IMPROVEMENT OF THE ADEQUANCY OF EMP SIMULATION OF ELECTRONIC EQUIPMENT

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A correct choice of the testing pulses parameters is one of the problems in an effective use of high-powerful EMP simulators for experimental estimations of radioelectronics stability. This choice must provide the highest authenticity of simulation to operational conditions. In this paper aircraft object modeled by a finite perfectly conducting cylinder has been studied for the possibilities of realization of complete adequacy.

To make the correct choice of the testing pulses parameters it is necessary to take into consideration a number of peculiarities of the fast transition EMP (FT EMP) interaction with the object both during the operation and tests in the simulators. Among these peculiarities are resonant character of FT EMP interaction with an object, the superposition of the natural frequencies, defining the diffusion inside the object through the screen walls, is negligibly small and the principal penetration occurs through the irregularities in the walls of screen-casing. Therefore, only the latter interaction mechanism will be considered further. Dimensions of irregularities are considered small in comparison with the dimensions of an object. Under these assumptions it is sufficient to determine the distribution of current induced on the homogeneous screen and then to determine fields inside the screen that are mainly stipulated by the action of irregularities.

The spectrum of natural frequencies of electrodynamic system "test object - FSS" can be represented in the first approximation as a superposition of frequencies spectrum of the object located in the free space and of the FSS of simulator. The conditions under wich the complete adequacy could be realized have been defined using the analysis of the spectrum of induced currents in cases of both operational conditions and simulation.

To solve this problem the advanced electrodynamic apparatus has been used. The problem is reduced for calculations of the currents induced on cylinder. It includes formulation of the problem using tensor Green functions, Pocklington integral equation for induced currents and its asymptotic solution on the basis of the method of sequential approximations.

The recommendations for further modifications of high-power EMP simulators have been formulated on the basis of obtained result. Method of selecting the testing pulses parameters proposed in this paper has a general methodological importance and is not limited by thin cylinder model.