Abstract Submitted
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**Localization, scarring, and the effects of disorder on Rydberg atoms and other excited systems** MATTHEW EILES, ANDREW HUNTER, ALEXANDER EISFELD, JAN-MICHAEL ROST, Max Planck Institute for the Physics of Complex Systems, FINITE SYSTEMS TEAM — We present an investigation of wave function localization in the excited states of separable Hamiltonia perturbed by small, short-range impurities. In this context we explore possible connections between Anderson-type localization, classical periodic orbits, quantum degeneracies, and disordered environments. As a prototype system we focus on a Rydberg atom immersed in a cloud of ground state atoms, e.g. an ultracold gas or an optical lattice. As a consequence of their high degeneracy, which reflects the underlying symmetry of the Hamiltonian, the perturbed Rydberg states can localize due to these perturbations. Similar behavior has also been witnessed in other model systems, for example the case of a two-dimensional harmonic oscillator and other central power law potentials, and so we attempt to develop a theoretical framework to explain the common behavior found in these different systems.

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