Abstract Submitted
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Microscopic and Macroscopic Descriptions of Nonlinear Electromagnetic Interactions in Atomic Ensembles[1] VERNE JACOBS, Naval Research Laboratory — Microscopic and macroscopic descriptions of nonlinear electromagnetic interactions relevant to resonant pump-probe optical phenomena in quantized many-electron systems are formulated within the framework of a general reduced-density-matrix approach. Time-domain (equation-of-motion) and frequency-domain (resolvent-operator) formulations are developed in a unified and self-consistent manner. A semiclassical perturbation treatment of the electromagnetic interaction is adopted, in which the electromagnetic field is described as a classical field satisfying either the microscopic form or the macroscopic form of the Maxwell equations. A quantized-field approach is essential for a fully self-consistent quantum-mechanical formulation. Compact Liouville-space operator expressions are obtained for the general (n'th order) non-linear electromagnetic-response tensors for moving atomic systems. Environmental interactions can be treated in terms of the Liouville-space self-energy operator.

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