Abstract Submitted
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Reduced-Density-Matrix Description of Decoherence and Relaxation Processes for Electron-Spin Systems[1] VERNE JACOBS, Naval Research Laboratory — Electron-spin systems are investigated using a quantum-open-systems description. Applications of interest include trapped atomic systems in optical lattices, semiconductor quantum dots, and vacancy defect centers in solids. Time-domain and frequency-domain formulations are developed. The general non-perturbative and non-Markovian formulations provide a fundamental framework for systematic investigations of corrections to the standard Born and Markov approximations. Attention is given to decoherence and relaxation processes, as well as spectral-line broadening phenomena, that are induced by interactions with photons, phonons, nuclear spins, and external electric and magnetic fields. These phenomena are described either as coherent interactions or as environmental interactions. The environmental interactions are incorporated by means of the general expressions derived for the time-domain and frequency-domain Liouville-space self-energy operators, for which the tetradic-matrix elements are explicitly evaluated in the diagonal-resolvent, lowest-order, and Markov (short-memory time) approximations.

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