EXPERIMENTAL OUTCOME OF HUMAN PROVOCATION STUDIES DEPEND ON THE DESIGN SPECIFICS OF THE EXPOSURE SETUP

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ABSTRACT

The results reported in literature on the RF effects on brain activity are not always consistent. We investigated whether these discrepancies result from the differences in the applied exposure systems (exposure duration, signal characteristics, induced fields as a function of subfunctional brain regions and time of day of the exposure). We also illustrated how many early studies insufficiently characterized the exposure by not providing the recommended minimal dosimetric quantities. Our objective was to derive the optimal exposure parameters for future studies to further clarify the interactions of RF exposure on brain activity.

1. INTRODUCTION

In the past few years, the IT'IS Foundation collaborated with various research groups on several experimental provocation studies investigating the effects of exposure to RF EMF on human brain activity [1, 3, 4, 5, 6, 7, 8, 15, 16, 17, 18, 19] and conducted dosimetric post-analyses of several third party studies [2, 9, 10, 11, 13, 14]. These studies investigated the RF effects on EEG (during sleep and wakefulness), on waking rCBF, cognitive performance, sleep quality, subjective symptoms, etc. The overall findings indicate that RF EMF affect human brain activity. Furthermore, the results suggest dependence of the effect on the exposed tissues and on the ELF spectral content of the amplitude-modulated signal [1, 5, 7]. The results from these studies, however, are not always consistent, particularly in comparison to the available literature on the RF effects on brain activity.

2. OBJECTIVE

The aim of this project is to evaluate if the differences in the exposure system contribute to some of the inconsistencies among the reported results in the literature.

3. METHODS

We performed some detailed dosimetric post-analyses based on the published information. If the exposure transmitter was still available, we also performed experimental evaluations.

The simulations were performed using the finite-difference time-domain (FDTD) based platform SEMCAD X (IT'IS & SPEAG, Switzerland). The human numerical model employed for the detailed dosimetry was based on the most detailed human head models available [20]. Within the brain, grey and white matter, cerebrospinal fluid (CSF), midbrain and thalamus were distinguished in the first model. The latest simulations tool can assess the exposure of more than 1,000 functional subregions of the brain.

The measurements were conducted with the near-field scanning systems DASY4, 5 NEO for assessments based on SAM, child head phantoms and the immediate scanner iSAR (Speag, Switzerland). The data was applied to the flat phantom configuration as defined in IEC [2007].

4. RESULTS AND DISCUSSIONS

The differences of the induced field distributions and particularly, the variations of the exposure of functional subregions posed by the different exposure systems were significantly large, i.e., >> 10. Most studies do not provide sufficient dosimetric data for in-depth interpretations or adequate replications/verification of the studies. Sometime they appear very similar and only a detailed analysis reveals large differences or large variability in the exposure. The interactions of RF exposure on brain activity can only be clarified if the experimental design satisfies minimal requirements in future studies [13].

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