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A Definition of Thermophysiological Parameters of SAM Materials for Temperature Rise Calculation in the Head of Cellular Handset User

Salah I. Yahya Al-Mously and Marai M. Abousetta

PIERS Proceedings, 170 - 174, August 18-21, Moscow RUSSIA, 2009

Abstract:

A definition of thermophysiological parameters of the Specific Anthropomorphic Mannequin (SAM) CAD model material is proposed in this paper to calculate the temperature- rise in the head of cellular handset users. The SAM materials have the electrical and thermal parameters based on the averaged properties of a heterogeneous High-Resolution European Fe- male Head (HR-EFH) with twenty-five different tissues. The specific absorption rate (SAR) and the temperature-rise in the SAM because of the exposure to radiation of different handset models, i.e., candy-bar with external antenna and candy-bar with internal antenna, are calculated in the GSM900 and GSM1800 using a FDTD-based platform. The computations were also carried out applying HR-EFH for comparison.

Influence of the Human Head in the Radiation of a Mobile Antenna

Pedro Renato Tavares Pinho and João Carlos Ferreira De Almeida Casaleiro

PIERS Proceedings, 666 - 669, August 18-21, Moscow RUSSIA, 2009

Abstract:

The big proliferation of mobile communication systems has caused an increased concern about the interaction between the human body and the antennas of mobile handsets. In order to study the problem, a multiband antenna was designed, fabricated and measured to operate over two frequency sub bands 900 and 1800 MHz. After that, we simulated the same antenna, but now, in the presence of a human head model to analyze the head's influence. First, the influence of the human head on the radiation efficiency of the antenna has been investigated as a function of the distance between the head and the antenna and with the inclination of the antenna. Furthermore, the relative amount of the electromagnetic power absorbed in the head has been obtained. In this study the electromagnetic analysis has been performed via FDTD.

Experimental Characterisation of Radiowave Signal Propagation for Indoor UWB Wireless Communications

Tian Hong Loh and Luk R. Arnaut

PIERS Proceedings, 1488 - 1492, August 18-21, Moscow RUSSIA, 2009

Abstract:

A methodology is presented for experimental characterisation of ultra wideband (UWB) signal propagation in an indoor propagation environment for wireless communication networks. Time-harmonic *S*-parameters measurement is reported of radiowave propagation and scattering inside a typical indoor office environment between 500MHz and 3000MHz (which covers, in particular, the GSM and ISM bands), measured across a scanned sample volume. The main objective of these indoor radiowave propagation measurements is to determine the effect of location and multipath on radiowave propagation with different propagation channels. A 1 £ 1 Single-input-single-output (SISO) and 2 £ 1 multiple-input-single-output (MISO) channels measurements were methodically carried out to simplify the propagation channels considered. A data acquisition system, based upon a vector network analyzer and multichannel antenna array is described, together with its use to collect channel measurement matrices.

Effect of the Hand-hold Position on the EM Interaction of Clamshell-type Handsets and a Human

Salah I. Yahya Al-Mously and Marai M. Abousetta

PIERS Proceedings, 1727 - 1731, August 18-21, Moscow RUSSIA, 2009

Abstract:

A thorough investigation into the effect of the hand-hold position on the electro- magnetic (EM) wave interaction of a clamshell-type cellular handset and a human is presented in this paper. A FDTD-based platform, *SEMCAD-X*, is used to achieve the simulations, where two semi-realistic handset models of different external-antenna attachment positions (left and right- side) are designed with the most parts configuration and operating at different GSM-frequency standards (GSM-900, GSM-1800/DCS, and UMTS/IMT-2000). Moreover, homogeneous and heterogeneous CAD models are used to simulate the user's head, whereas, a homogeneous model with three different tissues is designed to simulate the user's hand-hold. The antenna performance, as well as, the specific absorption rate (SAR) in tissues are both examined for different (42) possible cases, where several antenna/hand positions are considered in simulation.

Impact of Human Head with Different Originations on the Anticipated SAR in Tissue

Salah I. Yahya Al-Mously and Marai M. Abousetta

PIERS Proceedings, 1732 - 1736, August 18-21, Moscow RUSSIA, 2009

Abstract:

The impact of human head with different originations on the induced SAR owing to the RF emissions of different cellular handset models is intensively investigated in this paper. Four

homogeneous head phantoms with normal (non-pressed) ears are designed and used in simulations for evaluating the electromagnetic (EM) wave interaction between handset antennas and human head at 900 and 1800MHz with radiated power of 0.25 and 0.125 W, respectively. The difference in heads dimensions due to different origins shows different EM wave interaction with cellular handsets.

Interaction between a Triple Band Handset Antenna and Human Head by Applying Various Head Models

Danoosh Davoodi, P. Saghatoleslami, and Mohammad Ali Ebrahimi-Ganjeh

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Abstract:

The interaction between human head tissues and handset antennas is a crucial concept in mobile communications. This paper presents a comprehensive study on the performance of a triple band PIFA antenna designed for operating in DCS, PCS and UMTS frequency bands, next to various human head models. Radiation patterns and VSWR of this antenna are computed in free space as well as in the presence of head models. Three different models are investigated: a spherical six layer model, a glass sphere model and a °at phantom. for six layer model and the glass phantom a 82 percent scaled model is also used in order to examine the interactions in presence of a child's head (seven years old). All the simulations are done for three different distances between the antenna and the model (5 mm, 15 mm, 25 mm). The specific absorption rate (SAR) is calculated in the glass sphere model. In addition, radiation efficiencies of the handset antenna is computed in the presence of head. All numerical simulations are performed using the Ansoft HFSS software. For validation of the numerical simulations, the simulated peak 1 g-SAR in the glass sphere model is compared to measured 1 g-SAR.
