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Stability of Ion Chains in a Cryogenic Surface-Electrode Ion Trap

GRAHAME VITTORINI, Georgia Institute of Technology, S. CHARLES DORET, Ga Tech Research Institute, KENNETH R. BROWN, Georgia Institute of Technology, ALEXA W. HARTEK, Ga Tech Research Institute — Cryogenic environments offer significant advantages for ion trapping due to their potential for low trap heating rates and exceptional vacuum. This makes cooled ion traps well suited to the study of chains of ions, which ordinarily suffer from melting and short lifetimes in conventional room temperature ion trapping systems. We have developed a simple, modular cryostat for use with surface-electrode ion traps that provides flexible optical access, high numerical aperture imaging, and excellent vacuum. Using this system we are investigating the stability of and ion loss from small chains of ions as a function of local factors such as vacuum quality, laser cooling parameters, and modifications to trapping potentials.

Grahame Vittorini
Georgia Institute of Technology

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