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Metastable Manipulation of the 133Ba+ Qubit[1] ZACHARY WALL, UCLA, UCLA HUDSON GROUP TEAM — Trapped ions are attractive qubit hosts due to their long coherence times and straightforward manipulation via electromagnetic fields. Future fault-tolerant quantum computers will not only require ultra-high fidelity gate operations, which has been the focus of recent efforts, but also ultra-high fidelity state preparation and measurement (SPAM), which is currently orders of magnitude lower. We present recent work with the synthetic trapped-ion qubit 133Ba+, a radioactive isotope of barium with a 10.5yr half-life. The spin-1/2 nucleus, visible wavelength electronic transitions, and long-lived 2D5/2 state make this trapped-ion qubit ideal for ultra-high fidelity work. We demonstrate manipulation through a stimulated Raman transition of the 2D5/2 state as a stable qubit.

[1]Department of Physics, University of California - Los Angeles

Zachary Wall
UCLA

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