Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

A System For High Flexibility Entangling Gates With Trapped Ions ALISTAIR MILNE, CLAIRE EDMUNDS, SANDEEP MAVADIA, TODD GREEN, MICHAEL BIERCUK, Univ of Sydney — Trapped ion qubits may be entangled via coupling to shared modes of motion using spin-dependent forces generated by optical fields. Residual qubit-motional coupling at the conclusion of the entangling operation is the dominant source of infidelity in this type of gate. For synchronously entangling increasing numbers of ions, longer gate times are required to minimise this residual coupling. We present a scheme that enables the state of each qubit to be simultaneously decoupled from all motional modes in an arbitrarily chosen gate time, increasing the gate fidelity and scalability. This is achieved by implementing discrete phase shifts in the optical field moderating the entangling operation. We describe an experimental system based on trapped ytterbium ions and demonstrate this scheme for two-qubit entangling gates on ytterbium ion pairs.

Alistair Milne
Univ of Sydney

Date submitted: 06 Nov 2015 Electronic form version 1.4