

TMS treatment exposure for workers: focus on operator hand

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This work focuses on a specific aspect related to operator exposure during Transcranial Magnetic Stimulation (TMS) treatment. In TMS clinical applications, the stimulating coil, placed over the patient's head, generates a high-intensity magnetic field, that spreads also in the space around the device. The clinical practice requires medical staff to operate in proximity of the patient, often holding the coil with hands. With respect to this latter condition, the aim of this study is to carry out a numerical evaluation of the local exposure of the clinician's hand considering different exposure circumstances. The system chosen for this analysis is figure-of-eight coil, that works at 3 kHz, fed by the Magstim Rapid² [1]. The computational analysis is conducted by means of the numerical software Sim4Life, considering a member of the virtual population [2], i.e. the male model Duke. Figure 1 shows the maps of the induced electric field (EF) in the region of the hand and upper limb.

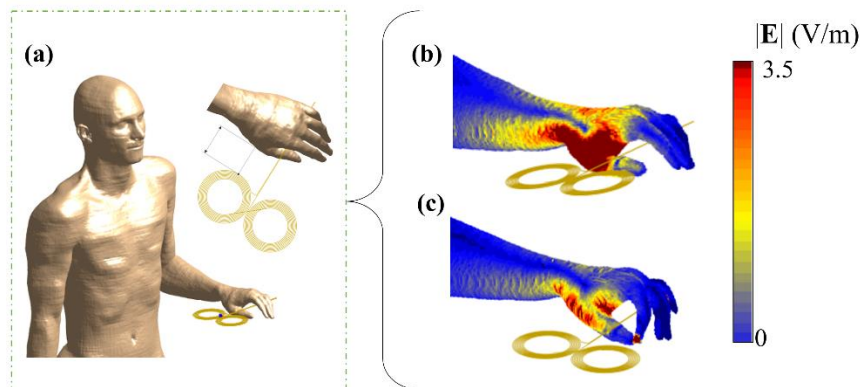


Figure 1. Maps of the EF distribution in the hand of the clinician performing the TMS treatment (a) exposure scenarios, with different grip modes (b) hand open, (c) hand closed.

The possibility to estimate numerically the induced EF is an important mean in the context of the risk assessment to verify compliance with the suggested limits[3][4]. Thus, the 99th percentile of induced EF has been evaluated through a post-processing tool, and directly compared with the limit. The evaluation of the exposure to the TMS figure-of-eight coil reveals that in the cases here analyzed the exposure limits can be exceeded in different conditions. From these results, it was possible to recognize some safety suggestions to reduce the risk of exposure to this type of source.

References

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