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Buffer gas loading and Doppler cooling of strontium ions in a planar Paul trap ROBERT CLARK, KENNETH BROWN, JAROSLAW LABAZIEWICZ, PHILIP RICHERME, ISAAC CHUANG, Massachusetts Institute of Technology — Traditional geometries for ion traps involve three dimensional structures which may be difficult to assemble in complex geometries demanded by applications such as large-scale quantum computation. Planar Paul traps provide an alternative approach [Chiaverini et. al., Quant. Inf. Comput. 5, 419 (2005)], in which the RF and DC electrodes are placed in a single plane, providing simpler fabrication and greater optical access to the trapped ions. We have designed and constructed a planar Paul trap using copper electrodes on a Rogers 4350 substrate. Strontium ions were loaded into this structure at UHV, and also at high vacuum using helium buffer gas cooling. The temperature of the ion cloud as a function of buffer gas pressure is compared to predictions from a model which includes ion-helium collisions and RF heating. The measured trap parameters, including secular frequencies, trap depth, and RF heating rates, agree well with a pseudopotential model based on finite-element electrostatic calculations.

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