

Abstract Submitted
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Real-time Simulations of Quantum Spin $\frac{1}{2}$ Particles Coupled to Multiple Spin Baths MARTA L. GUERRA, M.A. NOVOTNY, Mississippi State University, HANS DE RAEDT, University Groningen — We present simulations in real time for one and two spin $\frac{1}{2}$ particles coupled to one or more baths of $\frac{1}{2}$ -integer quantum spins. The simulations were performed using the algorithm and code of Prof. De Raedt [1,2]. We first simulated one spin coupled to one or two spin-baths with no interactions between the bath spins, as has been calculated theoretically [3]. We find in agreement with [3], that the quantum purity $\mathcal{P}(t)$ decays in both cases, exponentially for a single bath and algebraically for two baths. We extend these simulations by introducing random interactions between the bath spins in an attempt to reach the asymptotic decay rate at earlier times and for fewer spins in the baths. We also have performed similar studies for two spin $\frac{1}{2}$ quantum particles coupled to one, two, or more spin baths. The time-dependent quantum density matrix and $\mathcal{P}(t)$, as well as other quantities, are calculated in these simulations.

[1] V.V. Dobrovitski and H.A. De Raedt, Phys. Rev. E **67** 056702 (2003).

[2] S. Yuan, M.I. Katsnelson, and H. De Raedt, Phys. Rev. A **75** 052109 (2007).

[3] D.D. B. Rao, H. Kohler and F. Sols, New J. Physics **10** 115017 (2008).

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