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Numerical simulations of light propagation in a dense near-resonant gas JUHA JAVANAINEN, YI LI, SUNGMI YOO, U of Connecticut, JANNE RUOSTEKOSKI, STEWART D. JENKINS, U of Southampton — We study light propagation in a dense gas numerically by applying classical electrodynamics to a collection of near-resonant atoms regarded as point dipoles. In the limit when the atom density and the wave number of light satisfy $\rho k^{-3} \geq 1$, dipole-dipole interactions may make the system strongly correlated, whereupon the mean-field type approximations underlying traditional electrodynamics of polarizable media become invalid. In a dense homogeneously broadened sample both the Lorentz-Lorenz local-field shift and the cooperative Lamb shift are absent, but a more conventional phenomenology reemerges in both dilute and inhomogeneously broadened samples.

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