RF EXPOSURE OF TWO GENERATIONS OF NON-RESTRAINED WISTAR RATS

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ABSTRACT

During the last years the market of cellular-phone-network has grown rapidly. The launch of the wideband UMTS in Europe causes an enhancement of the number of base station antennas which reinforces the ongoing public discussion about health risks of weak electromagnetic fields. For intensifying the scientific work concerning that question, a substantial amount of research funds has been provided by industrial and official organisations, at least in Germany. The present project sponsored by the Forschungsgemeinschaft Funk (FGF) is designed to investigate a number of endpoints during the development of Wistar rats that will be exposed for two generations to electromagnetic fields around 2 GHz which are modulated by UMTS-typical signals. 20 hours/day exposure is applied during the complete period of the experiment of several months including the exposure of rats during mating and pregnancy of the first generation, as well as lactation, weaning, maturation, mating and pregnancy of the second generation.

This biological design implies that rats of different body masses are kept inside the same cage and that the rats are able to move freely within their cages. In order to minimize the variation of the absorption inside the rats to that amount which is unavoidable due to the biological design, the exposure field shall be as uniform as possible. Therefore, six radial waveguides of about 2 m in diameter, each loaded with 16 cages, are used. The prescribed height of the cages by animal protection authority is about 15.5 cm. In order to operate in the fundamental TEM-mode of a radial waveguide, its height increases from less than half the wavelength in the centre, where the feeding system is located, to about 17 cm in the exposure region by a tapered transition. Because of the unfavourable ratio of body size to wavelength, the rats can introduce larger field distortions. For maintaining the propagation of the fundamental TEM mode adjacent cages are separated by special high-impedance walls.

The investigation is performed with whole body specific absorption rates of round about 1 and 0.1 W/kg, respectively. Additionally, a sham control (0 W/kg) and a cage control group are part of the experiment. It was checked in a pilot study that the maximum SAR does not introduce an increase of the rat's body temperature. By application of numerical computations, extensive dosimetric analysis of whole body SAR is performed under consideration of the wide range of numbers and sizes of the animals per cage during the period of exposure (e.g. 1 adult rat, 1 adult couple, 1 pregnant rat, 1 female rat with 8 pups, 2 juvenile rats). Moreover, different positions and postures of the animals are analysed. From this investigation can be judged which configuration is the most critical with respect to the exposure of an individual rat and the maximum admissible total input power can be determined. Biological results of the first stages of the experiments will also be presented in the talk.