Abstract Submitted
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Noise-induced collective quantum state preservation in spin qubit arrays[1] EDWIN BARNES, Department of Physics, Virginia Tech and Condensed Matter Theory Center, University of Maryland, DONG-LING DENG, ROBERT THROCKMORTON, YANG-LE WU, Condensed Matter Theory Center, University of Maryland — The hyperfine interaction with nuclear spins (or, Overhauser noise) has long been viewed as a leading source of decoherence in individual quantum dot spin qubits. We show that in a coupled multi-qubit system consisting of as few as four spins, interactions with nuclear spins can have the opposite effect where they instead preserve the collective quantum state of the system. This noise-induced state preservation can be realized in a linear spin qubit array using current technological capabilities. Our proposal requires no control over the Overhauser fields in the array; only experimental control over the average interqubit coupling between nearest neighbors is needed, and this is readily achieved by tuning gate voltages. Our results illustrate how the role of the environment can transform from harmful to helpful in the progression from single-qubit to multi-qubit quantum systems.

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