Abstract Submitted
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Scalable entanglement in trapped ions using optimal control of multimode couplings[1] SHANTANU DEBNATH, TAEYOUNG CHOI, T. ANDREW MANNING, CAROLINE FIGGATT, CHRIS MONROE, Joint Quantum Institute, University of Maryland Department of Physics and National Institute of Standards and Technology, College Park, Maryland-20742 — We perform high fidelity multipartite entanglement of ion subsets in a chain of five Yb+ qubits using optimal pulse shaping [1]. A focused mode-locked laser beam individually addresses qubits to couple them to multiple collective transverse modes of motion to perform entangling phase gates on pairs of adjacent qubits. Pulse shaping by modulating the amplitude and phase of the laser can drive high fidelity gates for certain pulse solutions that are relatively insensitive to detuning errors. We create entangled states in the GHZ class and witness genuine tripartite entanglement using individual state detection. This method of engineering the evolution of multiple modes scales well for large qubit registers by keeping gate times short.

[1] T. Choi et al., arXiv:1401.1575 (2014).

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