

Abstract Submitted
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Generalized effective medium theory for metamaterials¹ BRIAN SLOVICK, ZHI-GANG YU, SRINI KRISHNAMURTHY, SRI International — We present an effective-medium model for calculating the frequency-dependent effective permittivity $\epsilon(\omega)$ and permeability $\mu(\omega)$ of metamaterial composites containing spherical particles with arbitrary permittivity. The effective constitutive parameters are derived within the dipole approximation from the condition that the scattering cross section vanishes for plane waves incident from the effective medium on the unit cell of the composite. In contrast to existing effective medium theories, our model does not invoke any additional long-wavelength approximations. As a result, it captures the effects of spatial dispersion and predicts a finite effective refractive index and antiresonances in $\epsilon(\omega)$ and $\mu(\omega)$, in agreement with numerical finite-element calculations.

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