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Asymptotic limit of momentum distribution functions in the sudden expansion a spin-imbalanced Fermi gas in one dimension STEPHAN LANGER, LMU Munich, CARLOS BOLECH, University of Cinncinati, IAN MCCULLOCH, University of Queensland, Brisbane, FABIAN HEIDRICH-MEISNER, LMU Munich, GUILANO ORSO, University Paris Diderot, MARCOS RIGOL, Georgetown University — We study the sudden expansion of a spin-imbalanced Fermi gas in an optical lattice after quenching the trapping potential to zero, described by the attractive Hubbard model. Using time-dependent density matrix renormalization group simulations we demonstrate that the momentum distribution functions (MDFs) of majority and minority fermions become stationary after sufficiently long simulation times. Our main result is that the asymptotic form of the MDFs is fully determined by the integrals of motion of this integrable quantum systems, namely the rapidities from the Bethe ansatz solution, which we show by a direct comparison of DMRG and Bethe ansatz predictions. We discuss the relevance of our results for the observation of Fulde-Ferrell-Larkin-Ovchinnikov correlations in one-dimensional systems, related to recent experiments from Rice University (Liao et al. Nature 467, 567 (2010)).

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