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Disorder and long-range interactions in many-body cavity quantum electrodynamics

We discuss the dynamics of one-dimensional Bose-Hubbard models describing ultracold atomic ensembles interacting via cavity-mediated forces and in presence of disorder. We show that in the presence of local disorder the dynamics can manifest signatures of many-body localization. When the long-range interactions are disordered, these give rise to superglass to superfluid phases which exhibit exotic critical properties. We discuss how these features can be revealed in the light emitted by the resonator.