Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

High-fidelity spatial addressing of $^{43}Ca^{+}$ qubits using near-field microwave control[1] DIANA PRADO LOPES AUDE CRAIK, NORBERT LINKE[2], University of Oxford, DAVID ALLCOCK, NIST, USA, MARTIN SEPIOL, THOMAS HARTY, CHRISTOPHER BALLANCE, DEREK STACEY, ANDREW STEANE, DAVID LUCAS, University of Oxford — Individual addressing of qubits is essential for scalable quantum computation. Spatial addressing allows unlimited numbers of qubits to share the same frequency, whilst enabling arbitrary parallel operations. We present the latest experimental results obtained using a two-zone microfabricated surface trap designed to perform spatial, near-field microwave addressing of long-lived $^{43}Ca^{+}$ "atomic clock" qubits held in separate trap zones (each of which feature four integrated microwave electrodes) [1],[2]. Microwave near fields generated by multi-electrode chip ion traps are often difficult to faithfully simulate and a simple method of characterizing and testing trap chips before placement under ultra-high vacuum would significantly speed up trap design optimization. We describe a printed circuit board antenna for use in mapping microwave near-fields generated by ion-trap electrodes. The antenna is designed to measure fields down to 100μm away from trap electrodes and to be impedance matched at a desired spot frequency for an improved signal to noise ratio in field measurements. References: [1] D. P. L Aude Craik et al, arXiv:1601.02696 (2016); [2] D. P. L Aude Craik et al, Appl. Phys. B 114, 3 -10 (2014)

[1]This work is supported by the US Army Research Office, EPSRC (UK) and the UK National Quantum Technologies Programme
[2]Now at the University of Maryland, USA

Diana Prado Lopes Aude Craik
University of Oxford

Date submitted: 01 Apr 2016 Electronic form version 1.4