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Finite temperature DMRG and the Drude weight of spin 1/2 Heisenberg chains CHRISTOPH KARRASCH, JENS BARDARSON, JOEL MOORE, University of California at Berkeley — We propose an easy-to-implement approach to study time-dependent correlation functions of one dimensional systems at finite temperature T using the the density matrix renormalization group (DMRG). If the auxiliary degrees of freedom which purify the statistical operator are time-evolved with the physical Hamiltonian but reversed time, the entanglement blow-up inherent to any time-dependent DMRG calculation is dramatically reduced. The numerical effort of finite temperature DMRG becomes comparable to that at $T = 0$, and thus significantly longer timescales can be reached. We exploit this to investigate current correlation functions of the XXZ spin 1/2 Heisenberg chain. At intermediate to large T, we can explicitly extract the Drude weight D from the long-time asymptotics. For the isotropic chain, D is finite. At low temperatures, we establish an upper bound for the Drude weight.

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