Abstract Submitted
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Absence of Collective Decay in a Cold Rydberg Gas[1] TAO ZHOU, B.G. RICHARDS, R.R. JONES, University of Virginia — We have studied the decay of Rydberg excitations in a cold Rb gas. A 10 ns, pulsed dye-amplified diode laser drives Rb $5p$ atoms at 70 μK in a MOT to ns or np Rydberg states. Excitation of np states is facilitated by Stark mixing in a small static electric field. Time-delayed state-selective field ionization (SSFI) is used to directly monitor the population in the initial and neighboring Rydberg levels. We find that the time-dependence of the Rydberg population is well described by numerical simulations which consider only spontaneous emission and stimulated emission and absorption of black-body radiation. No signature of collective decay phenomena is observed. In contrast, previous studies (T. Wang et al., Phys. Rev. A 75, 033802 (2007)) performed at similar atom density and laser focal volume conditions, but at slightly higher principal quantum number and without state resolved population detection, reported evidence of very rapid Rydberg decay that was attributed to superradiance.

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