

Abstract Submitted
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Flexible control of two-species ion chains for quantum information processing HSIANG-YU LO, DANIEL KIENZLER, BEN KEITCH, LUDWIG DE CLERCQ, VLAD NEGNEVITSKY, FRIEDER LINDENFELSER, FLORIAN LEUPOLD, JOSEBA ALONSO, MATTEO MARINELLI, CHRISTA FLUEHMANN, JONATHAN HOME, Institute for Quantum Electronics, ETH Zurich, TRAPPED ION QUANTUM INFORMATION GROUP TEAM — We will describe control of beryllium-calcium ion chains in a three-dimensional segmented linear Paul trap, which is relevant for scaling up quantum information processing based on trapped ions [1,2]. We have loaded multi-species ion strings, and imaged both species simultaneously using a bichromatic imaging system. We will describe experiments in quantum control using this system, including demonstrations of dissipative methods for preparing motional superpositions including squeezed states of motion, and new diagnostic methods for these states based on bichromatic Hamiltonians. These methods provide routes to open-systems quantum simulations with trapped ions.

- [1] D. Kielpinski, C. Monroe, and D. J. Wineland, *Nature* **417**, 709 (2002)
- [2] J. P. Home, D. Hanneke, J. D. Jost, J. Amini, D. Leibfried and D. J. Wineland, *Science* **325**, 1227 (2009).

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