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Dynamic structure factor from real time simulations using the time-dependent VMC method

We extend the time-dependent Variational Monte Carlo method to a new way of accessing the dynamic structure factor of strongly correlated one-dimensional bosonic systems in continuous space. In order to extract the response of the system in the form of density fluctuations, we use the stochastic noise inherent to this Monte Carlo simulations. We present the details of the method and show the application to bosons in an optical lattice, where the transition from the superfluid to the Mott insulating phase is manifested in the opening of a gap in the dispersion relation. The method can also be used to study mixtures of different bosonic species and non-linear excitations.

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