

Abstract Submitted
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New technology for quantum control of multi-species ion chains¹

BEN KEITCH, ETH Zuerich — I will present recent results of the trapping and control of calcium ions in a microfabricated, segmented Paul trap. The trap is a four-layer design that includes segmented compensation electrodes and that is optimized for implementing quantum control, separation and shuttling of mixed-species ion strings. The key features of the experimental apparatus include:

- Two high NA imaging systems, consisting of a custom in-vacuum objective for simultaneous diffraction-limited imaging at 313nm and 397nm.
- A >1W 313nm laser system for high-fidelity gate operations.
- A custom-built FPGA-based control system that uses an embedded processor controlling many distributed programmable DDS systems in a scalable architecture.

I will explain how these new technological elements will enable us to explore mixed-species gates, and perform open system quantum simulations by using one ion species as an artificial environment for the other.

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