Influence of electromagnetic radiation on an array of carbon nanotubes in the presence of electric nanosecond impulses

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For an array of carbon nanotubes (CN) the dependence of nonlinear current density on width of forward front of amplitude of an alternating (high-frequency) field is investigated for various values of constant (or non-stationary) fields. It is shown that in the case of metal "zigzag"-like CN the current density does not depend on CN radius. The dependence of reinforced microwave radiation in two- millimeter range on longitudinal coordinate is received. The problem of generation of submillimeter radiation is investigated under influence of two-frequency carbon-dioxide laser radiation (CO2-laser) on the system of parallel oriented CN in the presence of constant (or non-stationary) fields. The dependence of amplitude of submillimeter radiation has beating behavior. The possibility of the use of freely oriented in space parallel each other CN is shown.

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Cluster Embedding Method for Quantum-Chemical Simulation of Nanodevices

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Applicability of cluster embedding method with non-orthogonal wave functions for theoretical study of processes in nanodevices is studied. Processes in nanodevices are treated in the frameworks of time-dependent DFT. We demonstrate that our cluster embedding method is compatible with DFT Kohn-Sham method and quantum transport theory based on time-dependent DFT. We conclude that approach for electric current calculation developed for orthogonal wave functions may be applied for non-orthogonal wave functions if we transform initial equations assuming that overlaps are small and we may neglect contributions of highest powers of overlaps.

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Hardware-software system for studying the properties of magnetic shields and electrical products based on film and composite nanostructures

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The problems of development and use of hardware and software system, and methodological support for research the characteristics of the magnetic shields and electrical products based on film and composite nanostructures are discussed. Apparatus and methods for measuring the magnetic field distribution in free space and near the products made from magnetic materials are considered. Hardware and software package is designed that provides: -automatic scanning of the examined area, -measurement of magnetometering probe displacement, -measurement of the three components of the magnetic field and its module, -setting of external magnetic fields with permanent magnets, solenoids and Helmholtz coils, -magnetization and demagnetization of the samples, -acquisition and processing of output signals from the photomultiplier tubes that are protected by magnetic shields in order to determine the parameters of the most efficient technologies and designs of screening, -presentation of measurement results on a computer screen in the form of tables and graphs. With the use of hardware and software system measurements of magnetic fields inside the cylindrical magnetic shields were carried out , close to their internal and external surfaces when exposed to DC, AC and pulsed magnetic fields. A comparison of the efficiencies of multilayer thin-film and conventional magnetic shields used for the screening of photomultiplier tubes and electronic components of onboard spectrometer is provided. The results of studies of magnetic fields of permanent magnets, magnetic circuits, metal sheet and bar products, products based on nanoscale granular and multilayer structures, single-layer magnetic shields and shields based on multilayer thin-film nanostructures are presented.

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