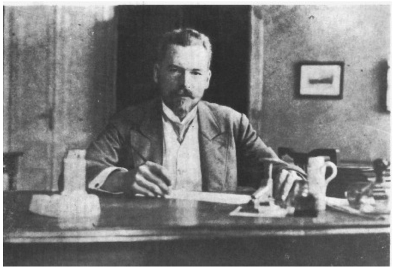

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Quantum boomerang effect in disordered interacting systems

Anderson localization (AL), the absence of diffusion, is one of the most famous phenomena occurring in disordered systems. Since the original Anderson's paper [1], AL was thoroughly investigated theoretically and observed in numerous experimental setups including light, classical waves and quantum systems. Presence of localization leads to many surprising phenomena. One of them is the *quantum boomerang effect* [2]. Due to AL, a wave packet moving with an initial velocity undergoes a retroreflection and returns to its initial position. On the other side, an inclusion of interactions to disordered systems, and more importantly, understanding of their impact on interference phenomena, was always undergoing intense studies. Through many years it was established that interactions may destroy the localization but also a new phenomenon emerged, dubbed *many-body localization* [3]. In our study we focus on the influence of interactions on the boomerang effect, in both the mean field theory approach and many-body simulations. As in other studies, which included nonlinearities to disordered systems, we observe a partial destruction of AL. Due to this, the boomerang effect is lessened, as the interactions act as an effective decoherence mechanism. Additionally, we compare results from the mean field theory with simulations of many-body systems.

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[3] Basko, Denis M., Igor L. Aleiner, and Boris L. Altshuler. "Metal–insulator transition in a weakly interacting many-electron system with localized single-particle states." Annals of physics 321.5 (2006): 1126-1205.

Summary

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