Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Entanglement in quantum-critical spin systems TOMMASO ROSCILDE, STEPHAN HAAS, University of Southern California, PAOLA VERRUCCHI, ANDREA FUBINI, VALERIO TOGNETTI, Universita' di Firenze —
In this talk I would like to review recent work done on entanglement in quantum spin systems at and close to a quantum critical point. Making use of the Stochastic Series Expansion Quantum Monte Carlo, we have extensively studied the $T = 0$ bipartite entanglement in the spin-1/2 XXZ model with a magnetic field applied in the xy plane. Simulations have been done on linear chains, two-leg ladders, and on the square lattice; a field-driven quantum phase transition is observed for all lattice geometries. We observe that the transition is always accompanied by a strong entanglement signature, namely a minimum in the pairwise-to-global entanglement ratio, which signals the critical enhancement of multi-partite entanglement [1]. Moreover, the appearence of a classical exactly factorized state at an anisotropy-dipendent field value, known in the one-dimensional case only, is surprisingly singled out by entanglement estimators also in the case of the ladder and of the square lattice. This shows the novel insight provided by entanglement estimators in lattice quantum spin systems. [1] T. Roscilde *et al.*, Phys. Rev. Lett. **93**, 167203 (2004); in preparation.

Tommaso Roscilde
University of Southern California

Date submitted: 29 Nov 2004 Electronic form version 1.4