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Efficient calculation of localization properties of particles with long-range hopping in extended finite-sized lattices[1] JOSHUA T CANTIN, ROMAN V KREMS, Univ of British Columbia — Determining the localization properties of particles with long-range hopping in lattices larger than 100^3 via exact diagonalization is computationally prohibitive. A faster alternative is to use scaling arguments to qualitatively determine the location of the localization-diffusion crossover line as a function of system size. These scaling arguments are based on the delocalization mechanism: site-to-site resonances. The probability that a given site has a resonance with another site in the system is a monotonic function of the disorder strength, filling fraction, and lattice size. Thus, by identifying a specific probability with the localization-diffusion crossover line at small system sizes, one can efficiently extrapolate the crossover line to macroscopically large system sizes using a combination of numerical and analytical techniques. Here, we determine the quantitative accuracy of this new method by computing the dynamics of a particle with long-range hopping in 1D lattices with different sizes ranging over multiple orders of magnitude. We compare this method with one based on energy level statistics and investigate the connection between the probability of site-to-site resonances and the single-particle Green's function.

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