Abstract Submitted
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Femtosecond optical excitation of trapped barium ions[1] N. KURZ, M.R. DIETRICH, R. BOWLER, G.T. HOWELL, V. MIRGON, J.S. SALACKA, G. SHU, L. WANG, B.B. BLINOV, UNIVERSITY OF WASHINGTON DEPARTMENT OF PHYSICS TEAM — Ion-photon entanglement and the remote entanglement of trapped ions are crucial building blocks of several proposed quantum computing architectures. The creation and detection of single photons from the trapped ions is a fundamental step in this process. Ultrafast laser pulses with an optical bandwidth broad enough to coherently excite both hyperfine levels of the ground state can be used to create optical qubit photons differentiable by their frequency or polarization upon decay to their respective ground states. Preliminary results have been achieved with this technique using trapped $^{138}Ba^{+}$ ions, which displays Rabi oscillations between $S_{1/2}$ and $P_{3/2}$ states driven by near-resonant 400 fs pulses at 455 nm. We plan to use the odd isotope ($^{137}Ba^{+}$) whose nuclear spin leads to ground state hyperfine splitting, where the same excitation method would create optical qubits and ion-photon entangled states.

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N. Kurz
University of Washington

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