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Investigation of Trapped-Ion Heating Rate with Surface Preparation Techniques JULES STUART, Massachusetts Inst of Tech-MIT, JONATHON SEDLACEK, COLIN BRUZEWICZ, ROBERT MCCONNELL, JEREMY SAGE, JOHN CHIAVERINI, MIT Lincoln Laboratory — Systems of trapped ions are promising candidates for scalable quantum computing applications. The motional states of ion crystals can be used as a bus to transfer entangled states between ions and perform multiple complex quantum operations. Electric field noise tends to heat up the ions in an incoherent way that prevents long sequences of multi-qubit gates. We seek to characterize and reduce this effect by monitoring the heating rate of trapped Sr+ ions in surface electrode traps. We employ surface preparation techniques, including plasma cleaning and ion milling, and analyze the effects on ion behavior. In complementary experiments, we test the effect of a thin dielectric oxide layer deposited on the trap by sputtering and monitored using XPS. We also measure heating rates of co-trapped Sr+ and Ca+ ions in the stretch and common motional modes.

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