

# The Source of New Possibilities

Agilent 5977B GC/MSD system





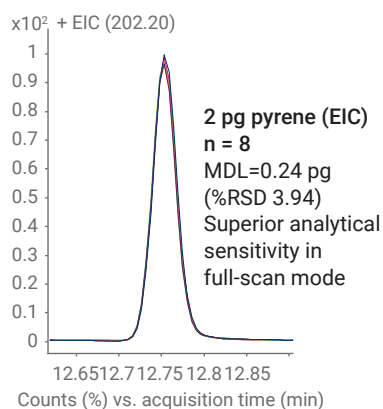
The Agilent 5977B GC/MSD system

## Instrument Reliability and Performance: The Keys to a Good Day in the Lab

Improve your sample throughput, analytical performance, and business outcomes with the Agilent 5977B GC/MSD system. It's built for labs that focus on applications such as environmental, chemical, petrochemical, food, forensic, pharmaceutical, and material testing.

This powerful GC/MSD builds on a long track record of innovation, bringing together the technologies of one of the industry's best GC and MS systems. Agilent has pushed the technological frontier even further by introducing the high-efficiency source (HES).

What's more, the system's proven robustness and reliability mean less maintenance and more uninterrupted productivity. Simply put, the 5977B GC/MSD can help you meet your toughest challenges and your most ambitious business goals... today and in the future.



Take advantage of the improved analytical sensitivity and see instrument detection limits as low as 1.5 fg IDL. The 5977B GC/MSD brings yesterday's triple quadrupole limits of detection into today's single quadrupole laboratory.



The Agilent 5977B GC/MSD was named "Most Popular Instrument" at the 2017 Conference of China Scientific Instruments. This award is the highest industry recognition in China.

| Analytical Challenge              | Agilent 5977B HES System Benefits                                                                                                                                                                                                                                                                  |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| More to do, fewer people to do it | <ul style="list-style-type: none"> <li>– Design innovations increase performance for high analytical sensitivity and simpler workflows</li> <li>– Less maintenance and increased instrument uptime</li> </ul>                                                                                      |
| Demanding measurement challenges  | <ul style="list-style-type: none"> <li>– 10 times greater analytical sensitivity</li> <li>– IDL as low as 1.5 fg</li> </ul>                                                                                                                                                                        |
| Lab efficiency and profitability  | <ul style="list-style-type: none"> <li>– 10 times less sample required</li> <li>– Spend less time on sample preparation and maintenance</li> <li>– Save on shipping costs</li> <li>– Consistent, reliable performance lets you analyze large sample batches over longer periods of time</li> </ul> |

## The accuracy of the instrument detection limit (IDL)

Today's GC/MS detection demands a more rigorous performance standard than classic signal-to-noise ratios. The IDL follows guidelines established by organizations such as the International Union of Pure and Applied Chemistry and the U.S. Environmental Protection Agency. It is measured at realistically low analytical levels and is a practical indicator of analytical sensitivity for your quantitative assays. For more information about IDL, see Agilent publication [5990-8341EN](#).

|                                         | Agilent 5977B EI MSD                                                                                                                                                     | Agilent 5977B Inert Plus EI MSD                                                                                                                                                                                                                    | Agilent 5977B EI/CI MSD                                                                                                                                                   | Agilent 5977B HES MSD                                                                                                                                                                                |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IDL</b>                              | 24 fg                                                                                                                                                                    | 10 fg                                                                                                                                                                                                                                              | 10 fg (EI)                                                                                                                                                                | 1.5 fg                                                                                                                                                                                               |
| <b>Analytical and business solution</b> | The traditional stainless steel source performs most similar to previous Agilent MSD instruments at a budget-friendly price. Designed for sample-dependent applications. | The inert extractor EI source enables high analytical sensitivity for active compounds that are most likely to interact with noninert surfaces. Designed for routine labs across various industry applications for optimum operational efficiency. | An inert extractor EI source provides high analytical sensitivity. The CI source delivers softer ionization for molecular formula determination and enhanced selectivity. | The inert HES delivers unparalleled analytical sensitivity for ultratrace-level applications. Ideal for high-throughput labs that need to save time and money with extreme operational efficiencies. |
| <b>Source</b>                           | Stainless steel                                                                                                                                                          | Extractor                                                                                                                                                                                                                                          | Extractor for EI, CI source for CI                                                                                                                                        | HES                                                                                                                                                                                                  |

# Innovative Technologies for High Operational Efficiency



## Boost your lab's operational capabilities and achieve your business goals



### High-efficiency source

This state-of-the-art ion source incorporates a novel design not seen in previous EI source generations. It increases ionization efficiency and maximizes the ions transferred into the quadrupole analyzer—so you can significantly improve operational efficiency and analytical performance.

#### Other benefits include:

- Less frequent liner maintenance, longer column life, and faster sample preparation
- Industry-leading detection limits
- Decreased shipping, storage, disposal, and maintenance costs

## Turn cleaning time into productive time



### Agilent JetClean self-cleaning ion source

During routine analysis, matrix deposits inevitably build up. In the past, you would have to remove the ion source, scrub the lens, then put it all back together and recalibrate the instrument.

The JetClean self-cleaning ion source eliminates these problems. It uses a carefully controlled hydrogen flow that removes even the most stubborn deposits. So you can reduce manual cleaning frequency from once every two weeks to once every three to six months.

JetClean is available as an option on Agilent single quadrupole and triple quadrupole GC/MS systems.

## Clean, quiet, reliable, oil-free



### Agilent IDP-3 dry scroll pump

The Agilent IDP-3 dry scroll pump is an affordable way to make GC/MS productivity happen and put the hassles of oil-sealed pumps behind you.

#### Advantages include:

- Oil-free operation, which lowers your cost of ownership and minimizes pump failures
- No more hassles with oil leaks, oil spills, or hazardous waste disposal of used oil
- A quieter and more peaceful lab environment, to keep you focused
- Small footprint and lightweight construction, ideal for any instrument configuration—even inside cabinets
- MSD qualified, and compatible with Agilent 5977, 5975, and 5973 GC/MS systems; instruments that use hydrogen as a carrier gas; and JetClean

## Rapid screening without sample preparation



### Agilent QuickProbe GC/MS system

QuickProbe gives you the speed and simplicity of direct sample analysis on a platform that has been a laboratory workhorse for decades.

The Agilent QuickProbe is a real-time MS analysis technique that lets you identify compounds with little or no sample preparation. Its easy-to-use probe, combined with an Agilent GC/MS system, provides fast data analysis with GC/MS EI library identification. The result: near instantaneous sample composition determination at a fraction of the cost.



[illegible]

## Make MS analysis easier and more productive

- Time-saving features, such as batch-at-a-glance and compounds-at-a-glance that facilitate review-by-exception.
- Almost 50 integrated quality test criteria, and a parameter-less integrator with built-in peak validation. So, you can focus exclusively on problem peaks and minimize the need for manual integration.
- One-click results, as all associated peaks, spectra, and calibration data are immediately displayed. More pop-up information is available.

6





## Reliable and Unparalleled GC Separation with Gold-Standard Performance

Building the world's most trusted GC system is an ongoing process. With every step we increase speed, improve functionality, and incorporate new analytical capabilities, while never losing sight of the most important objective—business results.





### Unlock your lab's revenue potential

The Agilent Intuvo 9000 GC stands in a class by itself. The innovative compact design offers fast direct heating, ferrule-free fittings, Guard Chip technology, and no-trim columns to provide faster sample runs as well as fewer and faster column changes. Intuvo continues the Agilent legacy of reliability and gold-standard performance in a compact and powerful complete package.



### Meet your analytical needs today—and tomorrow

The Agilent 8890 GC system offers flexibility to meet your analytical needs. As the next evolution of the trusted Agilent GCs, the 8890 drives productivity, delivers high-quality data, and provides unparalleled confidence to all users.

- Configure with any GC/MS system and combine with a wide range of GC detector options.
- Helium conservation module and integrated hydrogen sensor provide cost-saving carrier gas options.
- Analyzers provide preconfigured and tested systems for a wide range of specific applications.



### A new outlook on routine GC

The Agilent 8860 GC system combines simplified operation with the proven reliability expected from Agilent GC systems. It can be configured with a range of GC detectors, and can be upgraded for use with the 5977B GC/MSD with stainless steel source to reliably deliver high-quality data. What's more, the 8860 GC enables user-induced instrument diagnostics and has an easy-to-learn touch screen interface that let's you instantly view GC setpoints and status.

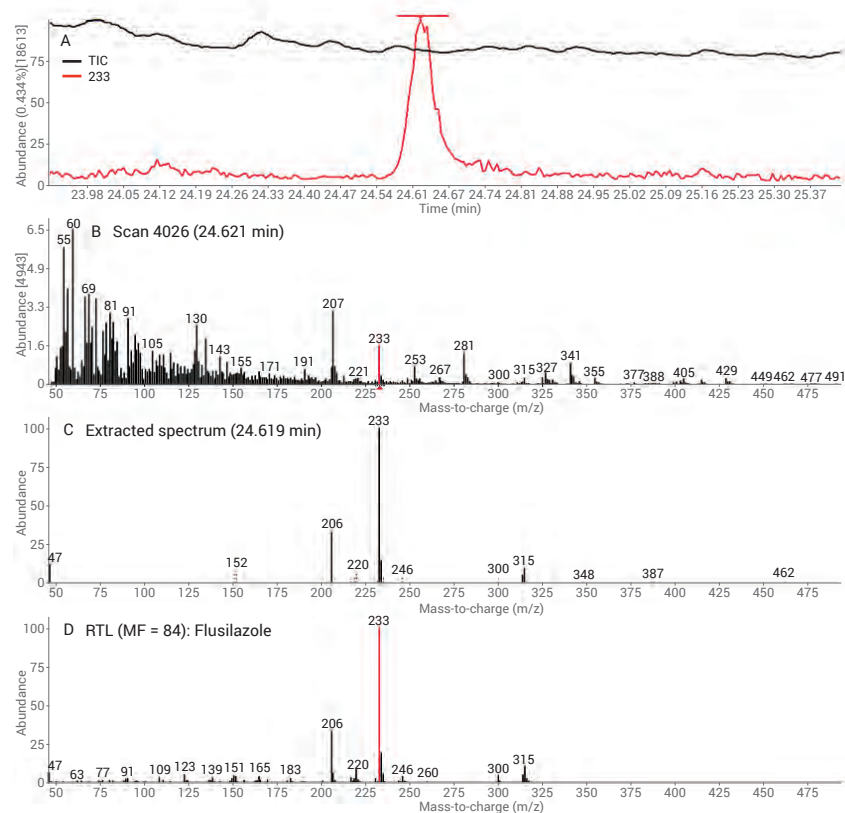
# Lower Detection Limits and Streamlined Workflows for Food and Environmental Testing



## Identify more pesticides, faster

You need to rapidly set up your full-scan GC/MS method and confirm that it produces accurate results for hundreds of pesticides in complex matrices. Our solution combines the 5977B GC/MSD with deconvolution reporting software and a database of pesticides and endocrine disruptors.

Together, they accelerate reporting and increase the number of targets screened. When configured with our high-efficiency source (HES), this analyzer lets you identify more pesticides in less time.

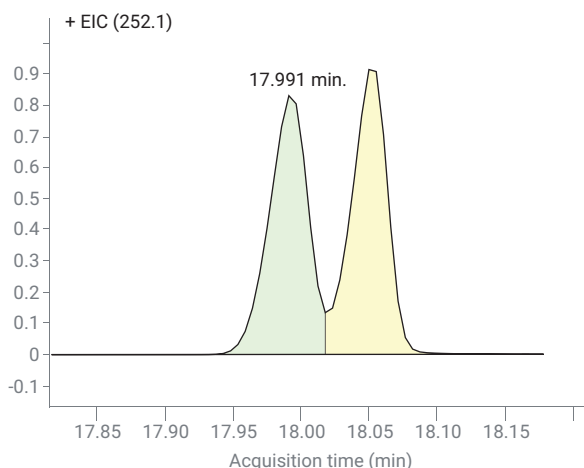


Analysis of 10 pg flusilazole in tomato using AMDIS.  
A) Overlay of extracted ion  $m/z$  233 (red) and TIC (black);  
B) Raw spectrum;  
C) Extracted spectrum for the component;  
D) Library spectrum, AMDIS match factor = 84.  
The reported NIST reverse match score is 73.

## EPA 8270 re-optimized for the widest calibration range

EPA Method 8270 requires simultaneous measurement of diverse compound classes over a wide concentration range. The 5977A and B Inert Plus GC/MSD meet these requirements over a range of 0.2 to 160 ppm using a single injection (one calibration). Better initial calibration results lead to longer continuing calibration. Therefore, more samples may be analyzed without operator intervention—lowering your cost of operation.

Here, we achieved a wider calibration range and low compound %RSDs, translating into greater laboratory productivity.



Benzo[b and k]fluoranthene isomer resolution at 50 ppm (midpoint). Split is 1:3 (17 ng injected), LPD liner, and 9 mm diameter draw out lens. Sufficient resolution is achieved if the height of the valley between two isomer peaks is less than 50% of the average of the two peak heights at the midpoint concentration level (8270D).

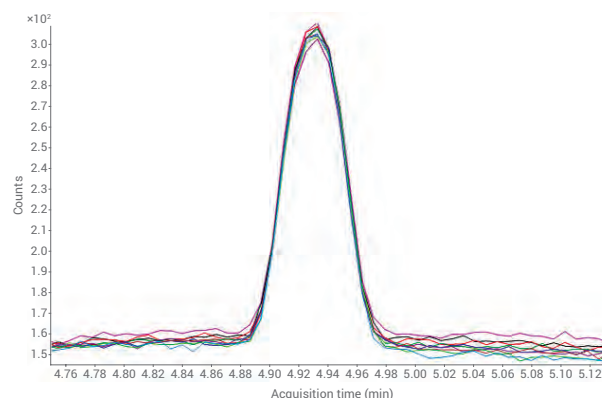
## Improved volatiles analysis using static headspace and the Agilent 5977B HES GC/MSD

The revolutionary design of the HES produces a higher ion current yield for many compounds. This greater analytical sensitivity gives you the flexibility to lower detection limits, reduce sample size, and speed up your analysis.

We analyzed a mixture of volatile organic aromatic (VOA) compounds spiked into reverse osmosis (RO) water over a calibration range of 0.02 to 20 µg/L. The analysis was performed in selected ion monitoring mode. Replicate injections were made at 0.04 µg/L to assess the method detection limits (MDLs). A study of local tap water replicates was used to demonstrate long-term stability for some naturally occurring compounds. The results suggest that a significant improvement in detection limits is possible in VOA applications using the HES of the 5977B GC/MSD.

## Routine qualitative water screening in minutes

The Agilent SureTarget GC/MS Water Pollutants Screener confidently identifies pollutants in water samples. An automated workflow reduces data analysis time by over 90%. Plus, it rapidly screens for over 1,000 pollutants, with minimal data processing time and fast report generation.



Overlay of the EIC for nine replicate injections of vinyl chloride at 0.04 µg/L.

# Perform Reliable Chemical, Petrochemical, and Materials Identification and Quantitation



## Phthalate plasticizers

Positive chemical ionization (PCI) lets you unambiguously identify different phthalates based on an intense molecular ion response. You can configure the 5977B GC/MSD hardware to handle CI reagents, including hydrocarbons (such as isobutane and methane) and softer reagents (such as  $\text{CO}_2$  and  $\text{NH}_3$ )—all with trace-level analytical sensitivity.

## Biofuel characterization

The 5977B GC/MSD exceeds the criteria for accurate, sensitive biofuel analysis. Its inert flow path, high-efficiency source, and heated gold-plated quartz quadrupole combine to deliver robust, high-analytical sensitivity analysis for the full range of biofuel analytes.

The system is easily set up for simultaneous SIM/SCAN data acquisition to maximize analytical sensitivity and selectivity, while providing full spectra for qualitative analysis.

## Measure impurities with confidence, in-house

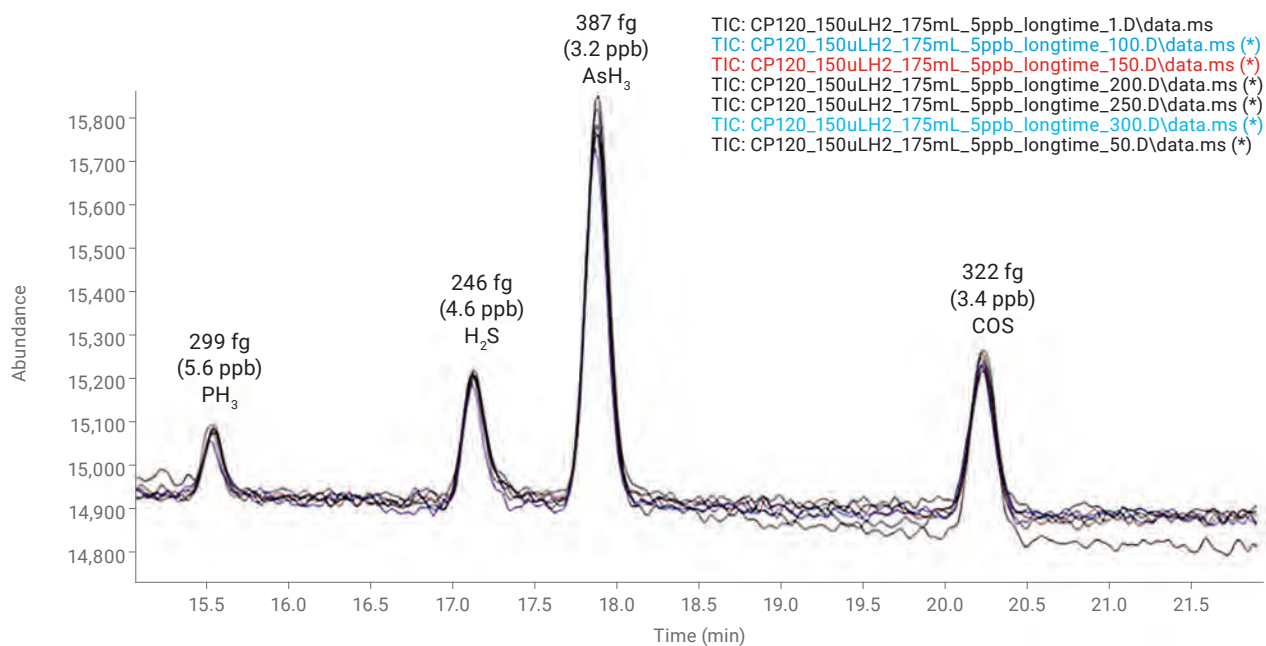
The Agilent Arsine Phosphine GC/MS Analyzer enables single-digit ppb monitoring of arsine and phosphine impurities in olefin production. Based on Agilent 7890 GC and 5977B MS platforms, each system is factory pretested and preconfigured to perform sensitive analysis in monomer-grade ethylene and propylene.



## Ensure regulatory compliance across the energy and chemical supply chain

Together with our industry-leading supplies and services, the 5977B GC/MSD helps you meet rigorous standards for quality, safety, and environmental stewardship.





Overlay of total ion chromatograms (TICs) for every 50th run out of 300 runs completed over 4.5 days with ~5 ppb concentration analytes in helium. Runs 1, 50, 100, 150, 200, 250, and 300 are shown.

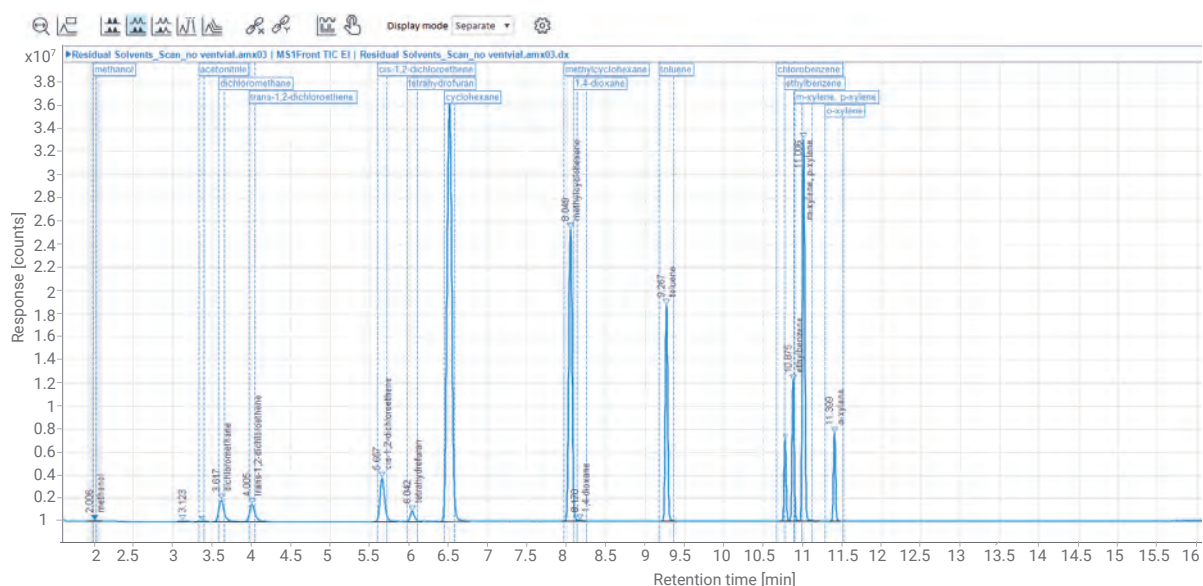


# Improve Your Compliance-Based Pharmaceutical Residual Solvent Analysis



## Accurate, sensitive, and trouble-free GC analysis with headspace sampling

The Agilent 7697A headspace sampler is an ideal companion for your 5977B GC/MSD. Its features include independent vial pressurization, automatic vial leak check, barcode reader, flexible vial sizes, and energy conservation mode. In addition, Agilent OpenLab CDS software helps you meet compliance requirements for residual solvent analysis and other relevant applications.



Reference chromatogram for Class 2 (Mix A) residual solvents. Solvents were collected using the Agilent 7697A headspace sampler and the 5977B GC/MSD on OpenLab CDS. The software gives you multiple ways to interact and present your GC/MS data, while ensuring the high degree of data integrity expected in FDA regulated labs.

# Quantify Drugs and Metabolites More Quickly and Reliably

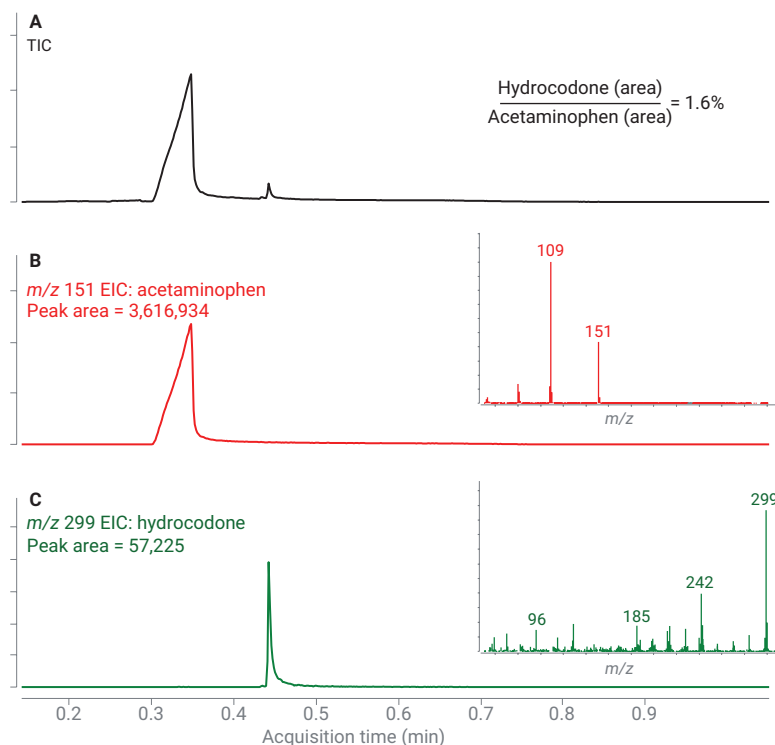


## Screen more drugs with the Agilent GC/MS Toxicology Analyzer

Broad-range screening for drugs in forensic samples requires full-spectrum identification and confirmation for an unlimited number of targets. It also demands spectral identification of nontargets. The Agilent GC/MS Toxicology Analyzer combines the 5977B with deconvolution reporting software and a forensic toxicology database. Together, these technologies screen a greater number of targets at low-concentrate ions while reducing analysis time. Resulting spectra are classical and NIST searchable.

## Fast analysis with no sample preparation using QuickProbe GC/MS

Analysis of a Vicodin tablet with no sample preparation in under one minute. This technique successfully separated acetaminophen and hydrocodone, the two main components. Also, the two active ingredients were identified with a NIST library match of >90—even when the hydrocodone accounted to <2% by weight of acetaminophen.



Pulverized Vicodin tablet (5:300 mg of hydrocodone:acetaminophen) analysis in ~one minute. A) Total ion chromatogram (TIC). Extracted ion chromatograms (EIC) for acetaminophen  $m/z$  151 (B) and hydrocodone  $m/z$  299 (C). NIST library match >90 for both components.

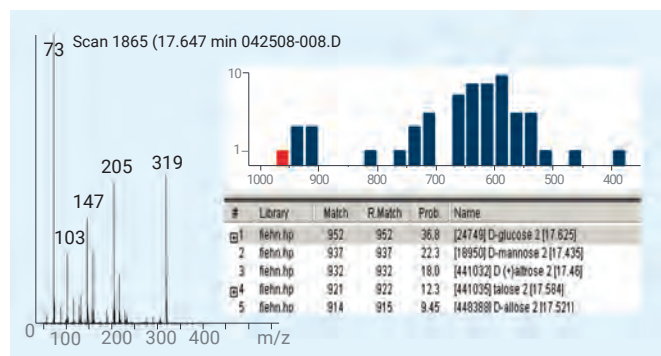
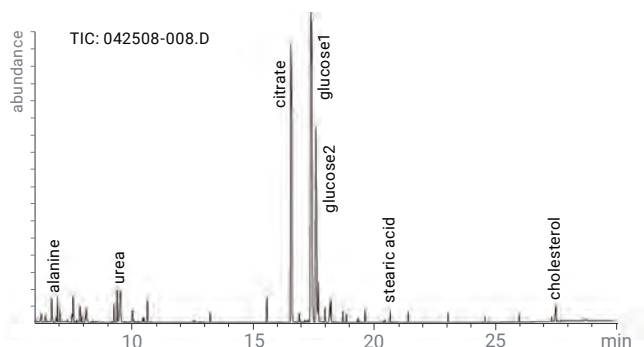
# Reliably Confirm Metabolites and Gain Deeper Insights into Biological Systems



## Enhance your research, gain new perspectives on metabolism, and answer challenging biological questions

Metabolomics typically involves global metabolite profiling by hyphenated MS techniques, followed by a familiar software workflow to process the GC/MS data files. Agilent offers software workflows for performing global metabolite profiling by GC/MS. In these workflows, features are found across all data files, and the results are analyzed using multivariate techniques. Important differential features are identified and visualized on pathways to aid biological interpretation.

This advanced analysis software relies on the highly reproducible data produced by the 5977B GC/MSD system—particularly when using Agilent MassHunter Profinder to identify complex metabolomics data. After statistical analysis using Mass Profiler Professional, compounds are identified using the Fiehn retention time locked EI library. The data are then visualized on pathways using Pathway Architect.



Metabolite identification in human blood plasma by GC/MS after methoximation and trimethylsilylation. The Agilent Fiehn library was also used. Left panel: Total ion chromatogram, split 1:10 injection. Right panel: Identification of glucose using the NIST MS search and retention time information.

For Research Use Only. Not for use in diagnostic procedures.



# Focus on System Validation and Data Generation Not Method Development



Agilent GC/MS analyzers are factory configured and chemically tested to meet method requirements for materials, food safety, environmental, and forensic toxicology testing applications. These workflow solutions get you on the fast track to producing quality data and processing sample backlogs.

Each analyzer arrives ready to perform with preset chromatography and checkout samples to verify separation capabilities. That means your team can work toward system validation immediately after installation, and reduce method development costs by up to 80%. As always, our support team is available, should any problems arise.



Application-optimized columns and supplies



Application setup

| R.T.   | Cas #    | Compound Name                    | Amc<br>Chem<br>station |
|--------|----------|----------------------------------|------------------------|
| 3.8773 | 62759    | N-Nitrosodimethylamine           | 7.33                   |
| 6.2524 | 62533    | Aniline                          | 10.21                  |
| 6.569  | 3855821  | 1,4-Dichlorobenzene-d4           | 10                     |
| 7.3429 | 78591    | Isophorone                       | 10.19                  |
| 7.7494 | 81209    | 1,3-dimethyl-2-nitrobenzene (ss) | 10.64                  |
| 7.8060 | 1146652  | Naphthalene-d8                   | 10                     |
| 8.6450 | 77474    | Hexachlorocyclopentadiene        | 12.88                  |
| 9.0438 | 7786347  | Mevinphos                        | 11.96                  |
| 9.5301 | 15067262 | Acenaphthene-d10                 | 10                     |

Customized reporting

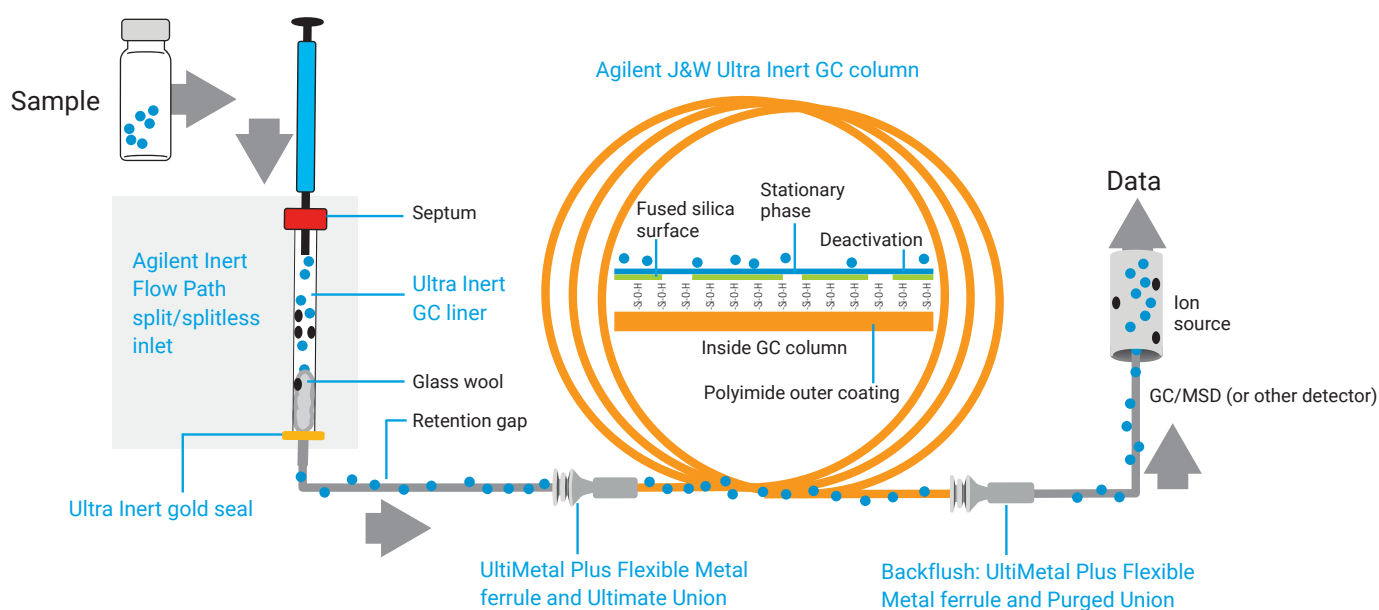


Training and consulting

# Ensuring an Inert Flow Path Has Never Been More Critical



As samples become smaller, increasingly active, and more complex, you cannot afford losses caused by flow path activity. Having to repeat or verify suspect analyses wastes valuable resources, hinders productivity, and hurts your bottom line. With trace amounts of active analytes, you might not even get a second chance, because there may be no more sample left to analyze.



## Don't miss a thing in your GC/MS analysis

From analyzing active environmental samples to screening for drugs of abuse, Agilent Inert Flow Path solutions help ensure higher analytical sensitivity, accuracy, linearity, and reproducibility.

For Forensic Use.

## An integrated approach to inertness: the Agilent advantage

As a GC industry leader, Agilent can help ensure the inertness of every surface that touches your sample. So you can achieve the parts-per-billion, or parts-per-trillion, detection levels that today's analyses demand.

- Agilent J&W Ultra Inert GC columns are tested with the industry's toughest test probe mixture to ensure consistent column inertness and exceptionally low column bleed.
- Ultra Inert inlet liners deliver a robust, reproducible, and reliable inert flow path, with or without glass wool.
- Inert flow path split/splitless inlet option provides an extra measure of inertness to the sample pathway.
- Ultra Inert gold seals feature deactivation chemistry applied on top of their gold plating for the most inert surface and highest-quality seal.
- UltiMetal Plus Flexible Metal ferrules are compatible with capillary flow technology fittings. They promote a leak-free seal that requires less torque and reduces the risk of column breakage.
- Gas Clean filter systems deliver the cleanest possible gas, reducing column damage, analytical sensitivity loss, and downtime.

For more information about creating an inert GC flow path, visit [www.agilent.com/chem/inert](http://www.agilent.com/chem/inert)



## Agilent CrossLab services

CrossLab is an Agilent capability that integrates services and consumables to support workflow success and important outcomes like improved productivity and operational efficiency. Through CrossLab, Agilent strives to provide insight in every interaction to help you achieve your goals. CrossLab offers method optimization, flexible service plans, and training for all skill levels. We have many other products and services to help you manage your instruments and your lab for best performance.

Learn more about Agilent CrossLab, and see examples of insight that leads to great outcomes, at [www.agilent.com/crosslab](http://www.agilent.com/crosslab)

Learn more:

[www.agilent.com/chem/5977b](http://www.agilent.com/chem/5977b)

GC column selection tool:

[selectgc.chem.agilent.com](http://selectgc.chem.agilent.com)

Inert flow path:

[www.agilent.com/en/promotions/inertflowpath](http://www.agilent.com/en/promotions/inertflowpath)

Buy online:

[www.agilent.com/chem/store](http://www.agilent.com/chem/store)

Find a local Agilent customer center in your country:

[www.agilent.com/chem/contactus](http://www.agilent.com/chem/contactus)

USA and Canada:

**1-800-227-9770**

[agilent\\_inquiries@agilent.com](mailto:agilent_inquiries@agilent.com)

Europe:

[info\\_agilent@agilent.com](mailto:info_agilent@agilent.com)

Asia Pacific:

[inquiry\\_lsca@agilent.com](mailto:inquiry_lsca@agilent.com)