Institutul Naţional de Fizică şi Inginerie Nucleară
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Seminar general

Electromagnetic Theory in Matter

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Maxwell equations in matter are cast in a new form. Polarization and magnetization are introduced explicitly. Beside the equation of motion for magnetization, the equation of motion for polarization is identified, via a displacement field for the charge carriers. Thus, Maxwell equations in matter are fuly solvable, without resorting to phenomenological dielectric function and magnetic permeability. The particular scheme of solving Maxwell equations in matter makes use of the equation of motion of the electric polarizability and Kirchhoff electromagnetic potentials. Boundary conditions, both geometrical and dynamical, are automatically included. This scheme leads to coupled integral equations for bodies with finite, special geometries. Plasmons, polaritons and diffraction are studied by solving such integral equations for a semi-infinite body, a slab of finite thickness, a sphere (Mie's theory), a two-dimensional screen, an infinite cylindrical rod, both for metals and dielectrics. Dielectric response, energy loss, reflection and transmision coefficients and cross-sections are computed wherever relevant. The electromagnetic modes in matter are calculated for two semi-spaces separated by a finite distance and van der Waals-London and Casimir forces are derived. Extinction theorem, effective medium theory and the role played by matter interacting with the electromagnetic field are discussed.

Miercuri 16.12.2009, ora 11^{00}, Sala de seminar TANDEM