Talk: Workshop on Localization and Ergodicity (smr3964, Trieste, August 2024)

Title: Perspectives on Anderson insulators: localization landscape and avalanche scenario of many-body de-localization

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Abstract: We will present simulations of electronic states and their respective dynamics for a minimal model of Anderson localization, i.e., the one-dimensional tight-binding chain of spinless fermions with nearest neighbor interactions. The first part of the talk will be devoted to the non-interacting limit, which has been analyzed recently within the concept of the "localization landscape". While traditional applications focused on the band-edges, our results suggests that another fruitful application may be in the intermediate energy range between edges and band center. Specifically, we identify spectral correlations in the local density of states on a large energy scale of $1/\rho\xi$, where $\rho$ denotes a density of states and $\xi$ the localization length.

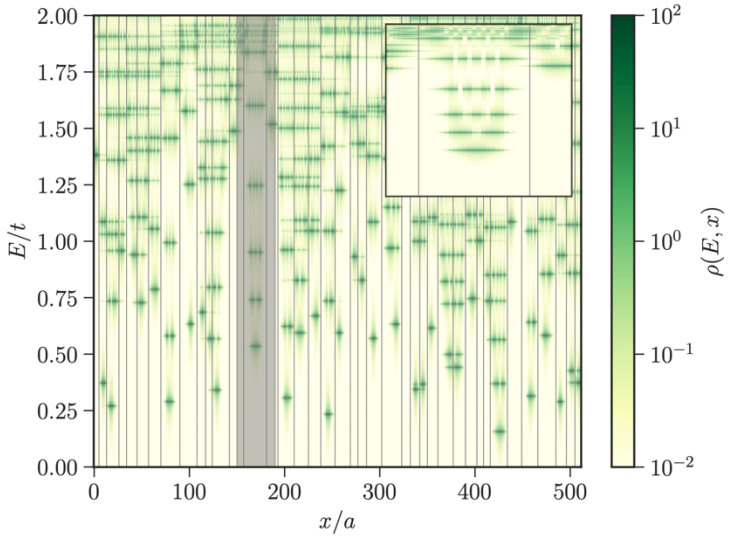


*Figure 1 Locally resolve spectral function of a tight-binding wire, $L = 512$, with on-site energies drawn randomly from [-2t,2t].*
*(Courtesy: J. Dieplinger (2024))*

The second part of the talk addresses the interacting problem. We ask how many-body de-localization in a large system, size L, relates to properties of the two subsystems of half the size, L/2. The traditional scenario foresees situations in which ergodic subsystems thermalize their environment, or the other way round. Our results indicate that this scenario is incomplete, at least for intermediate-sized systems: two localized subsystems can thermalize each other when brought into contact. Implications for many-body de-localization will be discussed.