Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Ideal Multipole Ion Traps from Planar Ring Electrodes ROBERT CLARK, The Citadel, Charleston, SC, 29409 — We present designs for multipole ion traps based on a set of planar, annular, concentric electrodes which require only rf potentials to confine ions. We illustrate the desirable properties of the traps by considering a few simple cases of confined ions. We predict that mm-scale surface traps may have trap depths as high as tens of electron volts, or micromotion amplitudes in a 2-D ion crystal as low as tens of nanometers, given realistic experimental parameters. We also discuss applications to quantum information science, frequency metrology, and cold ion-atom collisions.

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Date submitted: 08 Nov 2012 Electronic form version 1.4