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Title: Drive induced universal freezing in quasiperiodic chains

Abstract: In a tight-binding model, localization arises from suppressing the coherent superposition of localized Wannier orbital wavefunctions caused by sufficiently large differences in on-site potentials relative to the hopping amplitude. This delicate condition of localization can be broken by a strong enough time-periodic perturbation that can “melt” localization by restoring the Wannier wave function hybridization, however by choosing a special drive protocol localization can be also restored by dynamical “freezing” at resonant drive frequencies. We address the question of arisal of complete localization by engineering through an external time-periodic drive in a disordered system, regardless of a system’s static properties. In this work, we demonstrate a universal dynamical freezing regime induced by staggered time periodic modulation of the bond lengths of a generalized quasi-periodic Aubry-Andre model. Our asymptotically exact numerical results show that the periodic drive-induced dynamical freezing regime doesn’t depend on the static properties of the model or the discrete or continuum nature of the drive. We find that the universal dynamical freezing regime is a non-perturbative effect but employing two different perturbative approaches we propose a mechanism for the same that suggests a competition between drive induced infinite-range tunneling at infinite order of perturbation and crystalline symmetry breaking onsite potential.