with a consortium of **world-leading competence centres** in
  - epigenetics
  - signalling cascades
  - leukaemia *in vivo* models
  - *in vivo* toxicology
  - EMF-sensitive animal models
  - exposure assessment
  - biophysical modelling
  - risk evaluation

# ARIMMORA will give novel insight into ELF EMF and.....

- epigenetic dynamics associated with hematopoietic differentiation, potentially underlying cellular transformation to leukemia
- epigenetic stability in leukaemic and healthy cells including investigation of cellular responses;
- haematopoiesis in in vivo models, which are relevant for the development of childhood B-cell leukaemia;
- exposure of children in their daily lives and the relation between normal activity and exposures from far-field and near-field sources;
- tissue-specific and organ-specific induced field quantities as function of age, posture, and MF source;
- provide novel instrumentation that for the first time will enable routine exposure assessments in the near-field of sources
- provide knowledge needed by standardization groups to refine safety standards.



COST Action BM1309:  
EMF-MED – European network for innovative uses of  
electromagnetic fields in biomedical applications

## COST Action BM1309: EMF-MED – European network for innovative uses of electromagnetic fields in biomedical applications

- Approved in November 2013
- Kick-off in Spring 2014
- Initial list of participants (proposal stage):
  - >25 EU (COST) countries and USA >80 experts
- Network still growing...

## EMF-MED Summary:

- COST EMF-MED will provide a **cooperative framework** to support the research on beneficial biological effects of non-ionizing electromagnetic fields (EMFs) and their use in biomedical applications.
- Research on biological effects of EMFs has traditionally focused on health risks. EMF-MED will focus on **beneficial effects**, aiming for breakthrough results, new discoveries and innovative biomedical technologies.

## EMF-MED Summary (2):

- The Action aims to provide a **better understanding of** underlying physical and biological **interaction mechanisms**, related to both cancer and non-cancer applications, filling the gaps in present state of knowledge.
- Ultimately, EMF-MED will contribute to the development and optimization of **innovative EMF-based medical devices and procedures**, which will be safer, more efficient and less invasive.

COST Action EMF-MED Proposer:

**Prof. Dr. Antonio Šarolić**

FESB, University of Split

e-mail: [antonio.sarolic@fesb.hr](mailto:antonio.sarolic@fesb.hr)

COST funds pan-European, bottom-up networks of scientists and researchers.

These networks, called 'COST Actions', promote international coordination of nationally-funded research.

For details on COST (European Cooperation in Science and Technology), please visit [www.cost.eu](http://www.cost.eu).



## Other EC projects on EMF

# Other EC FP7 projects on EMF



- Wide Mob (2010-2013)

- <http://eeepro.shef.ac.uk/wide-mob/index.html>



- EMsafety (2011-2014)

- <http://www.sintef.no/Projectweb/EM-Safety/>



- Hemis (2012-2014)

- <http://www.hemis-eu.org/news.html>



- EMFWeld (2012-2014)

- <http://www.emfweld.com>



*Science consists in grouping facts so that general laws or conclusions may be drawn from them*

*Charles Darwin*

