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Onset of Chaos and Thermalization in a One-Dimensional Bose-Hubbard Lattice in the Mean-Field Regime DOUGLAS MASON, AMY CASSIDY, VANJA DUNKO, MAXIM OLSHANII, University of Southern California — The goal of this work is to identify a Chirikov threshold for the onset of chaos and, beyond the threshold, to study thermalization in a one-dimensional Bose-Hubbard Model. In the mean-field approximation the problem is conceptually close to the one of the beta-f Fermi-Pasta-Ulam model. In the regime of well developed chaos the atomic momentum distribution is shown numerically to converge to the predictions of the grand canonical ensemble, simulated in turn using the Monte Carlo method. We find good agreement between our analytical predictions and the results of our numerical calculations. We discuss the relevance of our results to the recent Newton's Cradle experiments on relaxation of an ensemble of bosonic atoms in a one-dimensional optical trap [T. Kinoshita, T. Wenger, D.S. Weiss, Nature (London) 440, 900 (2006)].

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