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# Twenty-zone surface ion trap with fully integrated photonics

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One of the obstacles in scaling up trapped ion quantum computing is the increasing number of free-space lasers with increasing numbers of ions. These lasers are necessary for cooling the ions as well as performing quantum state manipulation and readout. In QCCD architectures, where ions are moved in two-dimensional trap arrays, individual addressing by free-space lasers further increases the system complexity. A promising avenue to address this challenge is the delivery of light through on-chip integrated waveguides, as previously demonstrated in the Home group at ETH Zurich [Mehta, 2019] for infrared light. Jointly with the ETH team, our group at PSI, is exploring this approach now in a 2D array that incorporates both UV and infrared light delivery through integrated photonics, combining Si3N4 and Al2O3 for the first time in an ion trap.

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