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Generation of ion-photon entangled state with trapped barium ions[1] NATHAN KURZ, GANG SHU, MATTHEW DIETRICH, KATHERINE MITCHELL, BORIS BLINOV, University of Washington — Trapped ions are an attractive qubit candidate, particularly for their long coherence times and natural coupling to photons. We trap single Barium-138 ions in a linear Paul trap and excite these ions with mode-locked pulses to generate a single photon per excitation. The Zeeman sublevels of the ground state can then be entangled with orthogonal polarization modes of the photons emitted upon decay from either the $6P_{3/2}$ or $6P_{1/2}$ state at 455 and 493 nm, respectively. Preliminary results have been obtained using weak continuous wave excitation to generate single photons at 493 nm, as confirmed by anti-coincidence measurements. Such work represents a crucial step toward the generation of multi-ion entangled states.

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