General Session IX

Time Dependence of the Intensity of Parametric (Quasi-cherenkov) Radiation Produced by Relativistic Particles Passing Through Photonic Crystals

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Time evolution of parametric (quasi-cherenkov) radiation produced by a relativistic charged particle passing through a photonic crystal is studied. It is shown that the duration of radiation pulses, consisting of a sequence of peaks with decreasing amplitude, can be much longer than the time of particle flight through the crystal. This makes possible a detailed experimental investigation of the influence of the photonic crystal structure on the time characteristics of parametric (quasi-cherenkov) pulses generated by electron bunches. This makes possible to use the time-dependence of the parametric radiation for studying artificial periodical matter (photonic crystals) properties.

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The electrodynamic modeling of nanostructures and metamaterials on the basis of the method of minimal autonomous blocks

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On the basis of the method of minimal autonomous blocks (MAB) the complex approach to calculation of electrodynamic characteristics of composites, metamaterials and systems which structure includes any on geometry and material objects is developed. The basic algorithms of realization of the MAB method and features of the solving of internal and external electrodynamic problems are considered. It is established that the MAB method possesses high computing stability and allows to analyze systems with the big range of the wave sizes of structural elements. Various approaches to modeling of the systems containing composites and metamaterials are described: direct modeling by the MAB method, use of effective electromagnetic parameters, multichannel scattering matrixes of structurally non-uniform macroblocks, average scattering matrixes of non-uniform blocks. The technique of the analysis of electromagnetic properties of systems with the multiscale organisation of structure is considered. It is based on use of the MAB method and average scattering matrixes of dispersion which recurrently calculated at each scale level. Problems and features of calculation of scattering matrixes of MABs on nanoscale level are considered. Algorithms of the account of nonlinear properties of materials are presented. Results of modeling of interaction of electromagnetic radiation with various types of nanocomposites and metamaterials are presented. Possibility of use a system of nanosize metal particles in a plasmonic resonance modes for formation of the different types of electromagnetic fields distributions on a surface of a dielectric substrate is considered.

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