MT 26
International Conference
on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: **995** Type: **Poster Presentation**

Mon-Af-Po1.15-11 [42]: The design of transcranial magnetic stimulation thin core coil based on multi-objective optimization

Monday 23 September 2019 14:30 (2 hours)

Transcranial magnetic stimulation(TMS), as a new medical technology with great development prospect, has been shown to be effective in treating a variety of mental illnesses. The stimulation intensity and focality of the transcranial magnetic coil are often used to measure its biological effects. In order to improve its performance, a magnetic core can be added to the existing coil to enhance the local magnetic permeability. However, the eddy current loss in the core generated by the high-frequency alternating magnetic field cannot be ignored. Thus, this paper proposes a design scheme of transcranial magnetic stimulation thin core coil based on multi-objective optimization. Firstly, the core material suitable for high frequency alternating magnetic field is selected to improve the overall performance. Secondly, several groups of core placements and geometric sizes, which are used as decision variables, are designed using the exhaustive method. Then the corresponding induced electric field intensity, focality as well as the core coil heat can be calculated using the finite element method. Taking reducing the heat of the core and improving the intensity of the induced electric field as well as the focality of the coil as multiple optimization objectives, the final optimization model can be established after normalizing the above-mentioned objectives. At last, the optimal core placement and the geometric size can be obtained accordingly. In the case study, the stimulation effects are analyzed and compared. Under the same power output condition, results show that the proposed core coil can increase the intensity by 80% and the focality by 20% compared with the figure of eight coil. Compared with the existing core coil, it can reduce the heat by 50% with better intensity and focality.

Authors: Dr LIU, Chang (Huazhong University of Science and Technology); DING, Hongfa (Wuhan National High Magnetic Field Center, Huazhong University of Science and Technology); Dr FANG, Xiao (Huazhong University of Science and Technology); Dr WANG, Zhixun (Huazhong University of Science and Technology)

Presenter: Dr LIU, Chang (Huazhong University of Science and Technology)

Session Classification: Mon-Af-Po1.15 - Multiphysics Design and Analysis II