

Time-dependence with matrix product states

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In this talk, I will give an introduction to methods of calculating the time-evolution of strongly correlated quantum systems in low dimensions using matrix product state methods, both at zero and finite temperature. The methods will be exemplified by applications from the non-equilibrium dynamics of ultracold gases in optical lattices and (for linear response) by applications in neutron scattering.

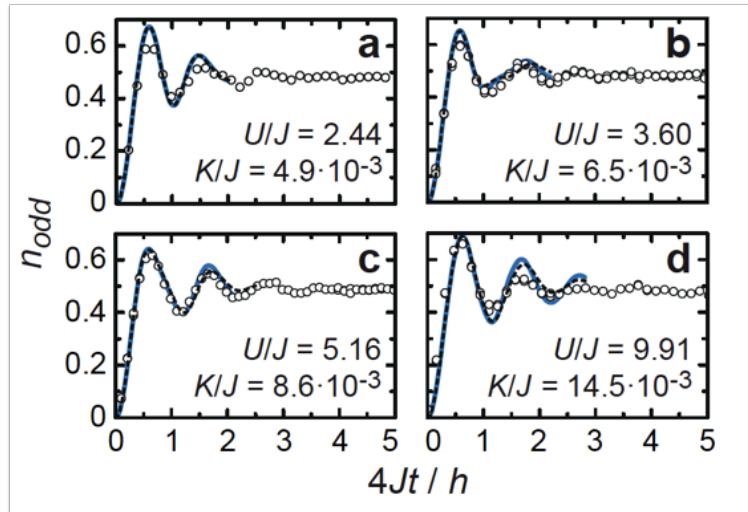


Figure 1: Relaxation of local density for different interaction strengths in a closed quantum system of ultracold atoms: simulation versus experiment [1].

[1] S. Trotzky, Y-A. Chen, A. Flesch, I.P. McCulloch, U. Schollwöck, J. Eisert, and I. Bloch, *Probing the relaxation towards equilibrium in an isolated strongly correlated one-dimensional Bose gas*, Nature Phys. **8**, 325 (2012).