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Strongly interacting quantum excitations of a cold atomic gas YAROSLAV DUDIN, ALEX KUZMICH, Georgia Institute of Technology, GEORGIA INSTITUTE OF TECHNOLOGY TEAM — Strong interactions of Rydberg atoms in a mesoscopic ensemble can be employed for fast preparation of desired many-particle states. In this work, Rydberg excitations are generated in an ultracold atomic Rb gas and are converted into light. As the principal quantum number n is increased beyond ~ 70, no more than a single excitation is retrieved from a mesoscopic ensemble. These results hold promise for studies of dynamics and disorder in many-body systems with tunable interactions and for scalable quantum information networks.

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