APPLICATION OF COMPUTATIONAL DOSIMETRY FOR SAR COMPLIANCE ASSESSMENTS OF WIRELESS TRANSCEIVERS

A. Bijamov[1], G. Bit-Babik[2], A. Faraone[2], A. Razmadze[1], L. Shoshiashvili[1], and R. Zaridze[1]

[1] Laboratory of Applied Electrodynamics, Department of Physics, Tbilisi State University, 3 Chavchavadze Avenue, 0128, Tbilisi, Georgia
[2] Motorola Corporate EME Research Laboratory, Fort Lauderdale, Florida, 33322, USA.

Numerical simulations are widely employed in the analysis of the human exposure to RF energy sources. The Finite-Difference Time-Domain (FDTD) method is most frequently adopted, but examples of the use of other methodologies such as MoM, FEM, MAS, FIT, TLM, etc., abound in literature. FDTD is probably the method that more readily allows taking advantage of the advances in computational speed, memory, and parallel or distributed architectures, and therefore is suitable to describe device geometries with sufficient detail and allow the calculation of SAR distributions in homogeneous or highly inhomogeneous bodies.

Presently, SAR compliance assessments are most frequently carried out by means of measurements based on consolidated, scientifically sound experimental techniques to assess human exposure in the near-field of RF sources. These techniques and the associated recommended practices are defined in several standards, e.g., IEEE Std 1528 ("Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques"). They typically require very specialized equipment, well trained personnel, and they are quite time consuming. Along with increased knowledge in the field of dosimetry and the advent of new technologies, standards organizations may redefine and at times expand the set of recommended procedures. Present SAR measurements standards specify well consolidated practices for single source scenarios, but typically require workarounds in case of multiple transmitting sources operating simultaneously on the same device. This latter case is becoming increasingly more frequent as cellular phone technologies have evolved in the direction of allowing simultaneous long and short range communications of both voice and data, e.g., Bluetooth enabled handsets. Consequently, the complexity of experimental SAR assessments is quite likely to grow along with the inclusion of advance features, e.g., Voice-Over-IP, in products, likely resulting in a significantly increased compliance process cost for the manufacturers.

Computational dosimetry techniques represent one possible avenue leading to simplifications and cost reduction of the compliance process for handheld wireless transceivers. If properly standardized, computational SAR assessments can be carried out to provide a conservative estimate of the applicable compliance metrics, i.e., the 1-g or 10-g peak average SAR, while resulting more cost effective than measurements. In some instances, SAR computations may actually be the only practical way to demonstrate SAR compliance. For instance, Motorola employed successfully SAR simulations of subjects exposed inside or nearby cars equipped with mobile radio devices to demonstrate product compliance.

In this contribution, the authors wish to illustrate the challenges posed by the advent of new technologies on SAR compliance assessment processes and the opportunities that would stem from using accurate numerical prediction tools in the framework of suitably standardized protocols. A panoramic of the state of standardization in this field will be also reported.