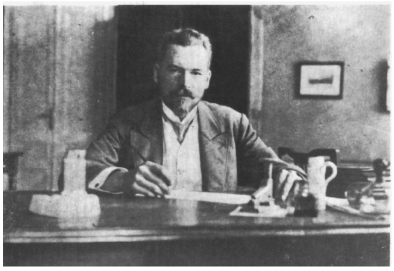

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Non-equilibrium fermionic transport in a periodically-driven tilted lattice

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Investigation of non-equilibrium fermionic transport in a periodically-driven tilted lattice is currently a subject of major interest. Transport properties in this setting are influenced by the drive, tilt, and interactions, as well as the non-Markovian nature of the fermionic reservoirs. We address this setup with two complementary tools, with an ultimate aim at addressing the interplay of all four of these factors in transport: We first formulate quantum transport of driven systems within the extended reservoir approach (ERA), which provides a method to capture continuum reservoirs with both a finite bandwidth and a finite bias. As with non–equilibrium steady states in time–independent scenarios, the current displays a Kramers' turnover including the formation of a plateau region that captures the physical, continuum limit response. We demonstrate that a simple stability criteria identifies an appropriate relaxation rate to target this physical plateau. To benchmark this criteria, we study a non-interacting, one-dimensional driven tilted lattice. The approach recovers well–understood physical behavior in the limit of weak system–reservoir coupling. Extended reservoirs enable addressing strong coupling and non–linear response as well, where we analyze how transport responds to the dynamics inside the driven lattice. In second step, we introduce a many-body density-density interaction and study transport in the fully Markovian limit (e.g., infinite bandwidth and bias). At weak many-body interaction (and weak system-reservoir coupling) the rotating wave approximation captures the various resonance that appear due to the periodic drive. As the many-body interaction increases, a new resonance appears that can display a giant enhancement of conductance. The next step is to put these two sets of results together within tensor networks and study fully many-body quantum transport in a periodically driven system in the presence of finite bias, finite bandwidth reservoirs.

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