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Self-localization in bosonic optical lattices: beyond mean-field theory TADEUSZ PUDLIK, Boston University, HOLGER HENNIG, Broad Institute, DIRK WITTHAUT, Max-Planck-Institute for Dynamics and Self-Organization, DAVID CAMPBELL, Boston University — The combination of nonlinearity and discreteness allows cold bosonic atoms in optical lattices to support stable excitations, known as discrete breathers or intrinsic localized modes. Prior mean-field theory studies suggest such structures form spontaneously in the presence of dissipation, as long as the nonlinearity is strong enough. But how many atoms must be present in the lattice before these effects are observed? In our work, we address this question using numerically exact treatments of the dissipative Bose-Hubbard model. Our results suggest interesting phenomena may be seen in near-term experiments with just a few atoms per lattice site.

Tadeusz Pudlik
Boston University

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