Abstract Submitted
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Rapid onset of decoherence in driven-dissipative Rydberg systems[1] ERIC MAGNAN, JQI - Institut d'Optique, THOMAS BOULIER, CARLOS BRACAMONTES, JAMES MASLEK, JEREMY YOUNG, ALEXEI GORSHKOV, TREY PORTO, STEVEN ROLSTON, JQI, JQI - RUBIDIUM ONE TEAM — Rydberg atoms have been strong candidates for the realization of quantum information processing and quantum simulation. Recently, however, there has been concerns about this approach due to the observation of a rapid onset of decoherence in large ensembles [PRA 93, 043425 (2016)]. In [PRL 116,113001 (2016)] we provide experimental support for the hypothesis that this is due to the avalanche-like onset of exchange dipole interactions, fueled by blackbody transitions to nearby Rydberg states of opposite parity. Making a fully microscopic model has proven difficult as it requires beyond mean-field arguments, but the ubiquitousness of Rydberg-Rydberg blackbody transitions at room temperature and the always-resonant nature of dipole exchange interactions make it an interesting challenge, and argues for deeper study into the matter. In this poster, we present complementary measurements and analysis that confirm this mechanism. We also discuss several possibilities to reduce its impact on the system's coherence.

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