Abstracts

Analysis of the interaction between a layered spherical human head model and a finite-length dipole

K.S. Nikita, G.S. Stamatakos, N.K. Uzunoglu and A. Karafotias. "Analysis of the interaction between a layered spherical human head model and a finite-length dipole." 2000 Transactions on Microwave Theory and Techniques 48.11 (Nov. 2000, Part II [T-MTT] (Special Issue on Medical Application and Biological Effects of RF/Microwaves)): 2003-2013.

The coupling between a finite-length dipole antenna and a three-layer lossy dielectric sphere, representing a simplified model of the human head, is analyzed theoretically in this paper. The proposed technique is based on the theory of Green's functions in conjunction with the method of auxiliary sources (MAS). The Green's function of the three-layer sphere can be calculated as the response of this object to the excitation generated by an elementary dipole of unit dipole moment. The MAS is then applied to model the dipole antenna by distributing a set of auxiliary current sources on a virtual surface lying inside the antenna physical surface. By imposing appropriate boundary conditions at a finite number of points on the real surface of the antenna, the unknown auxiliary sources coefficients can be calculated and, hence, the electric field at any point in space can be easily obtained. Numerical results concerning the specific absorption rate inside the head, the total power absorbed by the head, the input impedance, and the radiation pattern of the antenna are presented for homogeneous and layered head models exposed to the near-field radiation of half-wavelength dipoles at 900 and 1710 MHz. The developed method can serve as a reliable platform for the assessment of purely numerical electromagnetic methods. The method can also provide an efficient tool for accurate testing and comparison of different antenna designs since generalizations required to treat more complex antenna configurations are straightforward.

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