

# Systematic review on radiofrequency electromagnetic field exposure in the everyday environment

## Background

Currently the World Health Organization (WHO) is in the process of writing the Environmental Health Criteria Monograph for radiofrequency electromagnetic fields (RFEMF). The first draft document of more than 1000 pages addressing all relevant health effects is online and available for public consultation ([http://www.who.int/pehemf/research/rf\\_ehc\\_page/en/](http://www.who.int/pehemf/research/rf_ehc_page/en/)). This document addresses potential health effects in a systematic way that includes results from all scientific disciplines including cell, animal and human studies.

In addition, the consortium of the EU study ARIMMORA has planned a comprehensive risk assessment on childhood leukaemia and extremely low frequency magnetic fields (ELF-MF) including an evaluation of biological mechanisms in spring 2015 (<http://arimmora-fp7.eu/>). It does not make sense to duplicate any of these topics at the moment. However, there is an obvious lack of a systematic review on typical RF-EMF exposure levels in the everyday environment, which is not addressed in the WHO Monograph in a systematic manner. A review conducted within the EU project EFHRAN for ELF-MF and RF-EMF (<http://efhran.polimi.it/dissemination.html>) did not follow a systematic approach for the latter and is outdated since it was conducted in 2010.<sup>1</sup> Thus, a new review on RF-EMF exposure following a systematic approach will fill an important knowledge gap, which could not only help mitigating public concerns about electromagnetic exposure and potential health risks, but also enable effective exposure policies including appropriate risk communication.

## Objectives

The objective of this project is to conduct a systematic review of the distribution of RF-EMF exposure in the everyday environment in Europe. In particular, it aims at:

- deriving exposure distribution functions for total RF-EMF exposure for population samples and specific microenvironments such as private homes, schools and workplaces, public places and railway stations;
- assessing the contribution of different sources to total RF-EMF exposure at population and microenvironmental level;
- putting environmental (far field) RF-EMF exposure levels into context to exposure from devices operating close to the body.

## Expected results

Better knowledge of the exposure of the general population to RF-EMF exposure has been identified as a research priority by the WHO for its research agenda.<sup>2</sup> A preliminary literature search revealed approximately 50 to 60 relevant and eligible papers for this review. The approach of this review is novel and innovative since the application of systematic review techniques is common for health reviews but unusual for exposure assessment. However, without a systematic approach, measurement studies using different measurement techniques and sampling selection strategies are difficult to compare. Thus, the results of the project are of high interest for both, the scientific community and lay people. Lay persons and even experts<sup>1</sup> have little knowledge about EMF exposure in our environment. Lack of such knowledge impedes effective exposure policies including appropriate risk communication and risk assessment.<sup>3</sup> In order to address lay persons we will not only write a scientific article but also a lay summary for a German language journal.

## References

1. Grellier J, Ravazzani P, Cardis E. Potential health impacts of residential exposures to extremely low frequency magnetic fields in Europe. *Environment international* 2014;62:55-63.
2. van Deventer E, van Rongen E, Saunders R. WHO research agenda for radiofrequency fields. *Bioelectromagnetics* 2011;32(5):417-21.

3. Dürrenberger G, Fröhlich J, Rösli M, et al. EMF monitoring-concepts, activities, gaps and options. *International journal of environmental research and public health* 2014;11(9):9460-79.

### Own Publications

Full list see: <http://www.researcherid.com/rid/A-2658-2008>

- Urbinello D., ..., Rösli M. Temporal trends of radio-frequency electromagnetic field (RF-EMF) exposure in everyday environments across European cities, *Environmental Research*, 2014, 134: 134–142.
- Hauri D.D., ..., Rösli M. Exposure to radio-frequency electromagnetic fields from broadcast transmitters and risk of childhood cancer: a census-based cohort study, *American Journal of Epidemiology*, 2014, 79(7):843–851.
- Urbinello D., ..., Rösli M. Radio-frequency electromagnetic field (RF-EMF) exposure levels in different European outdoor urban environments in comparison with regulatory limits, *Environmental International* 2014, 68: 49–54.
- Lauer O., ..., Rösli M., Fröhlich J. Combining near- and far-field exposure for an organ-specific and whole-body RF-EMF proxy for epidemiological research: a reference case. *Bioelectromagnetics* 2013, 34 (5): 366-374.
- Joseph W., Frei P., Rösli M., et al. Between-country comparison of whole-body SAR from personal exposure data in urban areas, *Bioelectromagnetics* 2012, 33 (8): 682-694.
- Aydin D., ..., Rösli M. Mobile phone use and risk of brain tumours in children and adolescents: a multicenter case-control study (CEFALO). *Journal of the National Cancer Institute* 2011, 103 (16): 1264-1276.
- Frei P., ..., Rösli M. and the QUALIFEX-team. Classification of personal exposure to radio frequency electromagnetic fields (RF-EMF) for epidemiological research: evaluation of different exposure assessment methods. *Environmental International* 2010, 36 (7): 714–720.
- Frei P., ..., Rösli M. Temporal and spatial variability of personal exposure to radio frequency electromagnetic fields. *Environmental Research* 2009, 109 (6): 779-785.