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Collective quantum jumps of Rydberg atoms TONY LEE, California Institute of Technology, HARTMUT HAEFFNER, University of California, Berkeley, MICHAEL CROSS, California Institute of Technology — A quantum system under constant observation may occasionally switch between two metastable states. These quantum jumps are usually observed in a single object, like an atom, electron, or superconducting qubit. We report on a collective type of quantum jump in a group of atoms with long-range Rydberg interaction, laser driving, and spontaneous emission. Over time, the system occasionally jumps between a state of low Rydberg population and a state of high Rydberg population. The jumps are inherently collective and in fact exist only for a large number of atoms. We explain how entanglement and quantum measurement enable the jumps, which are otherwise classically forbidden.

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