

Abstract Submitted
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Observation of Dynamical Fermionization¹ YUAN LE, JOSHUA M. WILSON, NEEL MALVANIA, YICHENG ZHANG, MARCOS RIGOL, DAVID S. WEISS, Pennsylvania State University — In one dimension, the momentum distribution of a Tonks-Girardeau (T-G) gas of strongly interacting bosons is predicted to evolve from a bosonic to a fermionic shape after turning off the axial confinement [1, 2]. By letting atoms expand in 1D after such a quench, we observe this dynamical fermionization [3]. In this way, we have made the first ever measurement of a distribution of rapidities, which are the momenta of quasi-particles that emerge from interactions in integrable systems. The measurements agree well with numerical simulations of our T-G gas. We also observe bosonic-fermionic oscillations of the momentum distribution after the trap depth is suddenly changed to a new non-zero value [2, 3]. [1] M. Rigol and A. Muramatsu, PRL 94, 240403 (2005). [2] A. Minguzzi and D. M. Gangardt, PRL 94, 240404 (2005). [3] J. M. Wilson, N. Malvania, Y. Le, Y. Zhang, M. Rigol, and D. S. Weiss, arXiv:1908.05364 (to appear in Science).

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