

# Cylindrical Toroidal Ion Trap Mass Spectrometer

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We present a new ion trap mass analyzer employing a toroidal geometry, in which cylindrical electrodes are used rather than the hyperboloidal surfaces of revolution used in conventional toroidal ion traps. Analogous to the cylindrical ion trap (CIT) and the rectilinear ion trap (RIT), the cylindrical toroidal trap represents a simplified electrode geometry facilitating miniaturization or multilayer microfabrication. The toroidal geometry provides a large trapping volume, needed to maintain sensitivity in a reduced-size analyzer. Asymmetric overlap of the electrodes creates the proper fields, overcoming the inherent asymmetry of the toroidal geometry. Adjustment of the electrode spacing allows control of higher-order field components, and allows different ratios of major to minor radii. Miniaturization takes place as the minor radius is reduced (the characteristic trapping dimension) while holding the major radius at a large value. Ions are ejected radially onto a single point, allowing a small detector or a single detection wire to be used. Preliminary data from a full-sized prototype demonstrate device function on several organic compounds.