Standardization and Variation Analysis of Human Exposure in Automotive Environments for Compliance Evaluation

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Electromagnetic emission due to mobile radio devices mounted on vehicle can cause electromagnetic energy deposition within nearby human subjects. Such energy deposition is measured by Specific Absorption Rate (SAR) for the compliance evaluation with respect to applicable exposure guidelines (*ICNIRP, Health. Phys., vol.74, pp. 494-522, 1998*) and standards (*IEEE C95.1-2005*). Because SAR are mainly determined by the geometry of body parts exposed to the RF energy, and on the exact location and geometry of the RF sources, recent efforts have been devoted to develop protocols and standards allowing the accurate modeling of the vehicle, ground and human body (*Bit-Babik and Nadakuduti, IEEE 1528.3, 2006*). However, the modeling accuracy degrades when all parameters mentioned above change simultaneously. For standardization of a robust methodology and exploration of the total situations, a Finite-Difference Time-Domain (FDTD) technique based modeling is presented.

In this paper, a three dimensional FDTD method with non-uniform meshing scheme is presented first to construct various models of the occupant and bystander. Numerical simulations were performed at the representative frequencies in the range from 30MHz to 1GHz (*IEEE 1528.2, 2007*). In these simulations, the positions of the antenna and human body were varied to find the peak SAR values in the human body. We will discuss the associated variation of the peak SAR value with the relative positions of the antenna and human body. The numerical simulation will also be extended to explore the effect of metal parts with different shape close to exposure subjects, e.g., the metal spring and the metal seat in the vehicles.