

Abstract Submitted
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Traditional optics fails in cold dense gases JUHA JAVANAINEN,
Univ of Connecticut - Storrs — We study propagation of light in a homogeneously broadened atomic sample essentially exactly by means of classical-electrodynamics simulations, using a slab of matter with light in normal incidence as the specific example. We find that traditional optics fails qualitatively by the time the average distance between the atoms is comparable to or smaller than the inverse of the wavenumber of the driving light. The reason is that Maxwell's equations for a polarizable medium are a mean-field theory, while light-mediated dipole-dipole interactions make a dense and cold atomic gas a strongly correlated system. We demonstrate large deviations from standard optics already at surprisingly low densities.

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