NUMERICAL DOSIMETRY IN REVERBERATION CHAMBER EXPOSURE SYSTEMS EMPLOYED FOR RODENT BIOASSAYS

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Reverberation chambers (RCs) have recently been employed for radio frequency (RF) in-vivo bioelectromagnetics (BioEM) studies, e.g., to conduct large-scale bioassays, to investigate potential effects of RF exposures on large groups of animals. Numerical dosimetry may provide key guidance in determining the absorbed EM energy in exposed animals, informing the design of in-vivo animal studies (exposure levels, number of animals per room, etc.). However, such a dosimetry is one of the most challenging tasks due to the large computational domains and complex behavior of EM fields in RCs.

In this context, the UniAQ Research Group, together with the Motorola Labs, has developed an efficient plane-wave (PW) superposition method [1], used to generate a near-ideal Rayleigh fading environment in an electrically-large RC hosting a whole cohort of 96 animals. Then, a Monte-Carlo (MC) approach recently proposed by the authors in [2] has been employed to assess the numerical dosimetry of the whole cohort when changing the orientation, position, and posture of the rodents within the cage. The proposed MC approach is fully parametric and accounts for key stochastic variables in order to characterize statistically key dosimetric observables, such as the whole-body specific absorption rate (SAR) and organ-averaged SAR.

Recently, the research interests have been moved on randomizing the PW incidence to increase the near-ideal Rayleigh environment in an electrically-large RC working volume [3]. Finally, a collaboration with Motorola Labs and the Polytechnic of Marche has been started to address the numerical dosimetry of a whole cohort of animals in a 900 MHz RC with different full-waves approaches: Finite Difference Time Domain (FDTD) and Transmission Line Method (TLM) [4]-[5].

References

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