Abstract Submitted
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Entanglement of trapped ions using low-frequency magnetic field gradients[1] SHAUN C. BURD, National Institute of Standards and Technology, University of Colorado Boulder, DAVID T. C. ALLCOCK, National Institute of Standards and Technology, Boulder CO, RAGHAVENDRA SRINIVAS, National Institute of Standards and Technology, University of Colorado Boulder, DANIEL H. SLICHTER, ANDREW WILSON, DIETRICH LEIBFRIED, DAVID WINELAND, National Institute of Standards and Technology, Boulder CO — Entangled states of trapped ions are typically generated using laser-induced spin-motion coupling. Spin-motion coupling with hyperfine qubits has also been demonstrated with microwave magnetic fields instead of lasers, thus eliminating photon scattering errors and offering potential benefits for scalability. These experiments have relied on either static magnetic field gradients or oscillating magnetic field gradients at GHz frequencies[1-4]. We present a method of spin-motion coupling using a magnetic field gradient oscillating at MHz frequencies. We describe progress in using this method to perform one- and two-qubit manipulations of $^{25}Mg^{+}$ ions in a cryogenic microfabricated surface-electrode trap. This implementation offers important technical advantages over both the static-gradient and GHz-gradient techniques. [1] Mintert and Wunderlich PRL 87, 257904 (2001) [2] Weidt et al. PRL 117, 220501 (2016) [3] Ospelkaus et al. Nature 476, 181 (2011) [4] Harty et al. PRL 117, 140501 (2016)

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