

# The Coaxial Ion Trap: Concentric Quadrupolar and Toroidal Trapping Regions

---

D. AUSTIN, Y. PENG, B.J. HANSEN, A.R. HAWKINS, H. QUIST

Brigham Young University, Peovo, UT

We present the design and results for a new radiofrequency ion trap mass analyzer, the coaxial ion trap, in which both toroidal and quadrupolar trapping regions are created simultaneously. The device consists of two parallel ceramic plates, whose facing surfaces are lithographically patterned with concentric metal rings and covered with a layer of germanium. Ions can be trapped in either region, transferred from the toroidal to the quadrupolar region, and mass-selectively ejected from the quadrupolar region to a detector. Ions trapped in the toroidal region can be transferred to the quadrupole region using an applied ac signal in the radial direction, although it appears that the mechanism of this transfer does not involve resonance with the ion secular frequency, and the process is not mass selective. Ions in the quadrupole trapping region are mass analyzed using dipole resonant ejection. Multiple transfer steps and mass analysis scans are possible on a single population of ions (as from a single ionization/trapping event), illustrating the larger ion capacity of toroidal ion trap and possible applications in analyzing transient or dynamic events.