Abstract Submitted
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Probing the thermal to many-body localized transition in one dimension with single site resolution[1] ALEXANDER LUKIN, MATTHEW RISPOLI, ROBERT SCHITTKO, SOOSHIN KIM, M. ERIC TAI, VEDIKA KHEMANI, ADAM KAUFMAN, JULIAN LEONARD, MARKUS GREINER, Harvard University — Many-body localization is an example of the breakdown of quantum thermalization, which occurs in quantum ergodic systems when sufficiently strong disorder is applied. Characteristic features, such as the persistence of the initial state, have been experimentally observed on various platforms, but the growth of non-local correlations has yet to be studied. Here, we probe the interplay of thermalization and localization using a quantum gas microscope, giving us access to site-resolved full counting statistics over multiple decades of time evolution in an isolated system. This allows us to observe correlations that build up both in space and time across the phase transition. We study the decay of density-density correlations as the system crosses into the many-body localized regime and find that the correlation length increases as we approach the critical point. We also observe sub-diffusive temporal dynamics in the particle number fluctuations of subsystems.

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