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A DMRG study of transport properties and correlations of quantum dots FABIAN HEIDRICH-MEISNER, KHALED AL-HASSANIEH, ELBIO DAGOTTO, The University of Tennessee at Knoxville and ORNL, GEORGE MARTINS, Oakland University, Michigan, ADRIAN FEIGUIN, Microsoft Q, The University of California at Santa Barbara — We study transport through quantum dots using the time-dependent density matrix renormalization group method (tDMRG), recently proposed as a powerful computational tool to investigate transport through interacting nanostructures [1]. Since this technique relies on the numerical solution of finite clusters, we analyze the finite-size dependence of both static properties such as spin and charge fluctuations, spin-spin correlations and the conductance in detail, focusing on the example of one quantum dot. Our study reveals a crucial influence of global quantum numbers of finite clusters such as total spin on the results of tDMRG simulations, reflected in even-odd effects. We further establish a connection between the size of charge fluctuations on the quantum dot and the convergence of tDMRG with system size. Similar substantial even-odd effects exist within the framework of another technique, the embedded cluster approximation method (ECA). For the example of three quantum dots, we show that such even-odd effects strongly affect the spin fluctuations, leading to qualitatively different results for the conductance within ECA. [1] Al-Hassanieh et al., Phys. Rev. B 73, 195304 (2006)

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