



**Agilent 240 Ion Trap GC/MS**



More capabilities  
More choices  
More conclusive analysis

The Measure of Confidence



**Agilent Technologies**

# Agilent 240 Ion Trap GC/MS

Redrawing the boundaries of performance and flexibility

**Agilent's 240 Ion Trap GC/MS** gives you unmatched full scan sensitivity, while letting you choose from a range of advanced ionization and scanning techniques to enhance selectivity and detection limits. This leading-edge instrument also features MS/MS and MS<sup>n</sup> capabilities, which reduce matrix influences and provide more detailed structural information.

Together with **Agilent's 7890A GC System**, the 240 Ion Trap GC/MS delivers the reliability you expect from an industry leader. Its outstanding combination of analytical performance and simple, robust hardware makes it a valuable tool that fits your laboratory's needs.



### The most comprehensive GC/MS tool set, matched by none

- Unparalleled EI full scan detection at sub-picogram levels with reliable quantitation and identification over a wide range of concentrations
- Internal and external ionization configurations
- The ultimate selectivity of MS/MS in all configurations and ionization modes
- High-sensitivity internal PCI delivers comparable sensitivity to EI using liquid or gas reagents
- Automatic switching between fully optimized EI and CI is possible during *the same run* in internal mode, and between runs in external mode

### A simple, reliable path to greater productivity in your lab

The “sourceless” internal ionization configuration increases system reliability, while the pulsed external ionization configuration ensures clean, low-maintenance operation month after month. Dual filaments in each mode extend your uptime and productivity.

## A feature-rich system for routine applications and research studies



### 7890A GC System

Ensures reliable sample introduction and chromatographic separation when paired with accessories such as the 7693A Automatic Liquid Sampler, injectors, and column backflush capability.



### Internal and external ionization

Gives you the flexibility to choose between the simplicity of internal ionization or traditional external ionization.



### Advanced triple resonant scan

Improves trapping capacity, detection limits, and dynamic range by delivering more energetic ion ejection from the trap. The 10,000 u/s scan rate can also be used without loss of sensitivity.



### MS/MS and MS<sup>n</sup>

Enhances selectivity and improves detection levels. This cost-effective option also requires no hardware modifications.



### Unparalleled CI capability

Combines low-pressure CI with the simplicity, selectivity, safety, and low cost of liquid CI reagents.



### SilChrom Inert Electrodes

Produce the best chromatographic peak shape – even for high-boiling, polar analytes.



### Pulsed ionization

Permits ionization to take place **only during trapping**, allowing the system to “cleanse” itself during scanning for outstanding source stability and minimal maintenance.

To learn more about the Agilent 240 Ion Trap GC/MS, visit [www.agilent.com/chem/240MS](http://www.agilent.com/chem/240MS)

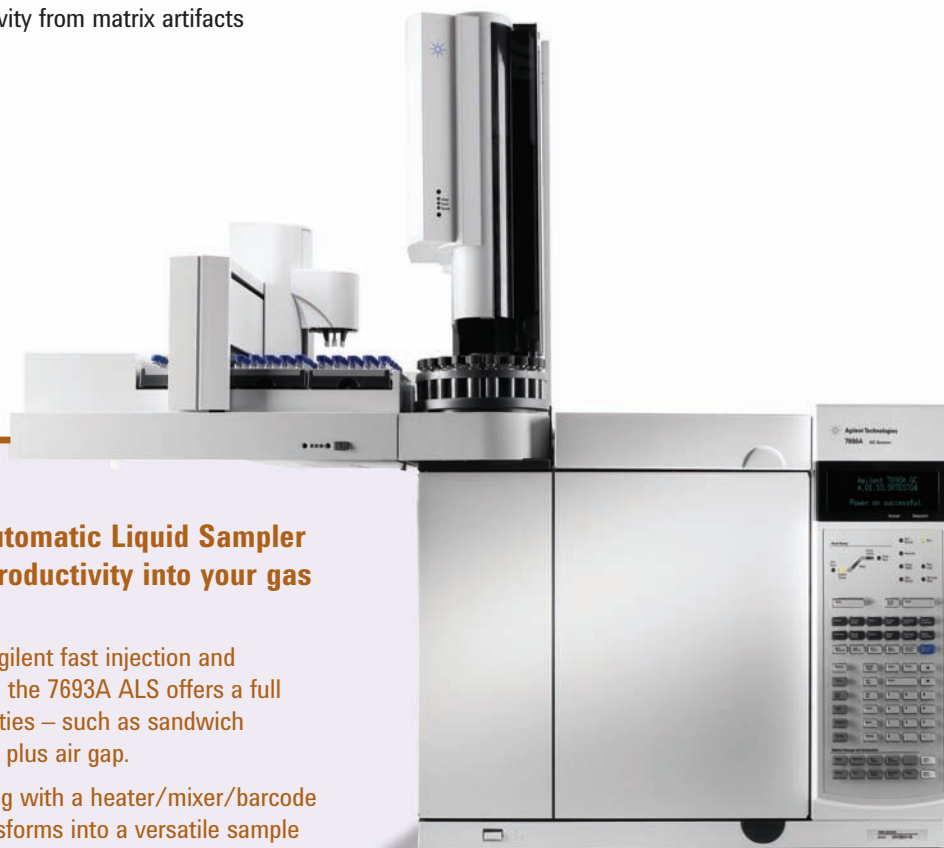
# Superior GC/MS performance starts with **the world's best GC**

MS and MS/MS selectivity is a powerful tool for complex matrix analysis; however, its full value cannot be realized without accurate, robust operation of the GC inlet and column. As sample complexity increases and detection levels decrease, chromatographic performance becomes even more critical.

## **Agilent's 7890A GC delivers consistently efficient separations for your most difficult analyses**

This highly reliable system maintains sample fidelity by ensuring an inert sample path without carryover. It is designed to give you:

- Exact sample introduction for small and large injection volumes *without mass discrimination*
- Precise separations without the retention time shifts caused by altered selectivity from matrix artifacts



## **The Agilent 7693A Automatic Liquid Sampler (ALS) injects extra productivity into your gas chromatography**

In addition to proprietary Agilent fast injection and expanded 150-vial capacity, the 7693A ALS offers a full range of enhanced capabilities – such as sandwich injections of up to 3 layers, plus air gap.

Add a second injector, along with a heater/mixer/barcode reader, and the 7693A transforms into a versatile sample preparation station that automates many bench tasks.

## Capillary Flow Technology simplifies column backflush

Complex matrices can compromise separation efficiency, shorten column life, reduce detector response, and increase MS maintenance. Backflushing – reversing column flow immediately after the last compound of interest has eluted – can significantly improve your analytical results and maximize the return on your GC/MS or GC/MS/MS investment.

**Agilent's novel Capillary Flow Technology simplifies column backflushing, making this valuable technique more routine.**<sup>1</sup> Other benefits include:

- Increasing sample throughput and extending column life by eliminating long, high-temperature bake-out
- Reducing the frequency of detector cleaning by keeping column bleed and high-boiling matrix out of the mass spectrometer
- Improving retention time precision by eliminating carryover, which can alter column selectivity

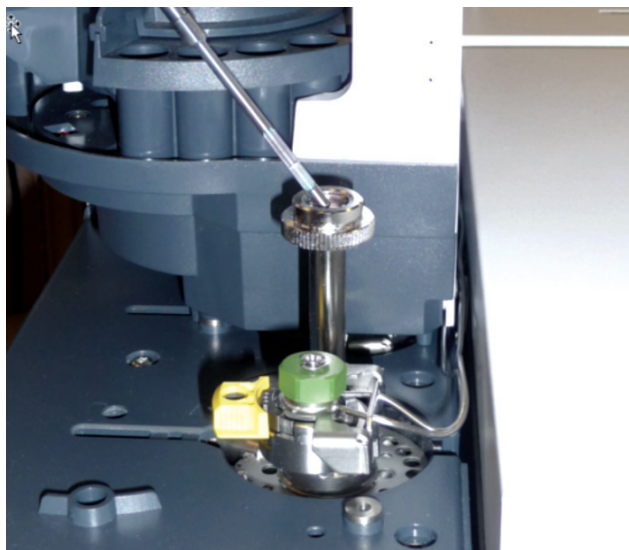


**Enhance the advantages of column backflush further with Agilent's Purged Ultimate Union.** This inert, low-mass/low-dead volume device guarantees optimal peak shape and response for difficult analytes.

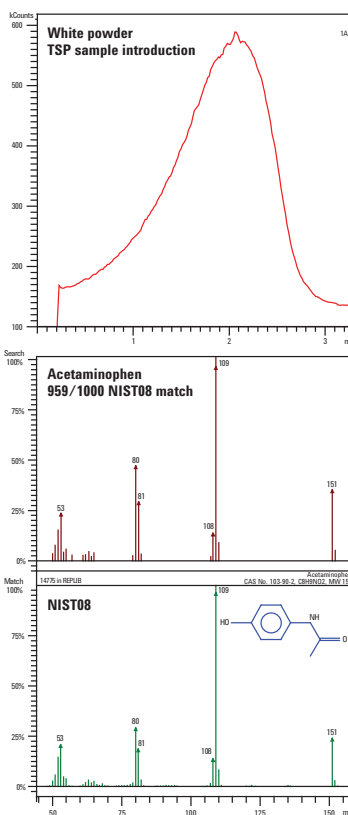
<sup>1</sup> Brochure 5989-9804EN: Reduce run time and increase laboratory throughput – Capillary Flow Technology Backflush

## Thermal Separation Probe (TSP) allows quick, easy sample introduction

The optional TSP accessory lets you analyze solids and liquids *with minimal sample preparation*. This is especially useful with unknown powders, residues, and other substances encountered during investigative work.



**Thermal desorption of the sample:** The sample vial is loaded into the TSP, which is then placed directly into the GC's Multimode Inlet.



**Prompt and confident identification.** In just a couple of minutes a white powder was identified as acetaminophen using TSP and the NIST08 library. The easily accessible ionization and scanning modes of the 240 MS are great complements to TSP to quickly gain information about a sample.

To learn more about the Agilent 240 Ion Trap GC/MS, visit [www.agilent.com/chem/240MS](http://www.agilent.com/chem/240MS)



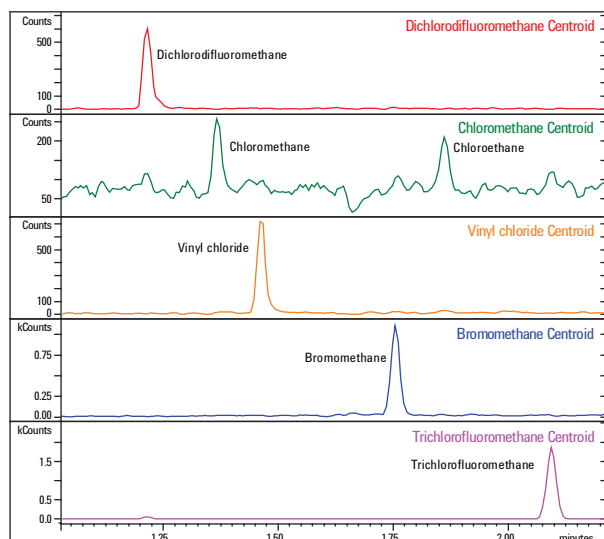
# Obtain reliable quantitative data in full scan with today's ion trap technology

The **triple resonance scan** function of Agilent's 240 Ion Trap GC/MS enables the most efficient ion motion (trapping and ejection), while allowing enhanced charge capacity. This enables you to achieve reliable detection at trace levels and across a wide concentration range.

The instrument's high sensitivity also allows you to use novel, online sample preparation and introduction techniques – such as solid phase micro extraction (SPME) and in-tube extraction (ITEX) – to simplify and speed up your analysis. Applications include:

- Trace-level identification and detection of contaminants in environmental samples
- Contaminants and natural components in foods and beverages
- Banned components in consumer goods
- General materials testing, and more

In addition, the 240 Ion Trap GC/MS holds tune and calibration for months, and readily meets QA/QC regulations for dynamic range, precision, accuracy, detection levels, and application-specific tuning.



**Detection of VOCs in drinking water** using purge and trap sample introduction. ("Gases" at 0.2 ppb, 1:100 split)

| Compound          | *Calibration                              |       | **MDL (pg) |
|-------------------|-------------------------------------------|-------|------------|
|                   | Correlation Coefficient (R <sup>2</sup> ) | % RSD |            |
| Hexachlorobenzene | 0.9989                                    | 5.1   | 3.5        |
| Propachlor        | 0.9953                                    | 7.3   | 1.2        |
| Atrazine          | 0.9966                                    | 11.2  | 3.6        |
| Lindane           | 0.9999                                    | 3.9   | 1.7        |
| Endrin            | 0.9997                                    | 12.4  | 1.7        |
| Benzo[a]pyrene    | 0.9967                                    | 13.2  | 1.8        |

**Wide calibration and low method detection limits (MDLs) for semivolatile analytes in drinking water.**

\*Calibration range: 10 pg to 10 ng

\*\*MDLs were calculated based on the standard deviation of seven replicate injections at 10 pg level, multiplied by Student's t at 99% confidence level

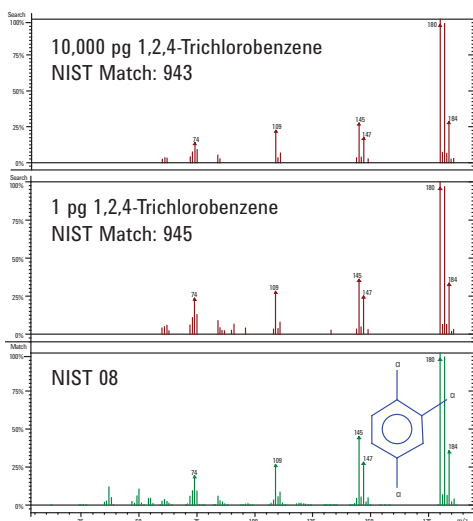


# Generate solid qualitative data by combining ion trap sensitivity with spectral library searching

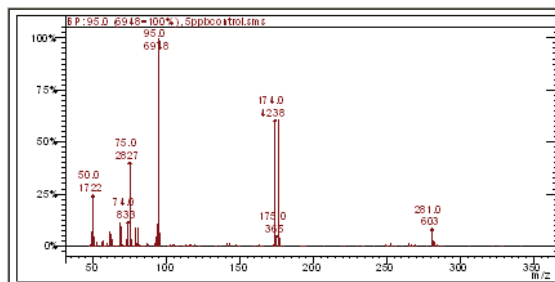
The Agilent 240 Ion Trap GC/MS allows you to take advantage of commercial and user-generated libraries to facilitate identification from trace levels to high concentrations.

In the example below, full scan EI spectra of 1,2,4-Trichlorobenzene were collected at 1 pg and 10,000 pg levels with excellent similarity. A NIST search demonstrates remarkable match quality of 945/1000 – even at the 1 pg level.

## NIST08 search results: confident spectral data at different concentrations



BFB 524.2 Report



| m/z | Acceptance Criterion      | Value  | Pass/Fail |
|-----|---------------------------|--------|-----------|
| 50  | 15-40% of m/z 95          | 24.78  | PASS      |
| 75  | 30-80% of m/z 95          | 40.69  | PASS      |
| 95  | Base Peak                 | 100.00 | PASS      |
| 96  | 5-9% of m/z 95            | 6.23   | PASS      |
| 173 | <2% of m/z 174            | 1.46   | PASS      |
| 174 | >50% of m/z 95            | 61.00  | PASS      |
| 175 | 5-9% of m/z 174           | 8.61   | PASS      |
| 176 | >95% and <101% of m/z 174 | 99.53  | PASS      |
| 177 | 5-9% of m/z 176           | 6.47   | PASS      |

*Application-specific tunes requiring strict ion ratio and resolution criteria (such as EPA's BFB and DFTPP) are easily and consistently met.*

## Flexible configurations satisfy your ever-changing demands

Agilent's 240 Ion Trap GC/MS is available in internal and external ionization configurations with an easy upgrade path to the other configuration – plus low-cost upgrades for CI and MS/MS. This broad choice of ionization and scanning modes increases your options for information-rich detection.

### Internal Configuration

- Low-maintenance, "sourceless" design
- Superior EI full scan sensitivity
- Unmatched PCI sensitivity with liquid and gas reagents
- Simple operation and maintenance
- The ability to perform EI and CI in the same run
- MS/MS upgradeable

### External Configuration

- A novel, external ionization source
- Excellent EI full scan sensitivity
- NCI, PCI, and hybrid CI options
- Pulsed, self-cleaning source (EI and CI)
- Optimized, automated EI/CI switching between runs
- MS/MS upgradeable

To learn more about the latest advances in ion trap technology, visit [www.agilent.com/chem/240MS](http://www.agilent.com/chem/240MS)

# Easy access to MS/MS places greater analytical power in your hands

For complex sample matrices with fewer than 120 target analytes, ion trap MS/MS offers consistently better detection limits and higher qualitative confidence than full scan or SIM.

When combined with EI or CI ionization, ion trap MS/MS is a powerful tool that is available whenever you require more selective analysis.

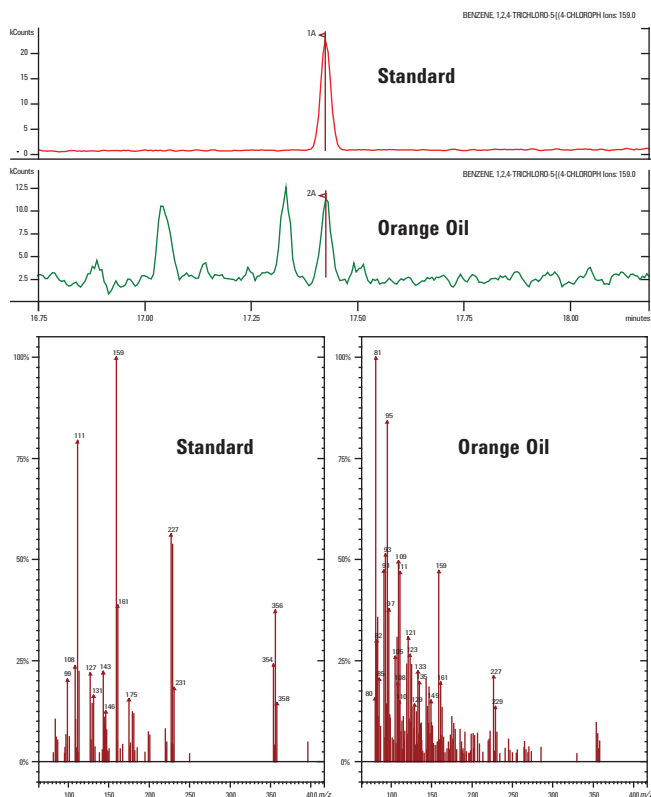
## Advantages of MS/MS

- Greater selectivity
- Lower detection limits
- More confidence in your results
- Less sample cleanup

## Advantages of Ion Trap MS/MS

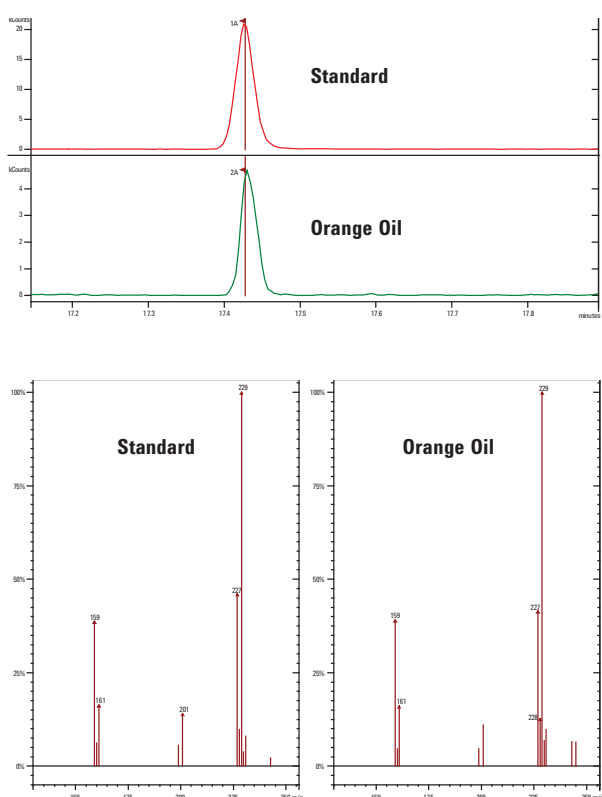
- Budget-friendly
  - Same analyzer hardware in MS and MS/MS
  - Same single-stage turbomolecular pump
  - Easy upgrade to MS/MS now or later
- Greater spectral information from a full scan product ion spectrum, without loss of sensitivity

### Full scan detection of tetradifon in standard and in orange oil



**Within the matrix, detection levels are negatively influenced by background noise. Spectral matching is also undermined by too many intense matrix ions.**

### MS/MS detection of tetradifon in standard and in orange oil

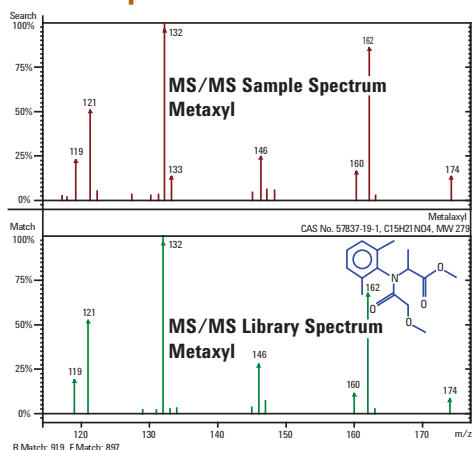


**MS/MS eliminates the matrix, resulting in a clean baseline and excellent peak shape. This significantly improves reliable quantitation of low amounts, while delivering an unequivocal spectral match for confident confirmation.**

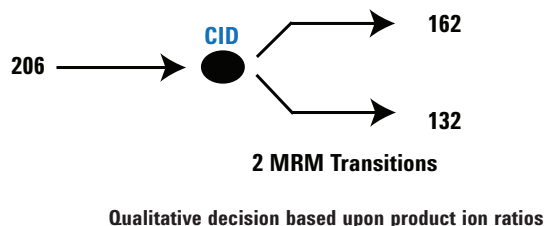


# Capture and compare more ions for more confident identification

## Ion Trap

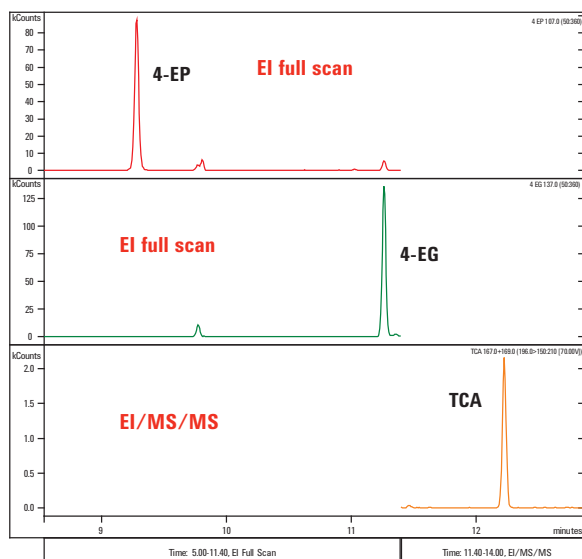


## Triple Quadrupole



*This example shows how ion trap MS/MS acquires a library searchable full scan product ion spectrum without loss of sensitivity. The precursor ion – metaxyl, m/z 206 – was dissociated into multiple fragments during CID in both the ion trap and triple quadrupole systems. While only a few ions (usually 2 or 3) were detected by triple quadrupole MRM operation, the ion trap delivered a full scan product ion spectrum.*

## Switch between full scan and MS/MS to satisfy *all* your analysis requirements



| Compound | Mode of detection | Calibration range | Unit | R <sup>2</sup> |
|----------|-------------------|-------------------|------|----------------|
| 4-EP     | Full scan         | 100 to 2500       | PPB  | 0.9996         |
| 4-EG     | Full scan         | 100 to 2500       | PPB  | 0.9997         |
| TCA      | MS/MS             | 1 to 25           | PPT  | 0.9988         |

### An example of wine quality analysis:

Trichloroanisole (TCA), 4-ethylphenol (4-EP), and 4-ethylguaiaicol (4-EG) all contribute to the degradation of wine flavor and taste. However, TCA can only be tolerated at trace levels, while 4-EP and 4-EG are undesirable at elevated concentrations.

Here, higher levels of 4-EP and 4-EG were analyzed by full scan EI. For TCA detection, we switched to EI/MS/MS, which enabled quantitative measurements at concentrations *over 100,000 times lower* than 4-EP and 4-EG in the same run. The analysis was carried out by online SPME sampling.



To put Agilent's 240 Ion Trap GC/MS to work in your lab, visit [www.agilent.com/chem/240MS](http://www.agilent.com/chem/240MS)

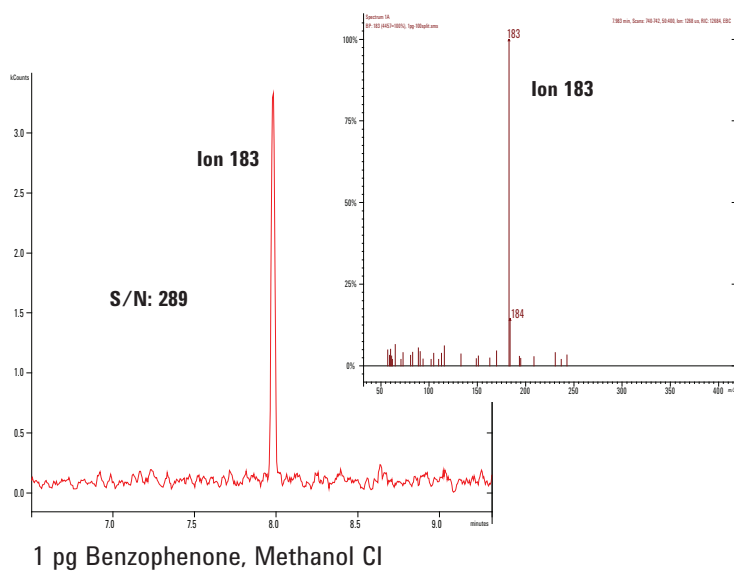
# Low-pressure chemical ionization (CI) capabilities increase sensitivity by 100 fold

## Liquid CI Reagents



With the Agilent 240 Ion Trap GC/MS, you can broaden your identification of compounds by effortlessly switching to low-pressure CI in internal configuration – even during a single run. This allows you to:

- Achieve 50x-100x CI sensitivity, compared to external ionization MS systems using high-pressure sources
- Increase analyte selectivity and reduce background noise
- Reduce costs and extend the range of available soft-to-hard CI reagents
- Increase safety and convenience by eliminating gas cylinders



**Outstanding PCI sensitivity:** The CI full scan sensitivity is comparable to EI, so you can easily switch modes to optimize selectivity without sacrificing detection limits.

## Hybrid CI: The ultimate in reagent ion selectivity

Hybrid CI is a unique combination of:

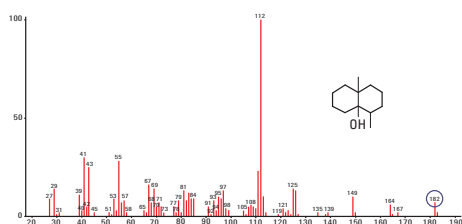
- An external source for the formation of CI reagent ions
- The high efficiency of internal sample ionization by CI reagent ions

The Agilent 240 Ion Trap GC/MS is the *only* ion trap MS that allows a single  $m/z$  reagent ion to be stored and reacted in the ion trap analyzer. This opens up new possibilities for selectivity and low pg sensitivity through the use of novel reagents and reactions.

# Use CI/MS/MS to choose the best precursor ion for improved selectivity and sensitivity

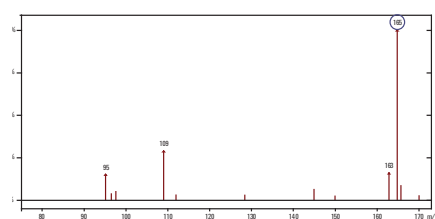
CI spectra are dominated by one or two high-intensity ions, such as a protonated molecule or a high  $m/z$  fragment ion. These high  $m/z$  CI ions carry all (or most) of the analyte's structural composition into the MS/MS dissociation process.

A higher  $m/z$  precursor ion typically increases the selectivity of MS/MS detection, along with the information content of its full scan product ion spectrum. Higher-intensity precursor ions also improve detection limits.



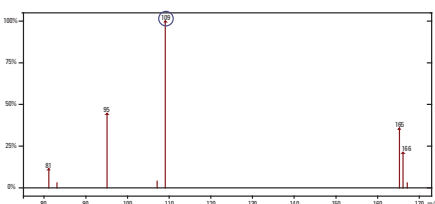
## EI full scan spectrum

Low molecular ion intensity ( $m/z$  182), combined with the absence of multiple intense fragment ions, renders Geosmin spectrum non-distinctive, and makes identification difficult when matrix is present.



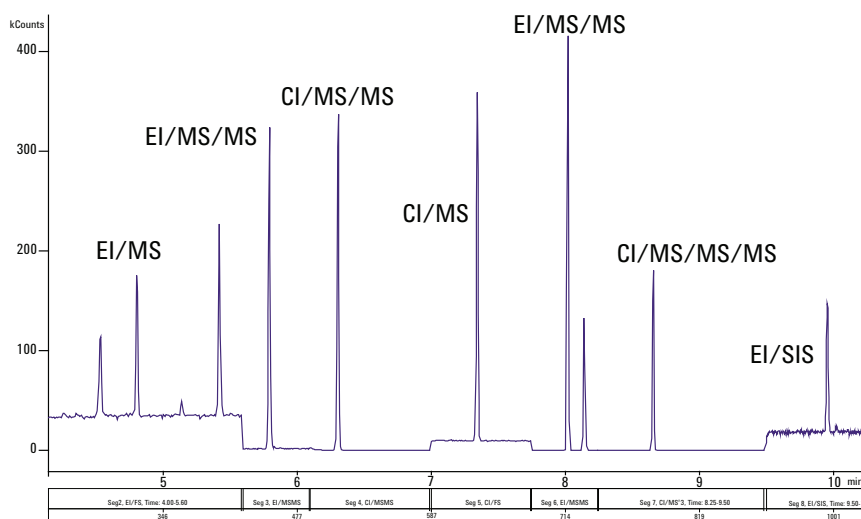
## CI full scan spectrum

In this example, methanol PCI produces a characteristic, strong base peak ( $M+H - H_2O$ )<sup>+</sup>, which is a more desirable precursor ion than either the weak EI molecular ion or the low mass EI base peak ( $m/z$  112).



## CI/MS/MS spectrum

CID of the  $m/z$  165 precursor ion provides additional spectral information for identity confirmation. It also enhances detection by incorporating the response of the unique  $m/z$  109 product ion, resulting in  $R^2$  of 0.998 for Geosmin in the 0.5 ppt-50 ppt calibration range. This reflects the combined sample concentration, separation, and detection using SPME online water sampling.



## Maximum information content

Internal mode allows you to use different ionization (EI and CI) and scanning (full scan and MS/MS) options – *even during the same run* – to enhance the qualitative and quantitative information content of your results.

**Agilent's MS Workstation Software** gives you convenient, single-point control of Agilent's 240 and 220 Ion Trap GC/MS systems – as well as the 7890A GC and its accessories.

- Easy operation for both expert and novice operators
- Intuitive navigation that simplifies setup, automation, acquisition, processing, and results review
- Complete qualitative and quantitative processing and report generation
- Simultaneous collection of GC and MS data, which allows you to detect specific compound classes (such as nitrogen or halogens)
- Extensive diagnostics and reporting on vital instrument functions
- Full-featured network compatibility for convenient file management, printing, and remote access
- Access control and audit trail software for 21 CFR Part 11 Compliance

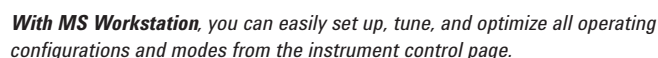
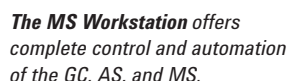
**Reporting  
Standard and  
Custom Reports**

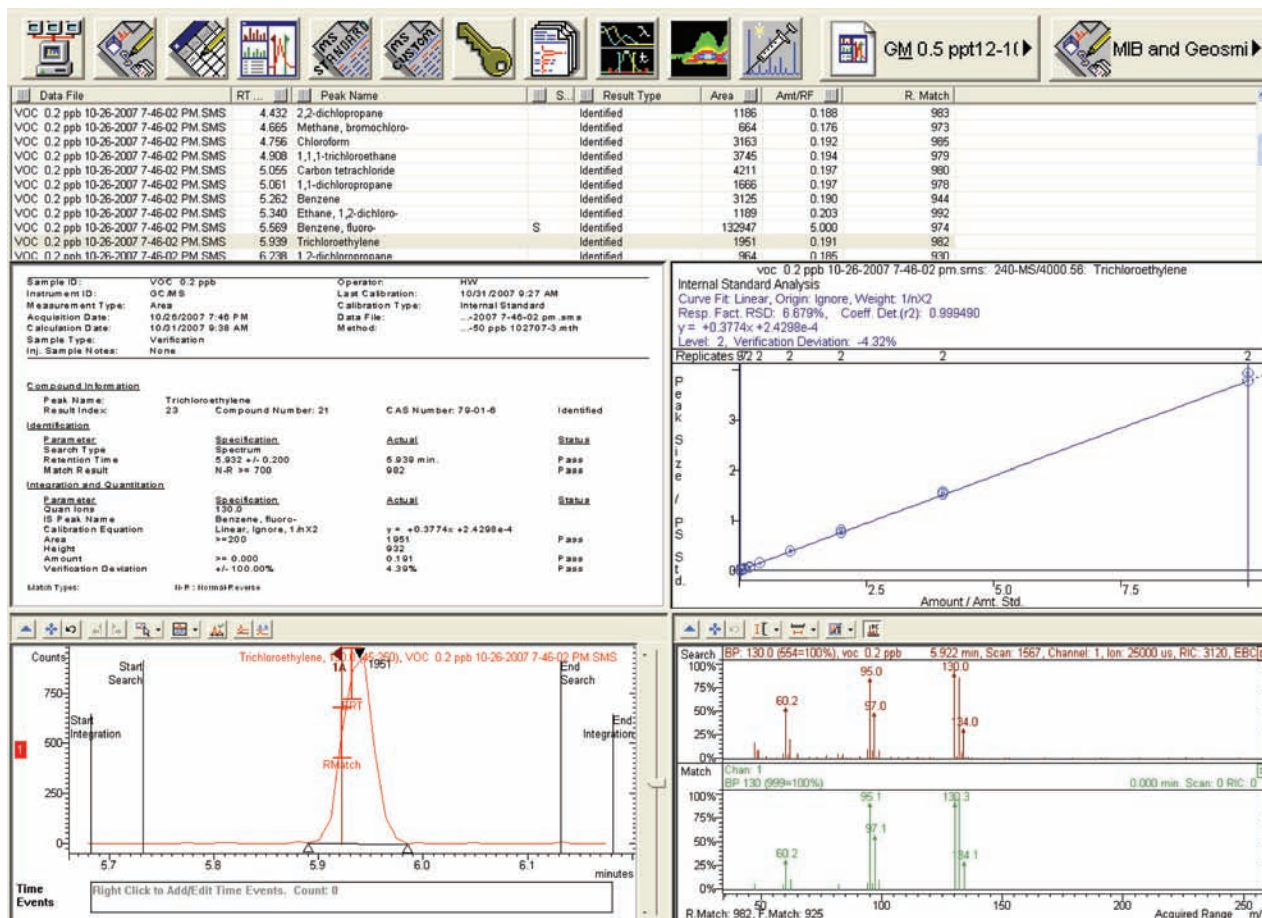
**Qualitative  
Data Analysis**

**Quantitative  
Data Analysis**

**Automation  
control**

**GC and  
MS  
control**





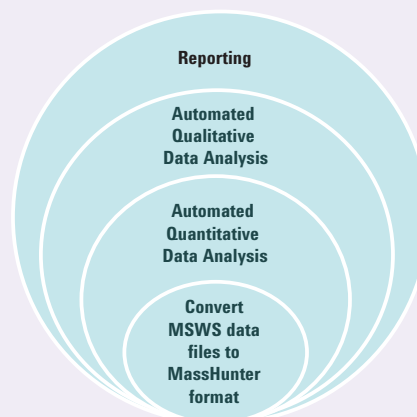
**All your data handling needs, fulfilled:** The capabilities of Agilent's MS Workstation Software include extensive qualitative data review, commercial and user-based library searching, and AMDIS deconvolution. Reliable generation of quantitative results, plus considerable selection for standard and market-specific reporting is also included.

## A second option for data control: Data processing with Agilent MassHunter Software

MassHunter software consistently processes data files collected using the MS Workstation after automatic file conversion. The software lets you:

- Boost productivity with features such as batch-at-a-glance data review, dynamically linked results, and customizable views
- Improve productivity – while reducing training time and costs – by applying consistent software across all Agilent MS platforms (GC, LC, and ICP)
- Process data from the GC detectors *and* the Ion Trap MS
- Confidently analyze unknowns using integrated deconvolution tools, retention index data, and integrated libraries
- Perform EI spectral searching using NIST, Wiley Libraries, and Agilent Retention Time Locked (RTL) databases

## MassHunter Software Capabilities



To learn more about software options for Agilent's 240 and 220 GC/MS Ion Trap, visit [www.agilent.com/chem/240MS](http://www.agilent.com/chem/240MS)

Big analytical capabilities in a smaller package

## Agilent 220 Ion Trap GC/MS

The 220 Ion Trap GC/MS delivers a sophisticated, yet easy-to-use platform for internal ionization with full analytical capabilities.

### A capable, reliable choice

Week after week, the 220 Ion Trap GC/MS gives you excellent sensitivity, a wide linear range, and reliable qualitative and quantitative results. Single-digit picogram detection levels can be achieved for most analytes with accurate identification using standard libraries.

### Start with EI today... upgrade easily to CI or MS/MS later

Both techniques can be factory ordered or field installed. What's more, the 220 Ion Trap MS's turbomolecular pump supports CI and MS/MS options, so there is no need to modify the vacuum system.

In addition, the 220 Ion Trap MS is perfectly complemented by **Agilent's 7890A GC**, enhancing productivity and ensuring your best results.

### Remarkable analytical power for academic labs

Agilent's 220 Ion Trap GC/MS demonstrates multiple ionization and scanning modes *in addition to basic EI full scan*. The system's proven robustness is also forgiving – even with novice users – making it the ideal teaching tool.

### An invaluable system for routine analysis and investigative work

The 220 Ion Trap GC/MS was designed to fit the requirements – and budgets – of high throughput laboratories. It meets common regulatory requirements for tuning, linearity, accuracy, MDL, and other QA and QC tests.

### Robust analyzer

The “sourceless” design promotes simple operation and extended uptime.

### MS/MS and MS<sup>n</sup>

Delivers consistent detection limits in complex matrices, and is compatible with EI or PCI.

### Exceptional CI sensitivity

Liquid CI reagents afford selectivity, low cost, safety, and convenience.

### Automatically switch from EI to CI in the same run

Use best ionization mode for every analyte.

### Optional inert SilChrom Electrodes

Ensure the best chromatographic peak shape.





# Count on the industry's best GC/MS systems for consistent, routine analysis

**Agilent's diverse GC/MS portfolio has exactly what you need to boost your lab's performance and productivity, including:**

- High-sensitivity detectors for every sample type
- Flexible configurations that can accommodate demanding out-of-lab measurements and cross-industry regulations
- Advanced analysis capabilities
- Optimized throughput and uptime
- Performance turbo, standard turbo, and diffusion pump options
- An inert ion source for trace analyses



## **Agilent 240 Ion Trap GC/MS**

- Broadest range of ionization and scanning techniques: EI, CI, MS/MS, MS<sup>n</sup>
- Highest EI and CI full scan sensitivity
- Robust operation and extended uptime



## **The transportable Agilent 5975T LTM GC/MSD**

- Lab performance out-of-lab
- Faster GC separations by LTM (Low Thermal Mass) technology



## **Agilent 5975C Series GC/MSD**

- Advanced separation capabilities and powerful productivity enhancements
- Real-time self-monitoring instrument intelligence



## **Agilent 7000 Series Triple Quadrupole GC/MS**

- The only triple quadrupole designed specifically for GC analyses
- Routine femtogram-level sensitivity and superior selectivity
- Up to 500 MRM transitions per second



## **Agilent 5975E GC/MSD with 7820A GC**

- An affordable GC/MSD option
- Suitable for major GC/MS applications worldwide



## **Agilent GC/MS Analyzers**

- Ready-to-use packaged workflow solutions for over 60 major applications
- Pre-configured and factory tested with application-specific method and standards checkout mixture



## **Agilent 220 Ion Trap GC/MS**

- Compact size with full analytical capabilities
- Easy upgrade path to CI and MS/MS
- Flexible and affordable

To view Agilent's full GC/MS portfolio, visit [www.agilent.com/chem/gcms](http://www.agilent.com/chem/gcms)

## Tough applications demand Agilent-engineered sample prep, columns and supplies

As the world's leader in chromatography, Agilent is uniquely positioned to offer not only industry-leading instruments, but also the most innovative GC columns, supplies, and sample preparation tools. All are engineered or selected by our experienced design teams, manufactured to our demanding specifications, and tested under a variety of strict conditions.

**Agilent Bond Elut SPE products** selectively remove interferences and/or analytes from complex matrices and provide the largest choice of sorbent formats in the market. Over 40 phase functionalities in more than 30 formats are available, including our industry leading QuEChERS Kits.

**Agilent J&W Ultra Inert GC columns** push industry standards for consistent column inertness and exceptionally low column bleed, resulting in lower detection limits and more accurate data for difficult analytes.

**Agilent J&W "Mass Spec Grade" GC columns** – such as VF-ms (Factor Four), DB-ms and HP-ms – offer the widest range of selectivity, the most robust performance and the lowest column bleed.

**Syringe and syringeless filters** clarify samples that need further analysis.



## Agilent services let you spend more time on what you do best

Whether you need support for a single instrument or a multi-lab, multi-vendor operation, **Agilent Advantage Service** plans help you solve problems quickly, increase your uptime, and optimize your resources. Our coverage options include:

- On-site preventive maintenance to ensure dependable operation
- Troubleshooting and repair for Agilent and non-Agilent instruments
- Remote diagnostics and monitoring to maximize productivity
- Industry-leading regulatory compliance services and education
- Expert consulting and training

## The Agilent Value Promise – 10 years of guaranteed value

In addition to continually evolving products, Agilent offers something else unique to the industry – a 10-year value guarantee. The Agilent Value Promise guarantees you at least 10 years of instrument use from your date of purchase, or you will receive credit for the residual value of that system toward an upgraded model. This promise ensures a safe purchase now and guarantees value in your investment over the long run.

## For more information

To learn more about the Agilent 240 Ion Trap GC/MS, visit us online at [www.agilent.com/chem/240MS](http://www.agilent.com/chem/240MS)

In the U.S. and Canada, call toll free **1-800-227-9770**, option 3, then option 3 again

In other countries, please call your local Agilent Representative or Agilent Authorized Distributor, visit [www.agilent.com/chem/contactus](http://www.agilent.com/chem/contactus)

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