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A microfabricated surface-electrode ion trap for scalable quantum information processing[1] SIGNE SEIDELIN, NIST, JOHN CHIAVERINI, RAINER REICHLE, JOHN BOLLINGER, DIDI LEIBFRIED, JOE BRITTON, JANUS WESENBERG, BRAD BLAKESTAD, RYAN EPSTEIN, DAVID HUME, JOHN JOST, CHRIS LANGER, ROEE OZERI, NOBU SHIGA, DAVID WINELAND — We demonstrate confinement of individual atomic ions in a radio-frequency Paul trap with a novel geometry where the electrodes are located in a single plane and the ions confined above this plane. This device is realized with a relatively simple fabrication procedure and has important implications for quantum state manipulation and quantum information processing using large numbers of ions. We confine laser-cooled Mg-24 ions approximately 40 micrometer above planar gold electrodes. We measure the ions' motional frequencies and compare them to simulations. From measurements of the escape time of ions from the trap, we also determine a heating rate of approximately five motional quanta per millisecond for a trap frequency of 5.3 MHz.

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