Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Dynamical scaling in infinitely correlated many-body systems through a quantum phase transition OSCAR LEONARDO ACEVEDO, LUIS QUIROGA, FERNEY JAVIER RODRIGUEZ, Universidad de los Andes, Bogota, NEIL JOHNSON, University of Miami, Coral Gables, Miami, FL — We assess dynamical scaling of many two-level systems (TLSs) infinitely correlated, either through a mediating radiation mode as in the Dicke Model, or through a direct interaction between TLSs as in the Lipkin-Meshkov-Glick model. Those models are characterized by the presence of a Quantum Phase Transition (QPT) in the thermodynamic limit, and they belong to the same universality class. The assessment is done by means of exact computational simulations of finite-size systems under linear rampings of the interaction parameter crossing the quantum critical point. Our results exhibit significant differences with respect to previous works on dynamical scaling across QPTs in the near-adiabatic regime, which have focused on spin-chain models where correlation lengths can be defined. We have confirmed that in infinitely correlated models an effective system size can play the role of the correlation length in traditional scaling arguments. However, due to the infinite correlation among TLSs, the standard Kibble-Zurek mechanism is not realized as the system cannot fully enter an adiabatic evolution during the ordered phase. Also, in the two-level approximation, a suitable deviation from the standard Landau-Zener protocol must be performed in order to obtain scaling collapse.

Oscar Leonardo Acevedo
Universidad de los Andes, Bogota

Date submitted: 09 Nov 2012

Electronic form version 1.4