Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

DMRG-optimized NRG treatment of sub-ohmic spin-boson model[1] CHENG GUO, ANDREAS WEICHSELBAUM, Physics Departement of LMU Munich, MATTHIAS VOJTA, Institute for Theoretical Physics, University Cologne, JAN VON DELFT, Physics Departement of LMU Munich — The sub-ohmic spin-boson model exhibits an interesting and much-studied quantum phase transition from a delocalized phase at weak spin-bath coupling to a localized phase at strong coupling. Previous works using NRG to calculate the critical exponents of this model near the phase transition failed partly because it cannot deal with the large number of states per bath oscillator required to describe the localized phase [1]. We show how this problem can be overcome by using DMRG to construct, for each site of the Wilson chain, an optimized boson basis containing only a small number of states, and using the resulting basis for standard NRG calculations. Our results are in good agreement with analytical predictions for this model. The approach presented here should be generalizable to other quantum impurity models with complex baths.

[1] M. Vojta, N.-H. Tong, R. Bulla, Quantum Phase Transitions in the Sub-Ohmic Spin-Boson Model: Failure of the Quantum-Classical Mapping, Phys. Rev. Lett. 94, 070604 (2005); Erratum: Phys. Rev. Lett., 102, 249904 (2009)

[1]We acknowledge support from the CeNS-IDK graduate program, and SFB631 of the DFG.

Cheng Guo
Physics Departement of LMU Munich

Date submitted: 23 Dec 2010 Electronic form version 1.4