Abstract Submitted
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Broadband Electromagnetic Transparency by Graded Metamaterial Sphere[1] L. SUN, K.W. YU, The Chinese University of Hong Kong — We have investigated the scattering of electromagnetic waves from a radially inhomogeneous metamaterial sphere whose dielectric permittivity is described by the graded Drude model $\epsilon_s(r) = 1-\omega_p^2(r)/\omega^2$. The radial position dependent plasma frequency depends on r as $\omega_p^2 = 1/2 - c(r/r_0)^n$, where c and n are positive constants and r_0 is the radius of the sphere. The electromagnetic field distribution has been calculated within the full-wave Mie scattering theory. When $n = 2$, exact analytic solutions can be obtained in terms of confluent Heun function and confluent hypergeometric function of Kummer. This allows us to obtain the full-wave total scattering cross section analytically from the scattering field amplitudes. While the total scattering cross section Q_s depends on both the graded plasma frequency profile and the frequency of the incident electromagnetic wave, it is found that Q_s can achieve extremely small values over a broad frequency band and graded parameters. The analytic solutions allow us to assess the conditions for achieving broadband electromagnetic transparency in the metamaterial sphere and make tunable electromagnetic transparency feasible.

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