

# Unbelievably Powerful Remarkably Small

Agilent Ultivo Triple Quadrupole LC/MS





# Meet Ultivo—It's a Pint-Sized Powerhouse

Decades of innovation have brought us into a new era of mass spectrometry with the design of Agilent's revolutionary triple quadrupole LC/MS. Ultivo is packed full of the same power and accuracy you'll find in the big guys but at a fraction of the size. It's on a transformative mission to reshape expectations, reinvent capabilities, and redefine what's possible when small meets powerful.

## Welcome to a new era of mass spectrometry

Ultivo LC/TQ is here to prove that small is big again, with key enabling technologies that allow you to:

- **Increase sample throughput.** The Vortex Collision Cell combines faster scanning with the confidence you need to do more, and quickly.
- **Optimize lab technician productivity.** VacShield enables lab personnel to quickly and seamlessly maintain the MS, freeing up valuable time to focus on science.
- **Maximize laboratory real estate.** The footprint of Ultivo LC/TQ is 70 % smaller than that of similar LC/TQs with all of the power of the big guys. You can triple your lab's capacity in the same space.
- **Produce better results.** The Cyclone Ion Guide gets more ions to the detector. More ions means better, more reproducible results.
- **Reduce instrument downtime.** Intelligent diagnostics use intuitive readbacks to pinpoint issues quickly.
- **Advance efficiency.** The efficiency-optimized InfinityLab LC series is the perfect partner for high-throughput mass spectrometry.



# Innovations for Enhanced Results

We specifically designed Ultivo with new technologies to maximize quantitative performance, enhance instrument reliability and robustness—not to mention it also promotes more uptime and a quick return on investment.

## VacShield

### Increased throughput, less downtime

Ion injector maintenance is simple, fast, and trouble-free.



## Agilent Jet Stream Ion Source

### More ions created, better MS results

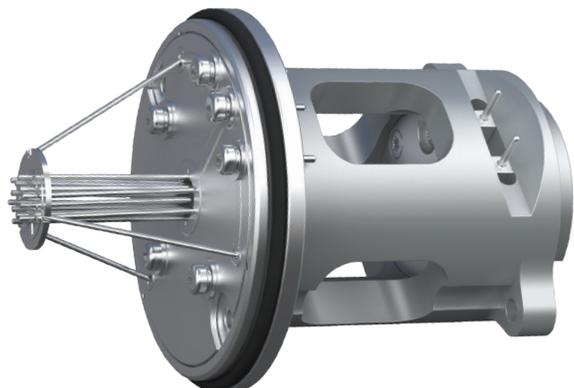
Enhanced desolvation efficiency over a wide range of LC flows.



## Cyclone Ion Guide

### More ions, increased signals, improved results

Maximum performance in a smaller footprint.



### Ultivo Hyperbolic Quadrupole Assembly

A truly hyperbolic surface for better mass transmission and improved analytical results



### Virtual Pre-/Post-Filters

Maximum ion transmission at entrance and exit of resolving quadrupoles

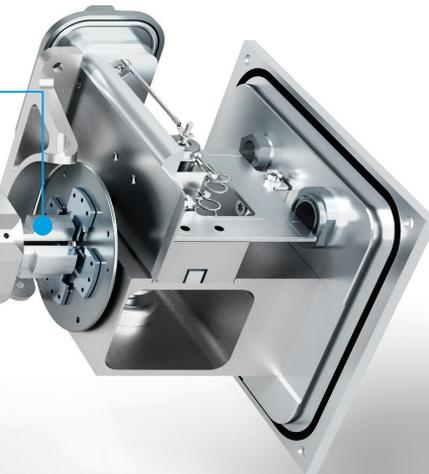
Reduces fringe-field effects, allowing for faster switching, enabling more MRMs to be performed.



### Intelligent Diagnostics

Maximum instrument operation

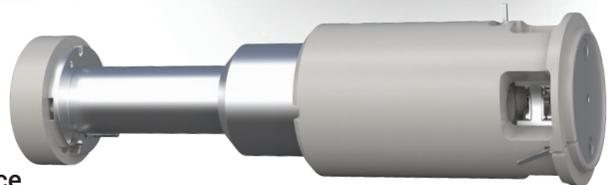
New Intelligent Diagnostics tools allow Ultivo to monitor several parameters in real time to ensure it is operating at peak performance.



### Vortex Collision Cell

Optimum ion transmission, enhanced MS/MS performance

Efficient collimation of the ion beam with zero crosstalk.



# Perform High-Throughput Quantitation With Precision

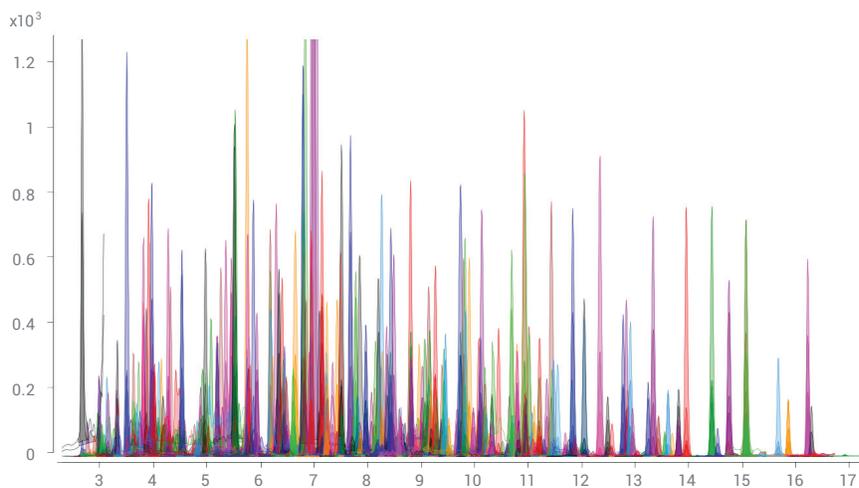
Food and environmental applications



For years, food and environmental analysis laboratories have struggled to do more with less—and do it faster. The Ultivo LC/TQ gives you the performance and confidence to meet increasing sample throughput demands, expand your analytical capacity in your current space, and deliver data quality that your clients expect.

## Fine-tuned for difficult food matrices

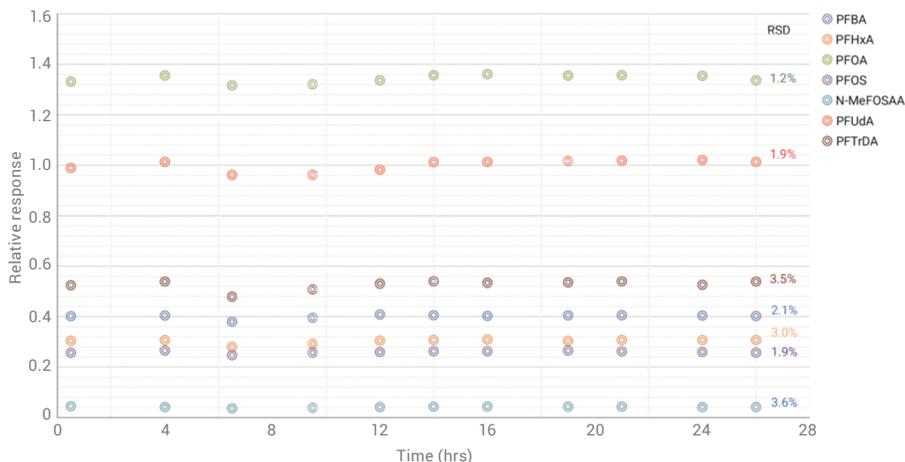
Ultivo LC/TQ is fine-tuned for accuracy and precision. With the selectivity and sensitivity needed to confidently monitor for, and identify contaminants, it helps keep the food supply safe.



MRM signal response for 251 pesticides detected in black tea extract at 5 ng/g, which corresponds to ½ MRL or 1 ng/mL. The innovations within the Ultivo are critical for rendering sensitive detection.

## High-performance analysis for newly emerging pollutants

New environmental contaminants emerge daily—you need a lab partner that can keep up. Ultivo LC/TQ seamlessly integrates with MassHunter software to enable powerful data collection, processing, and reporting tools to make sure you are always ready for the next sample.



Uncorrected (without use of internal standards) relative area responses for 7 PFASs in 11-CCV samples over 26 hours.

# Reliably Detect Compounds Over Varying Concentration Ranges

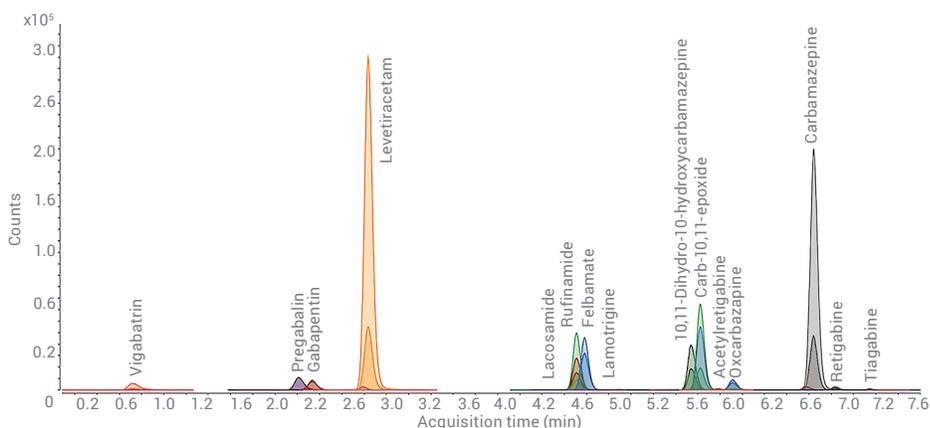
Clinical research applications



The analysis of drugs in research is challenging due to their low levels in human biological matrices like serum, plasma, and urine, as well as the enormity of drug classes encountered. As such, robust assays that are capable of simultaneous monitoring of large numbers of analytes over several orders of magnitude are required.

## Analyze multiple compounds in a single injection

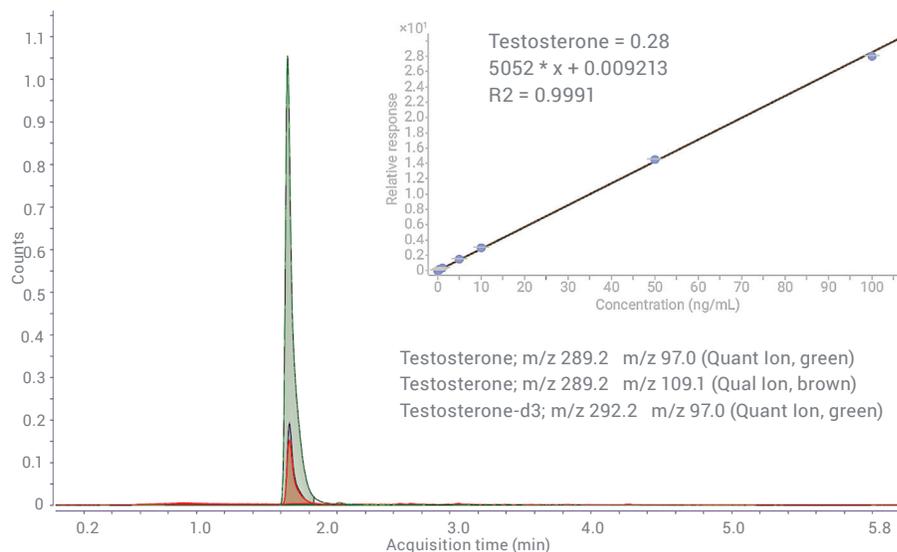
The Ultivo LC/TQ system provides the needed sensitivity and specificity to accurately quantitate antiepileptic drugs in human serum without compromising accuracy or precision.



Overlays of (15) Dynamic MRM (dMRM) chromatograms of antiepileptic drugs in human serum achieved under 8.0 minutes on the Ultivo LC/TQ system.

## Enable robust, sensitive, and fast analytical methods

Ultivo delivers excellent linearity, precision, and analytical sensitivity across a range of 1.0 pg/mL to 100 ng/mL for free testosterone in human serum in a 6-minute analysis cycle time.



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

Overlaid MRM chromatograms showing elution of testosterone (500 pg/mL) and its d3-analog (internal standard; 25 ng/mL); calibration curve using a 1/x weighting factor.

# Screen, Confirm, and Quantify Designer Drugs

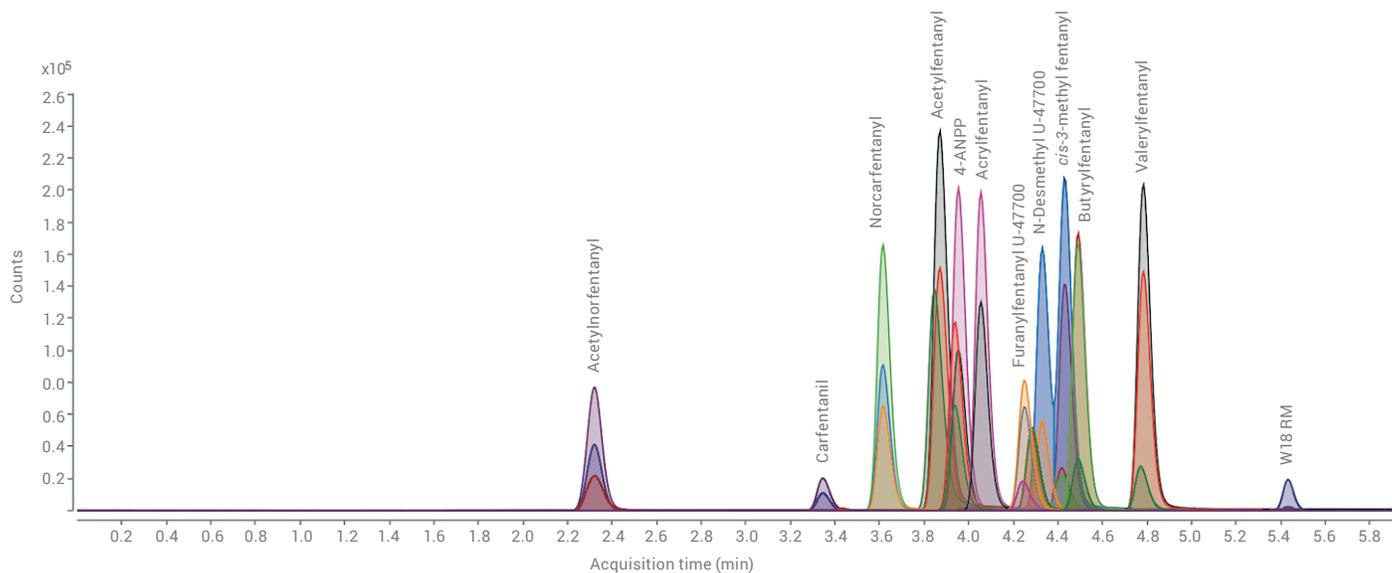
Forensic toxicology applications



The rising frequency and use of designer drugs are reaching epidemic levels. Synthetic drug production is high-paced and ever-changing due to the laws promulgated by the regulatory agencies. Therefore, the need for new forensic analytical methodologies to keep pace with measuring such analytes and metabolites is of utmost importance. The Ultivo LC/TQ provides all of the necessary tools to deliver sensitive, robust, and fast targeted analytical methods for the quantitation of synthetic drugs in biological matrices.

## Fast detection of target analytes

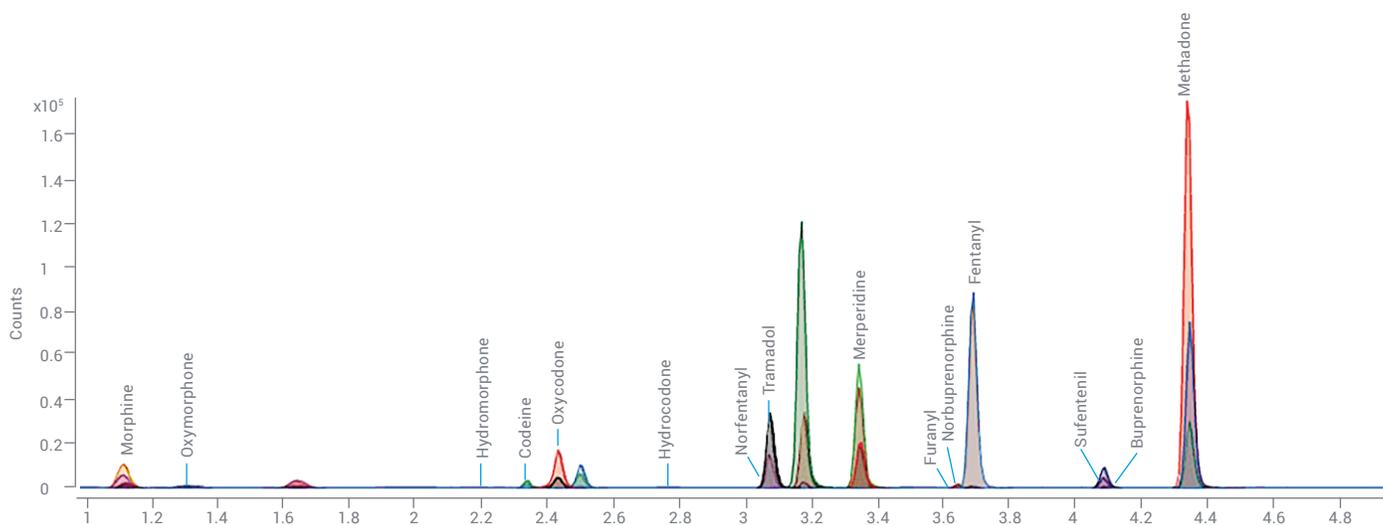
In challenging biological matrices like human serum and urine, Ultivo detects and quantitates a wide array of targeted analytes spanning a wide range of concentrations simultaneously.



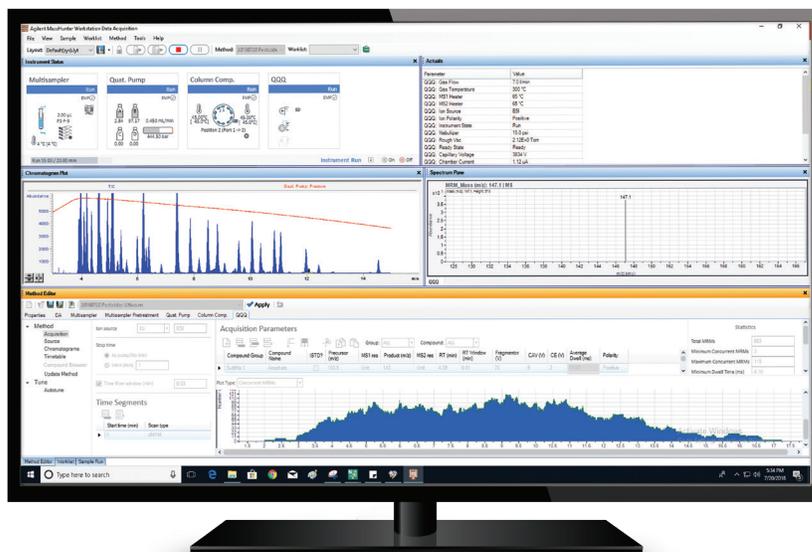
Composite MRM chromatograms of synthetic fentanyl compounds acquired in under 6-minutes on the Ultivo LC/TQ system.

## Excellent linearity and reproducibility for human serum extracts

To effectively respond to challenges presented by the current drug epidemic, scientists require speedy methodologies to assess drug class and level for forensic cases. The Ultivo LC/TQ system provides the critically needed high throughput for analysis of opioids in human urine.



MRM chromatogram overlay for hydrolyzed, low-QC opioid sample.



Ultivo combined with MassHunter software suite provides instrument controls with customizable data analysis features, such as Quant-My-Way, enabling fast quantitation of samples.

# Secure Your Pharmaceutical Studies with Enhanced Data Integrity Tools

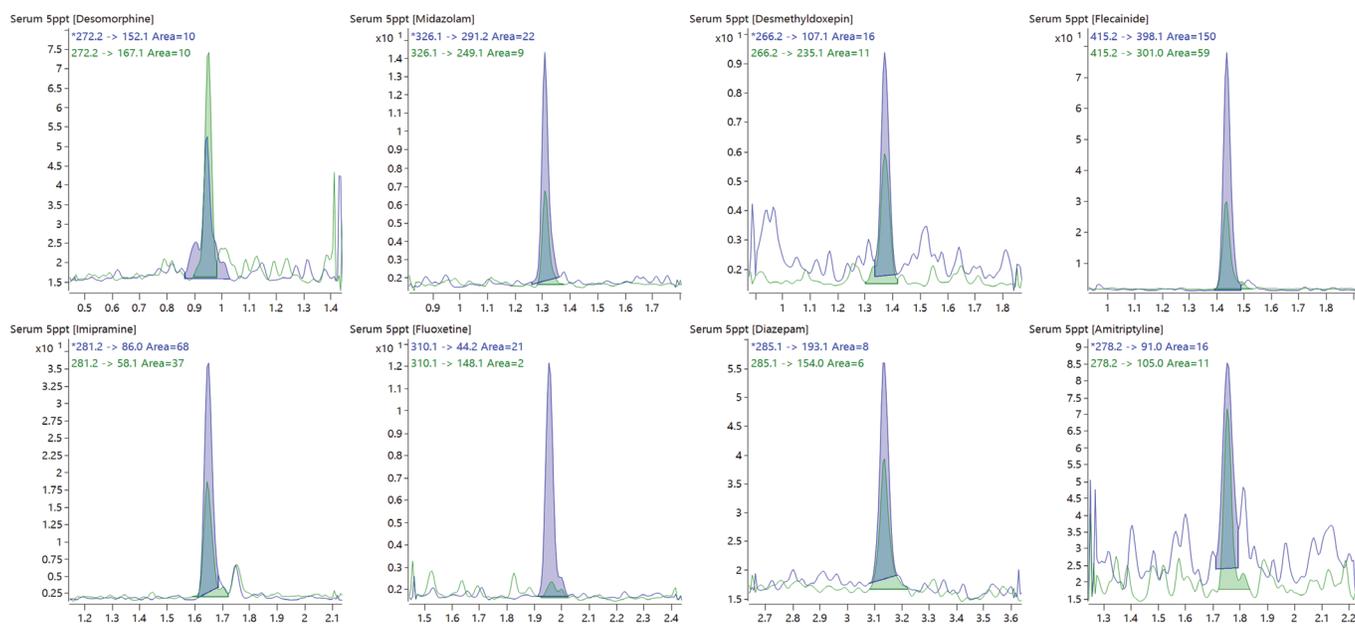
Pharmaceutical applications



Absorption, Disposition, Metabolism, and Excretion (ADME) labs are an integral part of the pharma drug discovery small molecule space. These studies are conducted to determine metabolic fate of test compounds in an appropriate medium to ensure efficacy and safety. This also precludes candidate failure rate once the compound enters into the development phase. Many organizations are moving towards implementation of GLP practices across both organizations and adherence to Code of Federal Regulations Title 21 Part 11, Electronic Records; Electronic Signatures Time Stamps. Ultivo LC/TQ, when combined with IQ/OQ services, ECM 3.5, and our MassHunter software, provides the requisite elements to assist you in enabling compliance-readiness within your laboratory.

## High throughput and reproducibility for ADME assays

The Ultivo Triple Quadrupole LC/MS system was designed to save laboratory space, while maintaining the performance required for high-throughput ADME analyses. Here we demonstrate a sensitive and precise method for analyzing eight drugs in serum in less than 4.0 minutes.



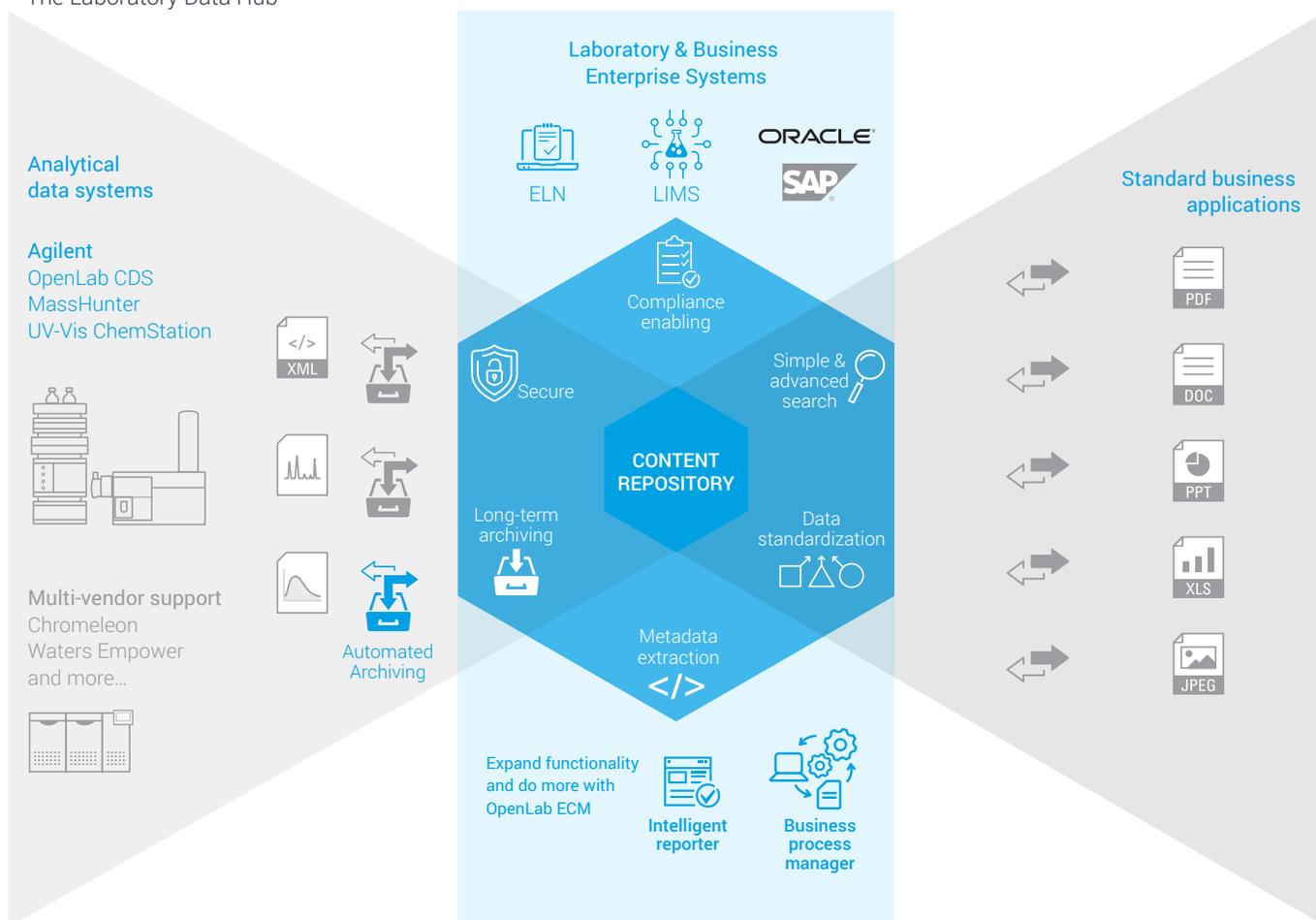
Extracted MRM chromatograms for the drug panel tested at 5.0 ppt.

## Comply with tight data integrity and regulatory requirements

From discovery to manufacturing, Agilent's Ultivo LC/TQ combined with MassHunter software, OpenLab ECM 3 series (3.5 and above), and IQ/OQ services provides data integrity tools to assist you in achieving compliance-readiness. Reduce the risk of data integrity audit observations through the system's user management, access control, tamper prevention and detection, audit trails, eSignatures, secure file retention features, and more. Enable your discovery and development workflows with the full-featured MassHunter Quantitative Analysis package, while unleashing your productivity in manufacturing with workflow-specific Quant-My-Way configurations. End-to-end, Ultivo, MassHunter, and OpenLab ECM provide you with the confidence to achieve dependable scientific results that are replicable and scalable for local labs or multinational establishments.

## OpenLab ECM

The Laboratory Data Hub



### OpenLab ECM 3.5 and Above

- Comprehensive enterprise content management system.
- Management of all your data, from multiple vendors or technologies that your lab produces, as well as documents generated locally to support lab activities.
- Monitors your operations and secures data in a central repository, ensuring timely completion of approvals with eSignatures, customized tasks, and lab reports.

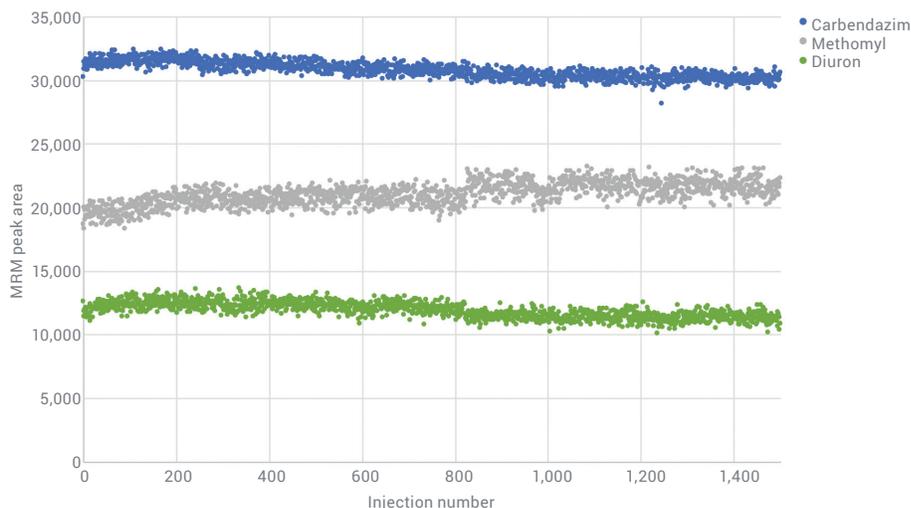
# Small in Size... Big on Robustness



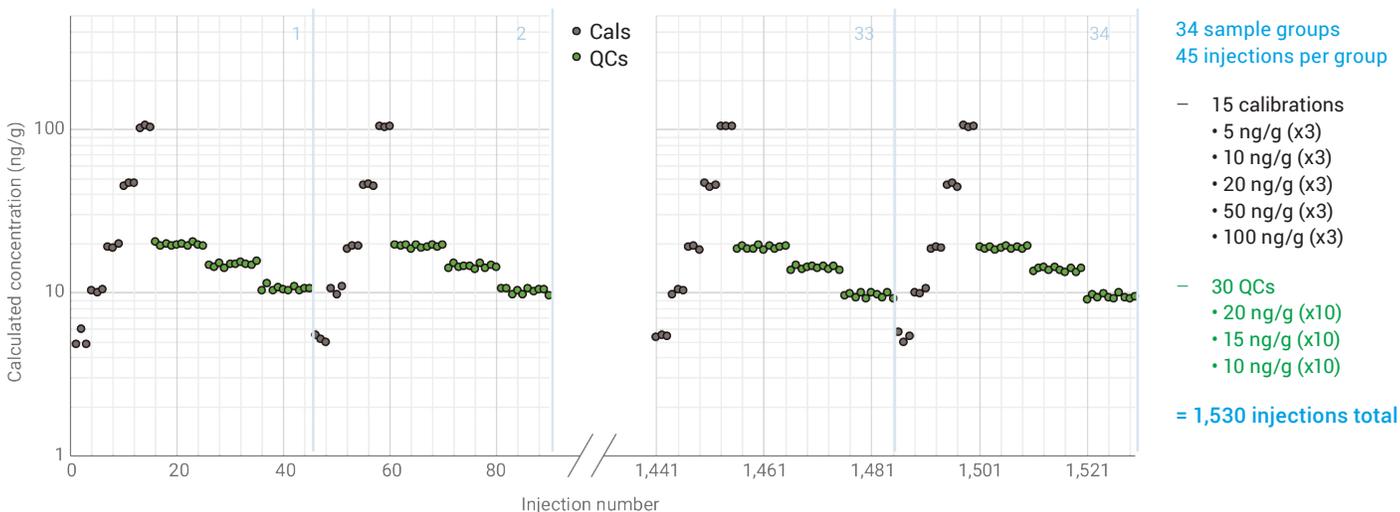
Identification and quantitation of a wide array of compounds in heavy matrices can be a daunting challenge. It requires the use of sensitive, robust analytical techniques and associated instrumentation. Innovations within Ultivo maximize quantitative performance, while enhancing instrument reliability and robustness.

## MRM signal stability

In quantitative determinations, signal stability is of utmost concern to ensure precise and accurate results. Here we demonstrate the raw MRM signal responses without correction or normalization for three pesticides spikes at 20 ng/g in avocado matrix. This data represents more than 1,500 injections acquired over a five-day period of uninterrupted operation, demonstrating excellent peak area stability.

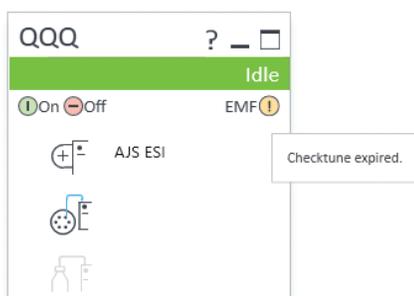


MRM peak area stability for carbendazim, methomyl, and diuron over 1,500 injections.



Experimental design for quantitation repeatability. Calculated concentrations for thiabendazole are plotted for sample groups 1-2 (first 90 injections), and 3-4 (last 90 injections).

# Avoid Unanticipated Downtime



Early Maintenance Feedback (EMF) feature allows labs to plan for maintenance downtime instead of reacting when the instrument loses sensitivity or exhibits poor performance. It monitors the usage of specific components in the system and provides feedback when the user-selectable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled. This leads to lower cost of ownership while increasing productivity.

## Increase uptime with planned maintenance

Early Maintenance Feedback alerts clearly and concisely tell the user what requires their attention.

EMF Actuals	
Early Maintenance Feedback Actuals	
	Status
Empty Calibrant Bottle or Clogged Nebulizer	Normal
Clogged Capillary	Normal
Bad Capillary	Normal
Unstable Spray	Normal
Aging Detector	Normal
Remaining	
Injection Count (Counts)	3902 <input type="button" value="Reset Counter"/>
Rough Pump Oil Change (Days)	355 <input type="button" value="Reset Timer"/>
Gas Filter Change (Days)	355 <input type="button" value="Reset Timer"/>
Checktune (Days)	Expired
Autotune (Days)	87
<input type="button" value="OK"/>	

Avoid unexpected downtime with easy-to-configure counters and timers, which enable the user to set the limits that they want for their workflows.

# Maximizing Qualitative and Quantitative Data Acquisition



Mixed-Mode Scanning allows for sequential acquisition of different scan types within a time segment. This is a highly effective tool when qualitative and quantitative data is desired within the same time segment.

Ion source: AJS ESI

Stop time:  As pump/No limit,  Limit (min) 1

Time filter window (min):  0.02

Time Segments: Start time (min) 0, Scan type Mixed

### Acquisition Parameters

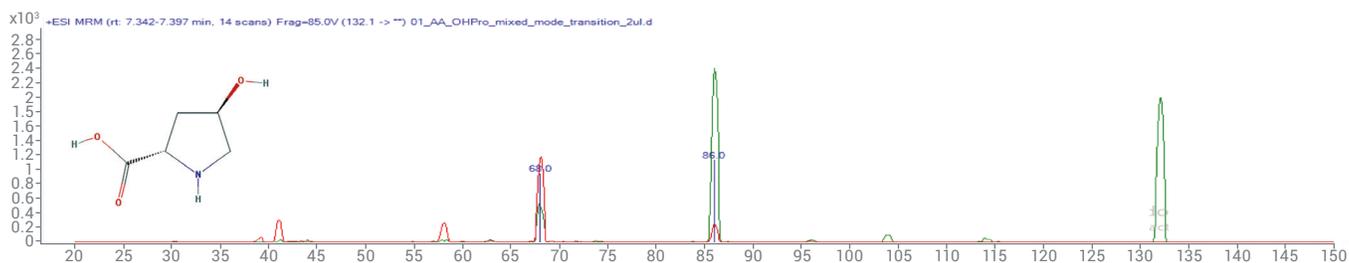
Scan type	Compound/Segment name	Precursor (m/z)	MS1 res	Product (m/z)	MS2 start mass (m/z)	MS2 end mass (m/z)	MS2 res	Scan Dwell time (ms)	Frag (V)	ISTD?	CAV (V)	CE (V)	Thru
Product Ion		132.1	Unit	20	150		250	85			9	0	0
Product Ion		132.1	Unit	20	150		250	85			9	25	0
MRM	Compound1	132.1	Unit	86			Unit	20	85		9	10	
MRM	Compound1	132.1	Unit	68			Unit	20	85		9	15	

Estimated cycle time (ms/cycle): 543  
 Estimated max scan speed (Da/s): 600  
 Data storage: Profile

Acquisition parameter table showing low and high collision energy product ion and MRM scans for a mixed-mode acquisition for amino acid analysis where an analytical standard for hydroxyproline was not available.



Low and high collision energy product ion and MRM scan for a mixed-mode acquisition showing isobars (leucine and isoleucine), as well as an MRM for an 'unknown' analyte (hydroxyproline).



Low and high collision energy product ion scan for putative analyte 'hydroxyproline', showing the mechanistic decomposition for hydroxyproline (a first loss of carboxylic acid  $-[M-CO_2H_2]$  46 Da, followed by a loss of water  $-[M-H_2O]$  18 Da).

# What If You Could Give Your Laboratory Analysts 40% More Time?



When deadlines loom, complex full-featured software packages can sometimes hinder productivity for the routine user. The Agilent MassHunter Productivity App for Targeted Pesticides Screening by LC/TQ delivers the functionality your people need, packaged for maximum efficiency. Advantages include:



Less need for operator training



Reduced time at the PC



Simplified data review and report generation

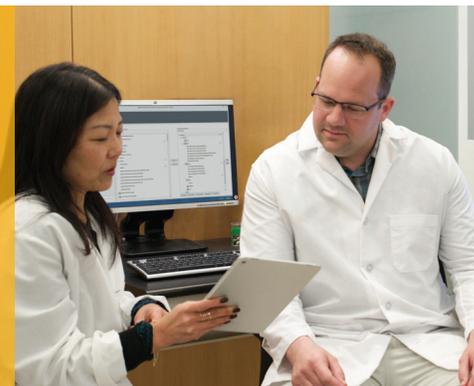
## No wonder users report productivity gains of up to 40 %

The Productivity App combines data acquisition and data review into a single, simplified user interface. Choose from the acquisition and quantitation methods we provide, use your own, or let Agilent's team of scientific and technical experts help you create new ones.

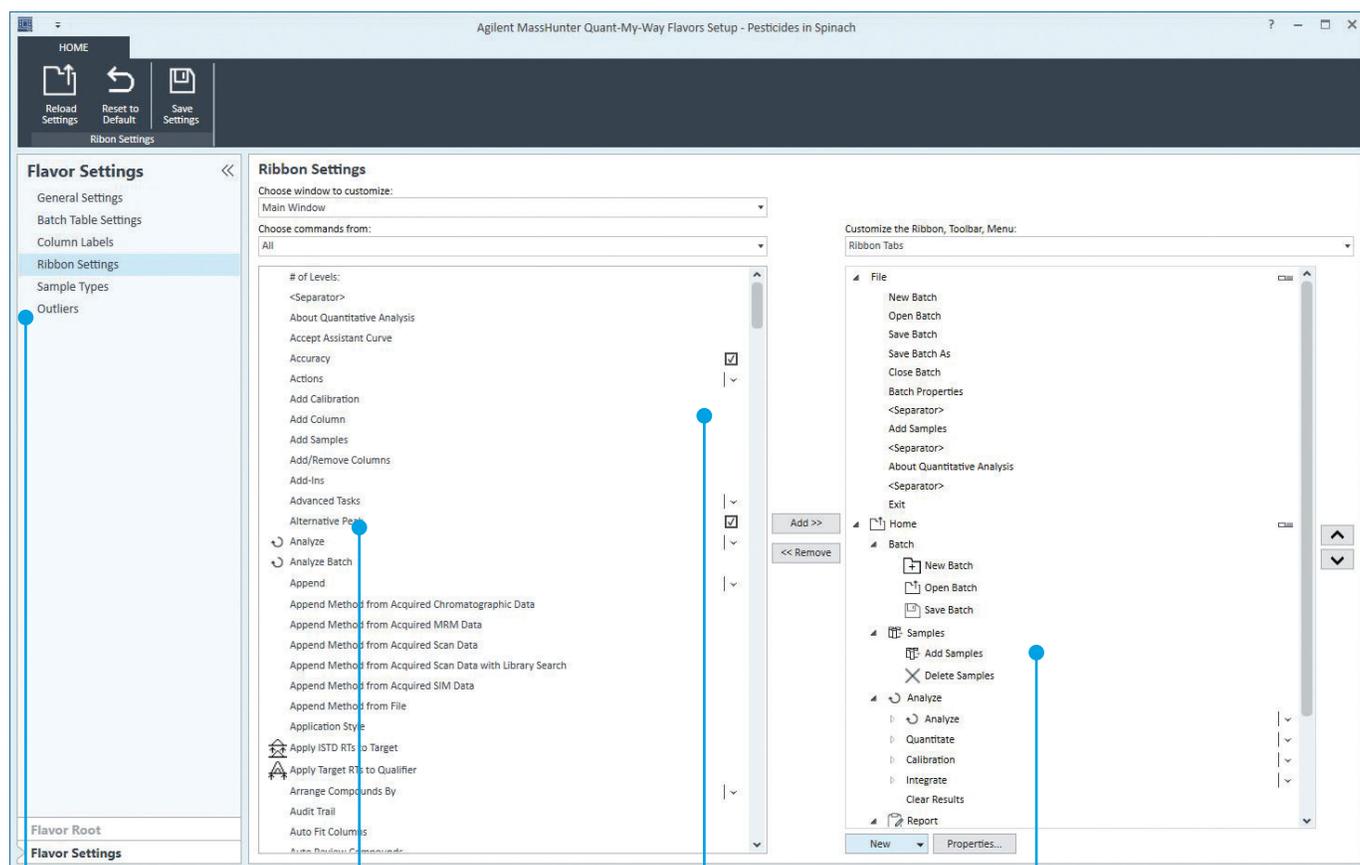


**Easy and intuitive:** Switch between “by sample” or “by compound” views with one click, and accelerate data review by applying individual flags or admin-defined filters.

# Reduce Your Time from Analysis to Reporting



Quant-My-Way is a set of tools designed to assist you in exposing only the capabilities of interest, so you can create your own streamlined version of MassHunter Quantitative Analysis for each of your specific assays. You can customize the new ribbon with just the actions you need, and you can hide as much or as little as your assay requires.



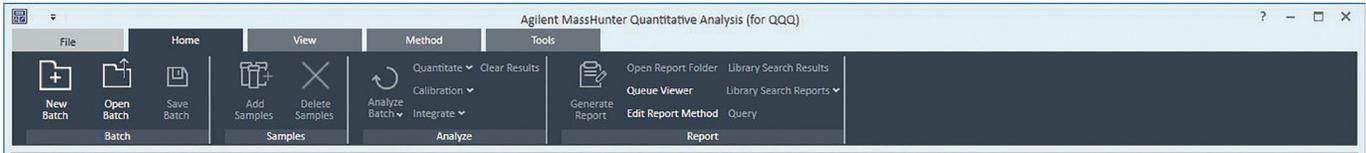
Hide features you don't need for your specific workflow.

Highlight the features you do need as you analyze the data acquired on Ultivo.

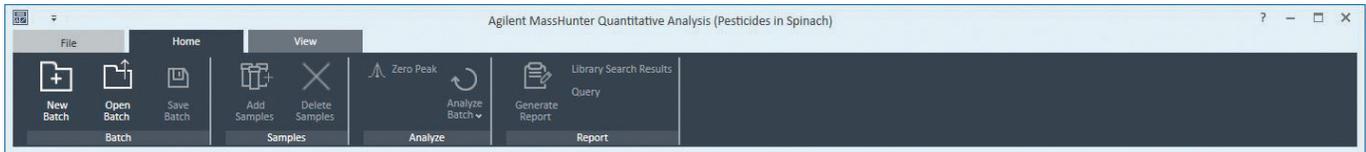
Stop wading through functions to find the necessary calculations.

Save hours of sample processing time each week.

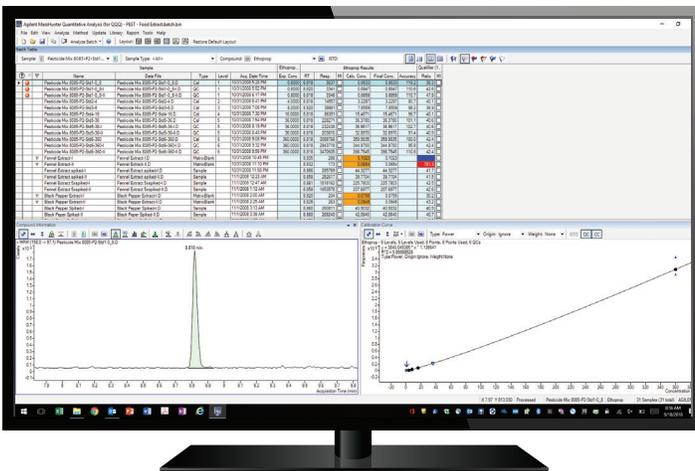
## Customize your ribbon and menus with only the features you need



Default ribbon view



Customized ribbon view



## Prefer the look and feel of earlier MassHunter Quantitative Analysis versions?

No problem. You can easily switch to the classic view. The familiar navigation, colors, and icons from earlier versions of MassHunter Quantitative Analysis will continue to be available.

# Advance Your Workflow Capabilities

The 70 % smaller footprint allows Ultivo to fit right into an Agilent InfinityLab LC system series, giving you triple the bench space of a similar LC/TQ.

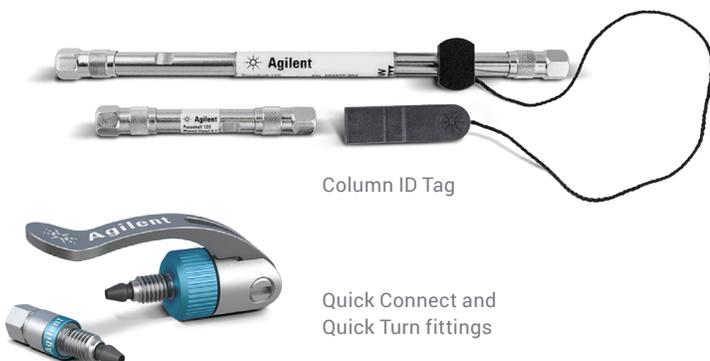


Bench size 1.8 meters (6 ft)



Ultivo and the Agilent 1260 Infinity II Prime LC make the perfect partner in compatibility. Both offer convenience and ease-of-use functions for everyday analysis.

The 1290 Infinity II LC system runs seamlessly with the Ultivo to provide the ultimate chromatography performance and sample throughput for both HPLC and UHPLC methods in a single stack to maximize efficiency.



Column ID Tag

Quick Connect and Quick Turn fittings

## Confidence in analytical efficiency and traceability

Agilent InfinityLab Poroshell 120 columns provide exceptional efficiency for all instruments, from standard HPLC systems to 1300 bar UHPLC systems. A column ID tag gives you at-a-glance details about usage. Quick Connect and Quick Turn fittings allow anyone to make leak-proof LC connections in seconds.



## Put CrossLab insight to work for you

CrossLab is an Agilent capability that integrates services, consumables, and lab-wide resource management to help laboratories improve efficiency, optimize operations, increase instrument uptime, develop user skill, and more. Our industry-leading services keep your instruments running at peak performance, and include instrument technology refresh, application consulting, repairs, preventive maintenance, compliance verification, and education.

Agilent CrossLab supports Agilent and select non-Agilent instruments and provides consultative support for workflow enablement, lab analytics, compliance, inventory management, and asset management, including relocation services.

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)

## The Agilent value promise: Ten years of guaranteed performance

Agilent offers the industry's only ten-year value guarantee. We guarantee you at least ten years of instrument use from your date of purchase or we will credit you with the residual value of that system toward an upgraded model. It's our way of assuring you of a safe purchase now and protecting your investment.

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