

Center for Quantum Science and Engineering (CQSE)

Weekly Seminar
Sept. 17, 2010 (Friday)

TIME Sept. 17, 14:30 ~ 15:30
TITLE Effective Medium Model for Dielectric Metamaterials
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Abstract

Metamaterials are artificial structures which exhibit properties not available in naturally occurring materials, such as negative permeability or negative refractive index. These unusual properties may come from the resonance of fields in the microstructures that compose the medium. The famous example of split rings was shown to possess artificial magnetism, whereas high-permittivity dielectric cylinders or spheres demonstrate similar and even richer phenomenon, which are eligible to be dielectric metamaterials.

A useful way to characterize the properties of metamaterials is through the effective parameters. The effective medium model based on the homogenization of fields is used to find the effective permittivity and permeability for dielectric metamaterials. With the help of Mie's theory, effective parameters are expressed in analytical form, which reveal the negative behavior at certain frequencies. The underlying mechanism is the electric and magnetic resonances in the quasistatic regime, which are illustrated with very inhomogeneous fields in the unit cell with rather weak coupling between neighboring cells.

