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Induced decoherence and entanglement by an interacting spin chain POCHUNG CHEN, Nat'l Tsing-Hua Univ, Hsinchu, CHENG-YAN LAI, JO-TZU HUNG, CHUNG-YU MOU — We study the reduced dynamics of a single or two qubits coupled to an interacting spin chain using time-dependent density matrix renormalization group (TD-DMRG) technology. By using TD-DMRG we can go beyond the uniform coupling central spin model and evaluate nonperturbatively the reduced dynamics even when the coupling between qubits and the chain is non-uniform. Furthermore, the qubit-bath interaction can be of Ising, XY, or Heisenberg type. This allows us to go beyond pure dephasing model. For single qubit we use Loschmidt echo to gauge the decoherence and investigate how the short time decay parameter and large time behavior are linked to the phase of spin chain. We use concurrence to quantify the (dis)-entanglement process of two qubits due to spin chain. We show that one can induced entanglement for an initially disentangled pair of qubit. The competition between induced decoherence and entanglement is discussed.

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