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The Effect of Variation in Permittivity of Different Tissues on Induced Electric Field in the Brain during Transcranial Magnetic Stimulation RAVI L. HADIMANI, Iowa State University, KONSTANTIN PORZIG, Ilmenau University of Technology, LAWRENCE J. CROWTHER, Iowa State University, HARTMUT BRAUER, HANNES TOEPFER, Ilmenau University of Technology, DAVID C. JILES, Iowa State University, DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, IOWA STATE UNIVERSITY TEAM, DEPARTMENT OF ADVANCED ELECTROMAGNETICS, ILMENAU UNIVERSITY OF TECHNOLOGY TEAM — Estimation of electric field in the brain during Transcranial Magnetic Stimulation (TMS) requires knowledge of the electric property of brain tissue. Grey and white matters have unusually high relative permittivities of $\sim 10^6$ at low frequencies. However, relative permittivity of cerebrospinal fluid is $\sim 10^2$. With such a variation it is necessary to consider the effect of boundaries. A model consisting of 2 hemispheres was used in the model with the properties of one hemisphere kept constant at σ_1 =0.1Sm^{-1} and ε_{r1} =10 while the properties of the second hemisphere were changed kept at σ_2 =0.1Sm^{-1} to 2Sm^{-1} and ε_{r2} = 10^2 to 10^5. A 70 mm diameter double coil was used as the source of the magnetic field. The amplitude of the current in the coil was 5488 A at a frequency of 2.9 kHz. The results show that the electric field, **E** induced during magnetic stimulation is independent of the relative permittivity, ε_r and varies with the conductivity. Thus the variation in **E**, calculated with homogeneous and heterogeneous head models was due to variation in conductivity of the tissues and not due to variation in permittivities.

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