Design, Development, and Characterization of a Dual Linear Paul Trap

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Synopsis We report the implementation and initial characterization of a dual-site linear Paul trap for confining Ca ions.

Here, we report the design, assembly, and initial characterization of a dual linear Paul trap, for confining Ca ions. The system is assembled within a vacuum chamber, with three atomic calcium ovens [1] integrated to allow simultaneous loading in the trap sites. A high-voltage radio-frequency drive is delivered via a custom-developed helical resonator [2] [3] to operate the trap. An imaging system with 15X-20X magnification has been designed [2] and implemented to detect ion fluorescence in both traps using a single-photon counting head. Resonant tickle excitation is subsequently employed to determine the radial and axial secular frequencies of the trapped ^{40}Ca ions. This system is being developed towards ion transport [4], scalability [5], coherent control of qubit transitions [6], and studies of fundamental physics. This is an ongoing experiment; recent developments and progress will be presented in the poster.

References

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