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Integrated Technologies for Chip-Scale Trapped-Ion Quantum Control ROBERT MCCONNELL, SURAJ BRAMHAVAR, COLIN BRUZEWICZ, DAVE KHARAS, WILLIAM LOH, MIT Lincoln Laboratory, KARAN MEHTA, MIT, JASON PLANT, JONATHAN SEDLACEK, CHERYL SORACE-AGASKAR, MIT Lincoln Laboratory, JULES STUART, MIT, JOHN CHIAVERINI, MIT Lincoln Laboratory, RAJEEV RAM, MIT, JEREMY SAGE, MIT Lincoln Laboratory — Microfabricated ion-trap arrays are attractive platforms for scalable quantum information processing with large numbers of qubits. The robust photolithographic techniques used to define the trapping electrodes can potentially be combined with integrated photonic devices and CMOS electronics to build a single system that performs the key functions of a quantum information processor on-chip. Here we describe progress towards the demonstration of the components of an integrated chip-scale platform, focusing on multilayer photonic waveguides to route multiple laser beams throughout a trap array, integrated photodetectors for ion-state readout, and embedded CMOS circuitry for on-chip electronic control.

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