

## Effective Response of Nonlinear Composite under External AC and DC Electric Field

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**Abstract:** A perturbation method is used to study effective response of nonlinear Kerr composites, which are subject to the constitutive relation of electric displacement and electric field,  $D_{\alpha} = \epsilon_{\alpha} E + \chi_{\alpha} |E|^2 E$ . Under the external AC and DC electric field  $E_{app} = E_a(1 + \sin \omega t)$ , the effective nonlinear responses and local potentials are induced by the cubic nonlinearity of Kerr materials at all harmonics. As an example in three dimensions, we have investigated this kind of nonlinear composites with spherical inclusions embedded in a host. At all harmonic frequencies, the potentials in inclusion and host regions are derived. Furthermore, the formulae of the effective linear and nonlinear responses are given in the dilute limit.

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Key words: nonlinear composite, dielectric response, AC electric field

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