

Replication and extension

by Gregor Dürrenberger



Background

In 2003, Zwamborn et al. from the Dutch TNO Institute published a widely noticed study (here: TNO study) investigating the influence of GSM and UMTS-similar electromagnetic fields on subjective well-being and cognitive performance in humans. There were two test groups: “electrosensitive” and “non-electrosensitive” persons (self-reported). Neither effects on well-being nor a consistent influence on cognitive functions caused by GSM radiation could be found. In contrast, exposure to a UMTS signal did lead to a decrease in well-being in both groups and to an improvement in cognitive performance related to a test (“visual selective attention test”). Although the study was of generally good quality, it has repeatedly been criticized for weaknesses in design, methodology and evaluation, and there was the request to verify or falsify results in a replication (Health Council of the Netherlands, 2004).

Participants and funding

After a longer preparation phase, funds required for a replication study are now available. The project was launched at the beginning of September. It was commissioned by the Swiss Research Foundation on Mobile Communication, ETH Zurich (<http://www.mobile-research.ethz.ch>). Director of the investigation is PD Dr. Peter Achermann, University of Zurich, Institute of Pharmacology and Toxicology (<http://www.unizh.ch/phar/sleep/handy/>). Other participants involved are Prof. Niels Kuster, IT'IS and ETH Zurich (<http://itis.ethz.ch/>) and Dr. Martin Röösli, University of Bern, Institute of Social and Preventive Medicine (<http://www.ispm.unibe.ch/>). Project funds amount to



Continuation of the TNO study Switzerland

723,000 Franken. 60% are covered by the state: the Swiss Ministries of Health (BAG), Environment (BUWAL) and Telecommunications (BAKOM), as well as the Dutch Ministries of Economy (EZ), Health (VWS), Housing, Spatial Planning and the Environment (VROM), and Social Affairs and Employment (SZW); and 40% by the industry (Swisscom Mobile, Orange and Sunrise). The study focuses on the replication of effects from UMTS radiation on human well-being and cognitive functions. Based on a feasibility study commissioned by the BAG, and in cooperation with the TNO, methodology was improved and extended. The replication study is monitored by an expert panel.

Objective and hypotheses

Based on the TNO study results, the objective of the replication study is to reproduce the experiments investigating the influence of UMTS-similar electromagnetic radiation on human well-being and cognition. Two field strengths are applied in tests done in persons with or without subjective disorders associated with electromagnetic radiation. The working hypothesis is based on the assumption that UMTS exposure might lead to a possibly dose-related decrease in well-being in both examined groups, as was indicated in the Dutch study. In contrast, effects of UMTS-similar radiation on cognition are not expected.

Design and methodology

The UMTS field conditions applied in the TNO study (1 V/m) will be reproduced with an identical exposure setup. In addition, a field strength of 10 V/m shall be applied in order to determine a possible dose-effect relation, if effects are reproducible. The applied sig-

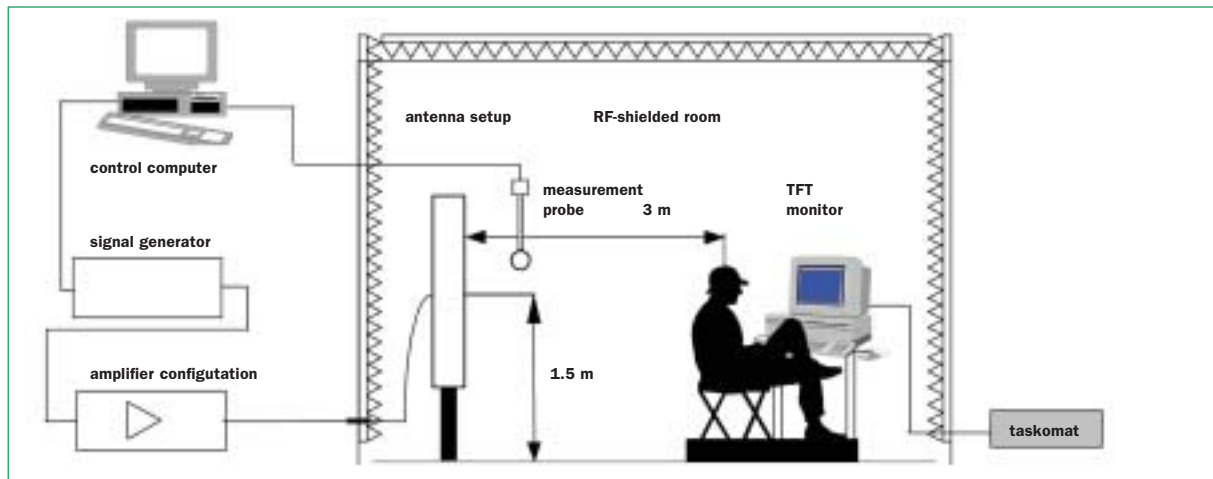
nal is a FDD signal without call simulation, just as used in the TNO study. Test persons will be examined under three exposure conditions (control, UMTS 1 V/m, UMTS 10 V/m) using a randomized, double-blinded design. This means that neither test persons nor test personal will know when exposure is actually on (and which field strengths are used) or off. Tests are conducted separately with a group of electromagnetically hypersensitive persons (group A) and with a group of non-hypersensitive persons (group B). Optimum sample sizes were calculated by means of a power analysis ($p < 0.05$; power 0.8) based on the TNO results. The TNO study evaluated 24 persons per group. In group A, where a clear difference was found, this sample size remained the same. In group B, 60 persons will be examined in order to enhance conclusiveness of results.

Aside from the questionnaire on well-being used in the TNO study and handed out after exposure, there will be an additional improved questionnaire in the replication study to be filled out before and after exposure. This second questionnaire will be validated internally and specially designed to collect information on electromagnetic hypersensitivity. During exposure, test persons will take part in various computerized cognitive tests. Moreover, UMTS power absorption in the body will be calculated specifically for organ and brain tissue.

Expected results

The Dutch TNO study was the first study to investigate UMTS-similar radiation and to find evidence of a decreased well-being in humans. The replication study, which will probably be completed within the year, is

Test set-up in the TNO study



meant to validate the reliability of TNO results regarding UMTS-similar radiation. Since the original study did not find any effects of GSM radiation on well-being, the replication of this part was relinquished in favor of a second, UMTS-related part. The questionnaire known from the TNO study and the application of identical test conditions enabled the authors to make an exact comparison of the two investigations. Reliability of the original measurements will be enhanced, as there is an additional improved questionnaire which will be more adequate with regard to the given test protocol and the study's objective.

Aside from the replication of UMTS exposure, the present study sets out to answer the questions whether there exists a dose-effect relation between exposure to electromagnetic radiation, and possible effects on well-being and cognition. Results will moreover show if the extent of potential changes in well-being or cognition is different across electrosensitive and non-sensitive persons. Specific mechanisms possibly leading to significant effects on well-being and cognition will not be examined; however, detailed dosimetry will allow for one to obtain insight into potential interaction mechanisms. The replication study will not be able to draw conclusions on the question whether a potential decrease in well-being might lead to other adverse health effects occurring in the long run.

Results will probably be announced at the end of 2005, as soon as they will have been published in a scientific journal.

References

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- Health Council of the Netherlands. TNO study on the effects of GSM and UMTS signals on well-being and cognition. Publ. no. 2004/13E (2004).

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