A Field Deployable Ion Trap Mass Spectrometer with Atmospheric Pressure Interface

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A miniature quadrupole ion trap mass spectrometer with atmospheric pressure interface will be reported. The instrument does not use any external pumps or gas tanks, is capable of battery operation, and its weight (34 kg), size (30x43x50 cm), and power consumed (150-250 W) make it ideal for numerous field applications. It has wide m/z 30-2500 mass range, better than unit mass resolution, and tandem mass spectrometry capabilities. The ways to reduce the size, weight, and power consumption will be discussed. Operation of the instrument with different ionization sources, including atmospheric pressure (AP) chemical ionization, electrospray (ESI), secondary ESI (sESI), direct analysis in-real-time (DART), and AP matrix-assisted laser desorption/ionization (AP-MALDI), will be reported. AP-MALDI analysis of low femtomole amounts of peptides reveals that sensitivity of the instrument is on par with current commercially available desktop quadrupole ion trap mass spectrometers. Other reported applications will include toxic industrial chemical and pesticide analysis, explosive trace detection, and microbial identification.