

Abstract Submitted  
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**Using optical pulse shaping to entangle individual ions in a chain by coupling to multiple motional modes**<sup>1</sup> TAEYOUNG CHOI, T.A. MANNING, S. DEBNATH, B. FIELDS, CHRIS MONROE, JQI and Physics Department, University of Maryland, College Park, MD 20742 — We present progress in an anharmonic linear trap that produces a uniformly-spaced chain of  $^{171}\text{Yb}^+$  ions that allows for individual optical addressing. When 355 nm laser beams are directed to the target ions, Raman transitions can be driven to couple ion qubit states through their collective transverse motional modes [1]. By optimizing the parameters of the applied laser pulse sequences, simultaneous coupling to multiple modes of motion may allow for high gate fidelity while increasing the gate speed [2]. Here, we show simulations that optimize the intensities, duration, and detuning of the laser pulses as well as our preliminary results for implementing this scheme.

[1] G.-D. Lin, et al., *Europhys. Lett.* **86**, 60004 (2009)

[2] S-L. Zhu, et al., *Europhys. Lett.* **73**, 485491 (2006)

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