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Self-consistent-theory approach to many-body localization

An analytical theory, based on the perturbative treatment of the disorder and extended into a self-consistent set of equations for the dynamical density correlations, is developed and applied to the prototype one-dimensional model of many-body localization.
Results show a qualitative agreement with numerically obtained dynamical structure factor in the whole range of frequencies and wavevectors, as well as across the transition to the nonergodic behavior. The theory reveals the singular nature of the one-dimensional problem, whereby on the ergodic side the dynamics is subdiffusive with a dynamical exponent varying with the disorder.
