

# Wire Ion Trap Mass Spectrometer: Strong Performance on a Tight Budget

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We report on a novel miniaturized linear ion trap made using a series of wires held between two support plates. The wire ion trap is made by replacing each of the four hyperbolic electrodes of a conventional linear ion trap with 4-6 wires of 80-120 microns' diameter. Wires are accurately positioned and held taut between two printed circuit boards or other rigid substrates. Holes in the substrates can be laser- or machine drilled for accurate placement. This approach takes advantage of the high accuracy of 2-dimensional positioning but allows a trap of arbitrary length, improving trapping capacity. The performance of the trap is largely immune to problems associated with mechanical misalignment, addressing a major issue affecting miniaturized ion traps. For instance, even if the support plates are 2-3 degrees off of parallel, the mass resolution is not noticeably degraded. In addition, the trap is extremely lightweight and rugged. The trap can be dropped from several feet and not require re-alignment. Experiments with pure compounds and complex mixtures show typical peak widths of 0.3 amu and detection limits in the ppb range. Instrument performance is demonstrated with a magnetically focused electron ionization source at one end and a vacuum-UV single-photon ionization source (enabling soft ionization) at the other end of the trap.