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Investigation of Ion Motional Heating in the Presence of Technical Noise JONATHON SEDLACEK, MIT Lincoln Laboratory, JULES STUART, Massachusetts Institute of Technology, COLIN BRUZEWICZ, ROBERT MCCONNELL, JEREMY SAGE, JOHN CHIAVERINI, MIT Lincoln Laboratory — Surface-electrode ion traps show tremendous promise for large-scale quantum information processing. However, motional heating of ions has a detrimental effect on the fidelity of quantum logic operations. Despite the extensive study of motional heating in recent years, the underlying mechanisms are not completely understood. In these experiments however, contributions due to technical noise present on the DC and RF electrodes are often overlooked. We present a method for determining if the motional heating is dominated by residual voltage noise on the DC or RF electrodes. Also, we have found that stray DC electric fields can shift the ion position such that technical noise on the RF electrodes can significantly contribute to the motional heating rate. After minimizing the pseudopotential gradient by using parametric excitation, the motional heating due to RF technical noise can be significantly reduced.

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