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Carving complex many-atom entangled states by single-photon detection JIAZHONG HU, WENLAN CHEN, YIHENG DUAN, BORIS BRAVERMAN, HAO ZHANG, VLADAN VULETIC, Massachusetts Inst of Tech-MIT — We propose a versatile and efficient method to generate a broad class of complex entangled states of many atoms via the detection of a single photon. For an atomic ensemble contained in a strongly coupled optical cavity illuminated by weak single- or multi-frequency light, the atom-light interaction entangles the frequency spectrum of a transmitted photon with the collective spin of the atomic ensemble. Simple time-resolved detection of the transmitted photon then projects the atomic ensemble into a desired pure entangled state. This method can be implemented with existing technology, yields high success probability per trials, and can generate complex entangled states such as multicomponent Schrödinger cat states with high fidelity.

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