Role of Material Changes and Topological Influence in Deterministic Estimation of Dosimetric Values in Complex Indoor Scenarios

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Wireless communication systems have been adopted for a wide range of applications and their use is increasing with the advent of Home Automation and Internet of Things. This leads to more complex electromagnetic environments, in which personal communication systems (i.e., Public Land Mobile Networks, such as UMTS-HSPA and future LTE systems), indoor-based communication systems (such as WiFi or wireless sensor network deployments, based on ZigBee or Bluetooth) and other EM sources (such as home appliances) conform a heterogeneous wireless scenario. Regulators as well as public environmental health organizations require to perform overall electromagnetic exposure estimations in order to guarantee compliance to the different standards, as well as to gain insight in the current application or modification of such standards. Such estimation in the case of indoor scenarios is a complex task, due to the interaction of different elements, such as walls, furniture or human body with the different wireless links established, experimenting mainly strong multipath propagation. In this work, the role in the change of material parameters of the scenario as well as the inclusion of human body models for indoor scenarios will be presented. The estimation of received field components is obtained with the aid of an in-house deterministic 3D Ray Launching code, taking into account dispersive material parameters and the topo-morphological characteristics of the indoor scenarios, which have a strong impact in the final estimations which are obtained. These results can aid in the assessment of dosimetric analysis in complex indoor scenarios in which heterogeneous wireless systems operate, such as residential, office and industrial environments.

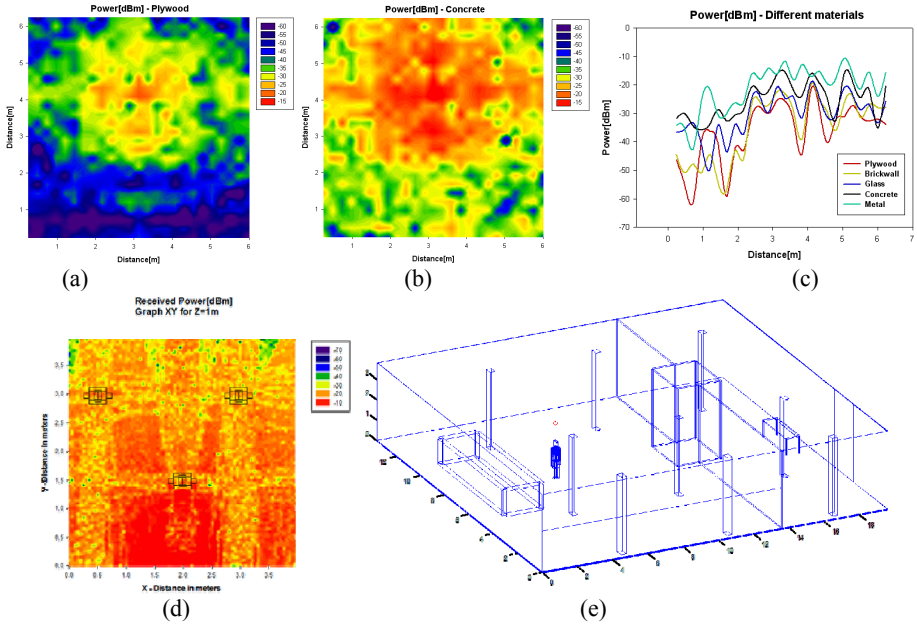

Figure 1: Variation in the estimation of received power level in relation with employed material elements within the scenario for a WiFi hotspot a) Plywood walls b) Concrete walls c) variation along a 1D axis in propagation losses, d) inclusion of several simplified human body models e) schematic of one of the employed scenarios.