

FLEXIBLE EXPOSURE SETUP FOR HUMAN PROVOCATIVE STUDIES AT 900 MHZ

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ABSTRACT

A flexible setup for the exposure of test persons at 900MHz is presented here. The Karolinska Institute (Stockholm, Sweden) currently conducts a human provocative study in the context of health risk assessment of low-level exposure to the RF of mobile phones, which examines the effects of the 900MHz GSM wireless communication signal on subjective symptoms, physiological reactions, alertness, performance and sleep. The study is designed as an experimental provocation study and follows standardized exposure protocol in humans.

The study uses an exposure system which consists of a headset (light-weight micropatch antenna mounted on a frame structure) together with a fully computer controlled signal unit which monitors and controls the applied RF signal at all times. The exposure setup enables the exposure of the left head hemisphere and is designed to maximize the exposure of brain tissue as may occur during actual usage of GSM phones. This cannot be accomplished by using a specific regular phone, because the absorption pattern depends on many parameters, e.g. phone model, holding position, etc. The developed setup provides the advantage of well-defined exposure of all tissues that might get exposed from mobile phones.

The headset system is based on a low-weight, stacked micropatch antenna fixed on a headset and allows the subject to move/rotate within a limited area ($\pm 40\text{cm}$) without changing the exposure distribution; this allows flexible and comfortable exposure situations. The weight of the headset is compensated with a hanging design, so that the subject does not carry more than about 100g of weight. Additionally allows the frame structure the simultaneous recording of the EEG. Furthermore a controllable heat load was realized using optical heating of a ceramic plate (cross section 10mm^2) which is placed at the ear lobe.

A fully computer-controlled signal unit enables the application of GSM modulated RF exposures for up to two subjects. The exposure is controlled by measurement of the forward and reflected powers and the temperature load is controlled by an RF immune thermistor sensor housed within the ceramic plate at the ear lobe. The information of the exposure condition (RF exposure or sham control) is stored in an encoded file in compliance to double blind exposure protocols.

The applied exposure signal was chosen with respect to (a) exposure strength (SAR) (b) GSM modulation (DTX, power control) (c) time course of exposure and consist of a GSM signal at an average SAR of 1.4 W/kg simulating a conversation, i.e., including periods of DTX (active during talking) and Non-DTX (active during listening). However, the system would also be able to apply various other modulation schemes such as all modes of GSM and DAMPS.

The numerical and experimental dosimetric evaluation of the setup used the advanced FDTD simulation platform SEMCAD (Vers. 1.8, SPEAG, Switzerland) and the near-field scanning system DASY4 (SPEAG, Switzerland), equipped with the latest probe technology. The setup as well as the dosimetry satisfy the quality requirements for exposure setups defined in [1] and [2] and the ethical standards for human studies. The exposure level meets the ICNIRP guidelines.

ACKNOWLEDGEMENT

This study is supported by the Mobile Manufactures Forum (MMF).

REFERENCES

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