THREE-DIMENSIONAL NUMERICAL SIMULATION FOR SOLVING PROBLEMS OF ELECTROMAGNETIC SCREENING

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Nowadays telecommunication is passing the way of hardware miniaturization, which causes the reduction of susceptibility threshold to electromagnetic interference. Electromagnetic screening is one of the most effective methods to protect hardware from the undesirable interference. However the effectiveness of shielding is highly correlated with the accuracy of calculations for screen parameters and, what is more important, it is greatly influenced by structural defects of the screen.

The main method to analyze the effectiveness of electromagnetic shielding is the comparison between electromagnetic situations (EMS) in interference area, located outside the screen and protected (screened) area inside it. The three methods widely used to describe EMS are electrodynamic, energetic and stochastic approaches. However, the given analytical approaches are hardly applicable for computation of complex screens in practice.

The alternative approach, which results in much more accurate EMS estimation, is the utilization of numerical methods, such as Finite Element Method (FEM). However, until recently, practical implementation of this method for 3D simulation of electromagnetic fields was almost impossible because of the necessity for big amount of complex calculations. The rough estimations were usually received after reducing 3D models to planar ones. Sometimes it caused significant miscalculations.

The situation is improving dramatically these days. The amount of available computational resources enables to process 3D simulations of electromagnetic fields and solve practical problems. In addition, the relevant CAD-software, which is developed rapidly nowadays, significantly simplifies the process of 3D model development and enables to get the most accurate results ever. One of the leading software programs in this field is Comsol Multiphysics. This software is designed to solve a variety of problems in different fields of physics, in particular in electromagnetics, using FEM. Comsol Multiphysics is very flexible in model design and limits neither geometric parameters of screens, such as size or shape, nor positional relationship between the screen and the source of electromagnetic field. For example, one can create a model, where the source is located inside the screen.

However, the backside of such a flexibility is the great dependence of the gained results on the model definition. Therefore, one who designs a model should be thoroughly familiar with the theory of electromagnetic screening and understand clearly what each parameter of the model means.