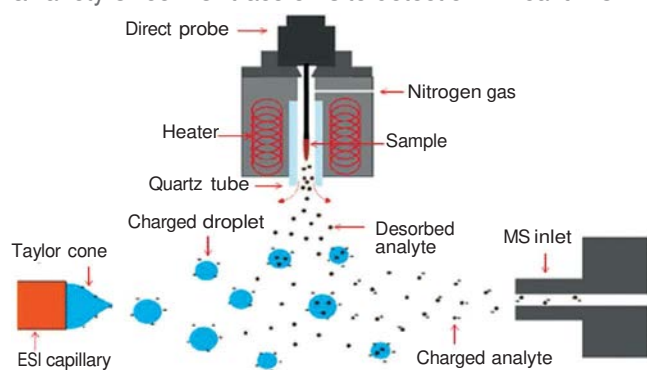


Novel Transportable Mass Spectrometer

There are a variety of compelling reasons to develop methods for the rapid on-site detection of chemical species at trace levels with high specificity. Performing chemical analysis *in situ* without the necessity to deliver samples to the off-site analytical laboratory is advantageous in many areas of chemical analysis from environmental monitoring and food control to chemical process monitoring. *In situ* monitoring is also crucial for an early warning of a chemical or biological release. This objective has been partly fulfilled through the development of the current generation of transportable analytical instrumentation for *in situ* detection of chemical compounds. Most of these field-deployed instruments are based on optical spectroscopy or electrochemical sensors, because miniaturization of these technologies was relatively straightforward. However, miniaturization of mass spectrometry lags behind, because no sufficient progress in miniaturization of vacuum technologies, ion optics, and mass analyzers have allowed simple shrinking of large research grade laboratory mass spectrometers.

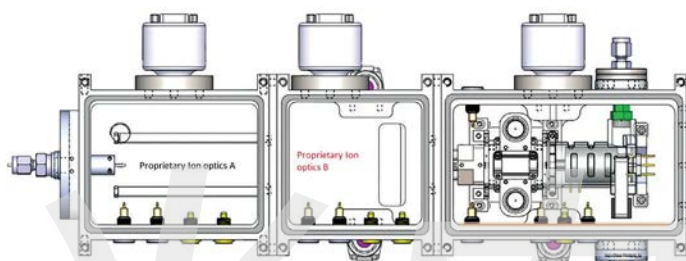
BaySpec has newly introduced its transportable mass spectrometer product line that was specifically developed for field applications using cutting edge linear ion trap technology. Featuring light weight and compact size, BaySpec's novel linear ion trap mass analyzers are the most sensitive portable devices available on the market with ppt-level detection limit. All instruments are equipped with two sample inlets for low pressure and atmospheric sampling. All BaySpec mass spectrometers are compatible with *in situ* and real-time ionization methods including electron impact (EI), thermal desorption (TD), electrospray ionization (ESI), atmospheric pressure chemical ionization (APCI), and any other ambient ionization techniques such as DART and DESI. These extremely compact instruments are very easy to operate and maintain and are ideal for a variety of bulk or trace on-site detection in real time.



Schematic of TD-ESI. Shiea et al. *Anal. Chem.*, 2013, 85 (19), pp 8956–8963.

Mass Analyzers

The new miniature mass spectrometers from BaySpec are based on proprietary linear ion trap technology that offers unparalleled performance. BaySpec's smallest mass spectrometer series, Portability™, offers trace-level detection with direct atmospheric sampling, while our Continuity™ mass spectrometer offers improved sensitivity and mass range for more demanding applications. Custom ion focusing optics coupled with high-efficiency transport optics allows Continuity™ to detect virtually all generated ions.



BaySpec mass spectrometers also benefit from a completely custom vacuum design that includes pump fabrication, chamber housings, and conductance limiters. These technologies allow our mass spectrometers to perform atmospheric sampling without sacrificing size or performance.

Sampling Systems

BaySpec offers an optional TD-ESI source that comes complete with a probe consisting of a metal inoculation loop for collecting minute amounts of liquids (~ 2 μ L) and/or solids (~ 20 ng). Our TD-ESI is capable of sampling virtually any liquid or surface without the need for costly and time-consuming sample preparation. For even greater flexibility, BaySpec's miniature linear ion trap mass analyzer can detect either positive or negative ions that are generated from the TD-ESI source. Switching the system's polarity measurement mode is easily accomplished with the click of a button or, in this case, a tap of the screen.



TD-ESI for atmospheric sampling of liquids and solid surfaces shown as a stand-alone unit as well as mounted to the Portability™ mass spectrometer.

Using Linear Ion Trap Technology

Features and Specifications

Portability™

- n Compact and Light-weight
- n Rapid deployment (< 10 min setup)
- n Pulsed atmospheric sampling



Continuity™

- n High sensitivity
- n Large mass range
- n Continuous atmospheric sampling

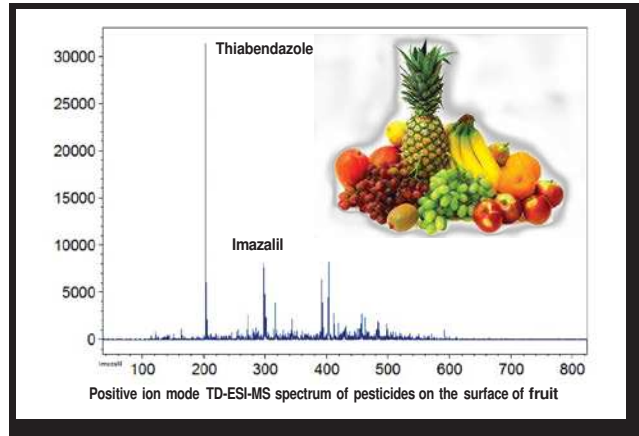
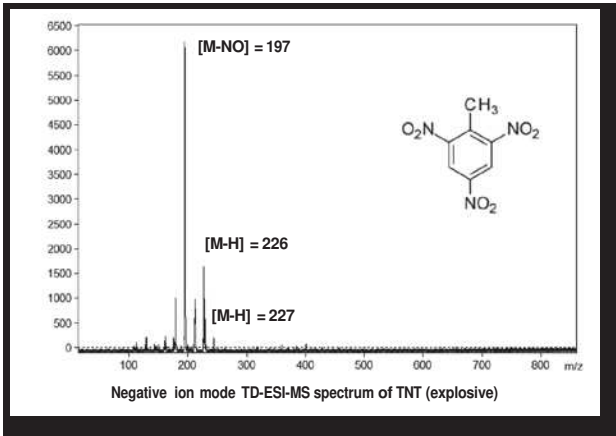


Specification	Portability™	Continuity™
Detection Limit	<10 parts-per-billion (ppb)	<100 parts-per-trillion (ppt)
Mass Range	m/z = 50 – 650 amu	m/z = 50 – 1200 amu
Mass Resolution	0.49 amu (FWHM)	0.49 amu (FWHM)
MS/MS Capability	Yes, including data intelligent MS/MS	Yes, including data intelligent MS/MS
Ion Polarity	Positive and negative	Positive and negative
Sample Introduction/ Ionization	<ul style="list-style-type: none"> • Atmospheric pressure inlet (API) • Thermal desorption coupled with electrospray ionization (TD-ESI) • Atmospheric pressure chemical ionization (APCI) • Electron impact (EI) • Customizable to user-desired ionization methods 	<ul style="list-style-type: none"> • Atmospheric pressure inlet (API) • Thermal desorption coupled with electrospray ionization (TD-ESI) • Atmospheric pressure chemical ionization (APCI) • Electron impact (EI) • Customizable to user-desired ionization methods
Mass Analyzer	Miniature Linear Ion Trap	Miniature Linear Ion Trap
Embedded PC	7" Touchscreen, with Windows® 7	10" Touchscreen, with Windows® 7
External PC Interface	WiFi, USB2.0	WiFi, USB 2.0
Remote Control	via WiFi	via WiFi
Export Data Format	CSV	CSV
Spectral Searching	Compatible with NIST EI library or user defined library	Compatible with NIST EI library or user defined library
Power	100-240 VAC, 50/60 Hz, 72W, Battery option available	100-240 VAC, 50/60 Hz, 72W, Battery option available
Operating Temperature	-5°C to +45°C	-5°C to +45°C
Weight	22 lbs. (10 kg)	44 lbs. (20 kg)
Size (W x H x L)	13 in x 9 in x 16 in (33 cm x 23 cm x 41 cm)	13 in x 13 in x 17 in (33 cm x 33 cm x 43 cm)

Applications

Rapid screening of trace residues.

Portability™ outfitted with TD-ESI has been used to rapidly screen for residual amounts of explosives, drugs, pesticides, and mycotoxins within a variety of different samples. A direct sampling probe was used to introduce analytes from surfaces of unprocessed samples. Due to short analysis times (1-5s per sample), the technique allows for rapid screening for applications in food and environmental safety.



Tandem MS capability

BaySpec's portable mass spectrometers are equipped with tandem MS capability. Here we show an example of MS/MS detection of illegal drugs. The parent ions were isolated inside the linear ion trap and fragmented by air. Product ions were all confirmed by the mzCloud database.

