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Title: **Spin-1/2 Heisenberg ladder: Variation of entanglement and fidelity measures close to quantum critical points**

We consider a two-chain, spin- 1/2 antiferromagnetic Heisenberg spin ladder in an external magnetic field *H*. The spin ladder is known to undergo second-order quantum phase transitions (QPTs) at two critical values *Hc*1 and *Hc*2 of the magnetic field. There are now known examples of strongly coupled (where the rung exchange interaction is much stronger than the nearest-neighbor intrachain exchange interaction) organic ladder compounds in which QPTs have been experimentally observed. In this paper, we investigate whether well-known bipartite entanglement meaures such as one-site von Neumann entropy, two-site von Neumann entropy, and concurrence develop special features close to the quantum critical points. As suggested by an earlier theorem, the first derivatives of the measures with respect to magnetic field are expected to diverge as *H*□*Hc*1 and *H*□*Hc*2. Based on numerical diagonalization data and a mapping of the strongly coupled ladder Hamiltonian onto the *XXZ* chain Hamiltonian, for which several analytical results are known, we find that the derivatives of the entanglement measures diverge as *H*□*Hc*2 but remain finite as *H*□*Hc*1. The reason for this discrepancy is analyzed. We further calculate two recently proposed quantum information theoretic measures, the reduced fidelity and reduced fidelity susceptibility, and show that these measures provide appropriate signatures of the QPTs occurring at the critical points *H*=*Hc*1 and *H*=*Hc*2.