Agilent 6400 Series Triple Quadrupole LC/MS Systems

SUPERIOR SENSITIVITY WITH PROVEN PERFORMANCE

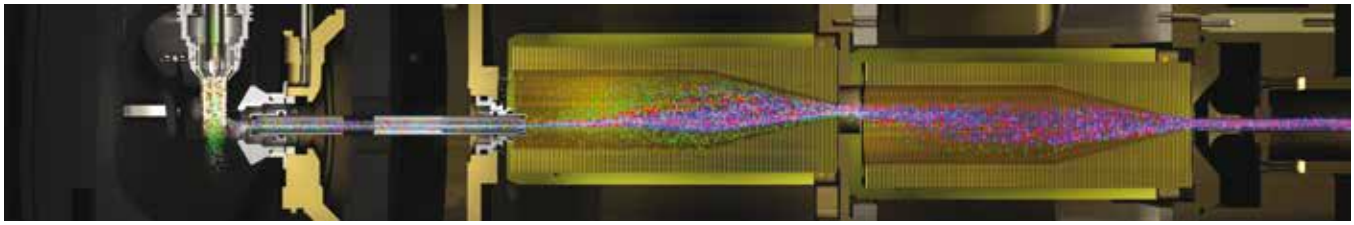
The Measure of Confidence

Agilent Technologies

THE AGILENT 6400 SERIES TRIPLE QUADRUPOLE SYSTEMS – PROVEN QUANTITATIVE PERFORMANCE

Choose an Agilent 6420, 6460, or 6495 Triple Quadrupole LC/MS System to achieve unmatched productivity, performance, and value for all your quantitative analysis needs.

Agilent 6400 Series Triple Quadrupole Systems	Highlights
6420	Economical and easy to use; with Agilent 1260 Infinity LC system, this option is a perfect workhorse instrument for laboratories requiring standard quantitative capabilities.
6460 Option 100	Offers the 6460 with the electrospray ionization (ESI) source to yield precision quantitation for most routine to trace analysis.
6460	Adds Agilent Jet Stream Technology to dramatically increase sensitivity for a wide range of demanding trace level quantitative applications.
6495	Includes novel iFunnel technology for ultra trace analysis – with attogram limits of quantitation and an unprecedented six orders of linearity for your most demanding quantitative applications. Enhanced ion optics and curved hexapole collision cell reduce contamination and improve transmission of fragment ions. High energy conversion dynode and low noise characteristics promote more efficient positive and negative ion detection and quantitation across a wide mass range.



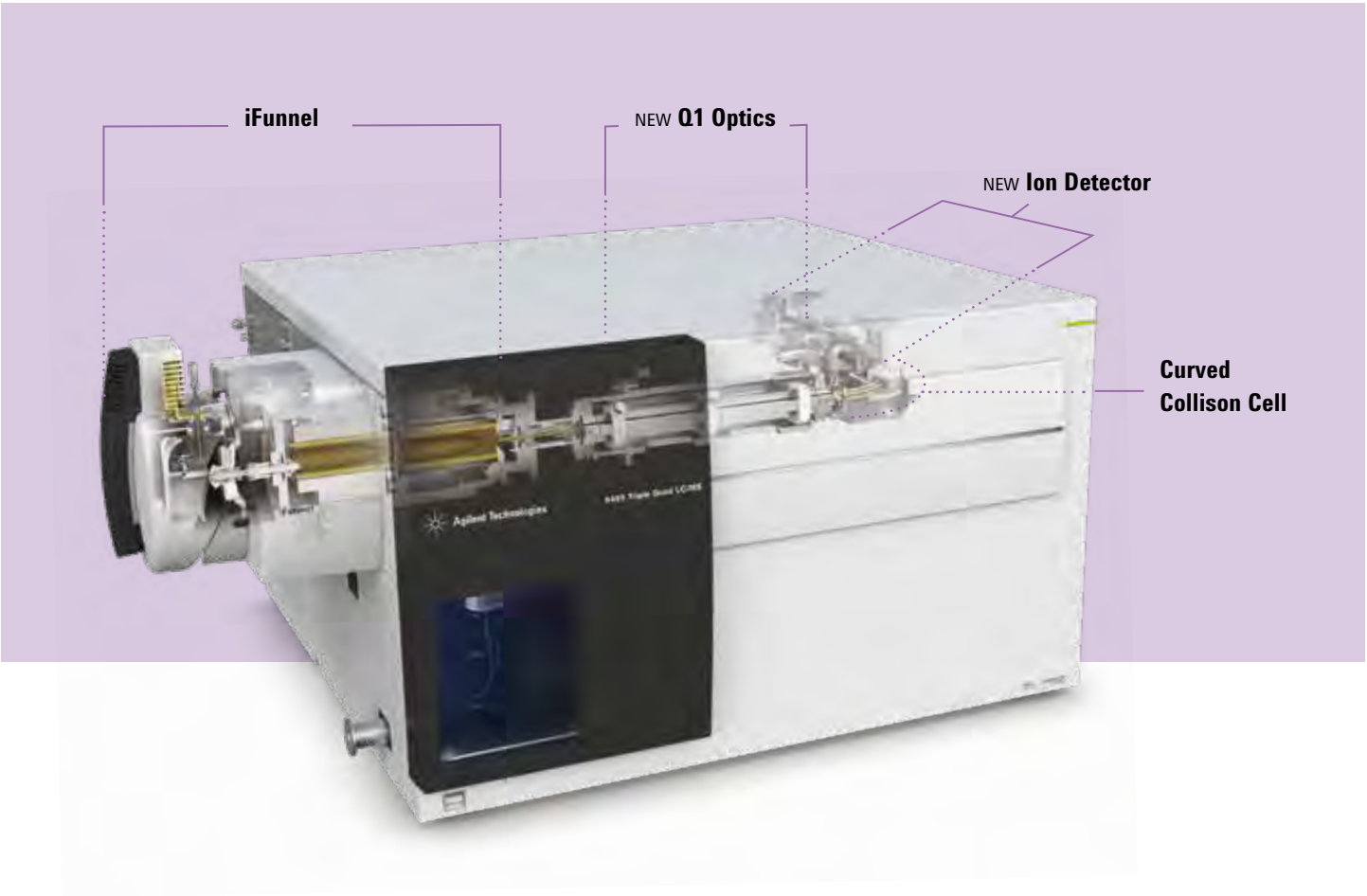
Proven iFunnel Technology

Agilent's proprietary iFunnel Technology combines three Agilent innovations:

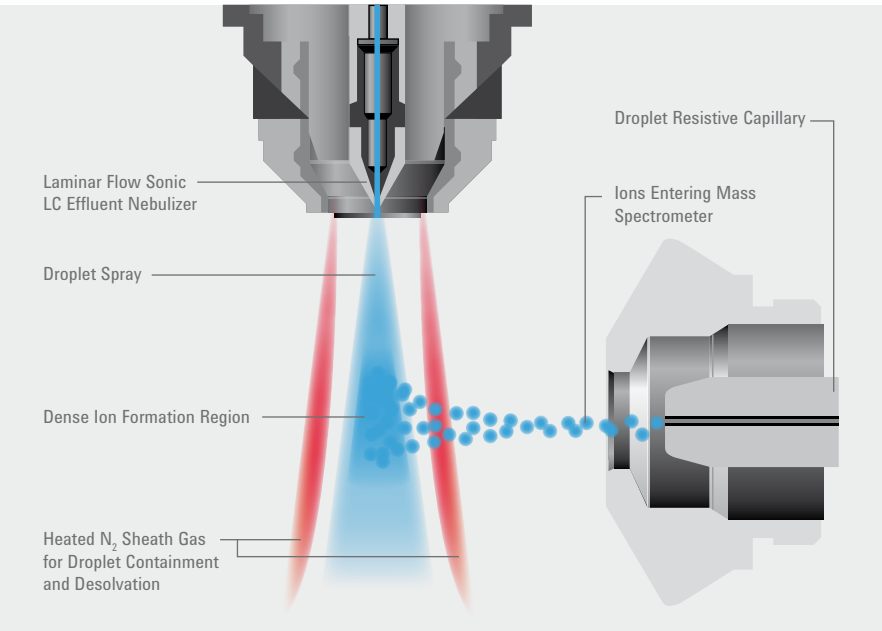
Jet Stream sample introduction, providing high-efficiency ESI ion generation and focusing; a hexabore capillary; and a unique dual-stage ion funnel assembly. Together, these technologies reduce neutrals and increase ion sampling to dramatically improve overall signal within the system, delivering significant increases in sensitivity compared with conventional instruments.

Innovative mass spectrometry technology delivers superior performance

Agilent 6400 Series Triple Quadrupoles are designed and constructed using the latest electronics and hardware manufacturing techniques. This state-of-the-art technology includes orthogonal ionization technology, a hyperbolic quadrupole design, a high-pressure hexapole collision cell with linear acceleration, and an off-axis high energy dynode detector. When integrated with the Autotune algorithm, MassHunter software, and processing tools, this technology delivers the highest quantitative performance available.



ROBUST ION SOURCES FOR A WIDE RANGE OF APPLICATIONS



Agilent Jet Stream II

- Uniformly supports flow rates from 20 uL/min to 2 mL/min
- Dramatically enhances sensitivity with thermal gradient focusing technology
- Improves ion transmission and enables rapid polarity switching with a resistively-coated sampling capillary

HPLC-Chip/MS technology

HPLC-Chip/MS technology is available with all Agilent 6400 Series Triple Quadrupoles to achieve robust analysis of large sample sets at nano flow rates. Precision laser etching of the column, connections, and nebulizer tip leads to the most reproducible, quantitative turn-key results available.

Commercially available Agilent chip solutions

Application	Chip
Peptide/Protein ID	ProtID-Chip
Intact Protein Analysis	Protein Chip
Glycan Analysis	PGC-Chip
Phosphopeptide Analysis	Phosphochip
Small Molecule Analysis	SmlMol-Chip
Monoclonal Antibody Glycan Analysis	mAb-Glyco Chip
Custom User Desired Analysis	Custom Chip

The Instrument Detection Limit: A better way to evaluate sensitivity

For years, scientists have relied on comparisons of signal-to-noise (S/N) values for various compounds to assess the sensitivity performance of a triple quadrupole instrument. However, the measured S/N values can vary significantly with different selected baseline regions and different software algorithms used to determine baseline noise. The choice of where and how to measure S/N in an LC/MS chromatogram is subjective, and often fails to estimate the limited of detection (LOD), especially when a relatively high level of analyte is used for S/N measurement.

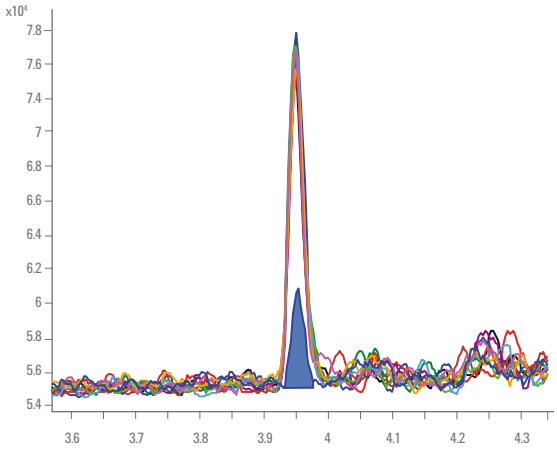
To provide a better assessment of an instrument's sensitivity, Agilent is leading the way with an additional metric that provides more accurate and reliable criteria for assessing the performance of a triple quadrupole LC/MS system—the Instrument Detection Limit (IDL).

Using a well-established statistical formula, IDL assesses typical performance from a series of replicate injections, not a single manual injection. IDL is measured at realistic low analytical levels. It also follows the guidelines of respected organizations such as the International Union of Pure and Applied Chemistry and the U.S. Environmental Protection Agency.

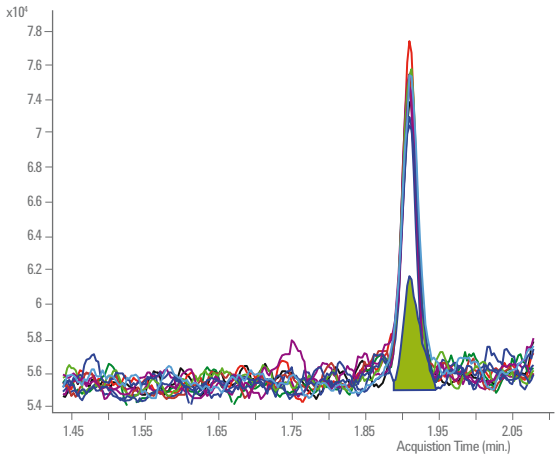
As a result, IDL provides an objective performance metric—a meaningful assessment of the instrument's limit of detection and its precision near that limit.

6495 QQQ IDL	Amount Measured	Replicates	Area % RSD	t (99%)	IDL
Response (+)	1 fg **5 fg**	n = 10	7.2 **7.2**	2.821	0.20 fg **1.02 fg**
Chloramphenicol (-)	1 fg **5 fg**	n = 10	9.7 **8.9**	2.821	0.27 fg **1.25 fg**

1 fg of reserpine used to measure IDL (+)



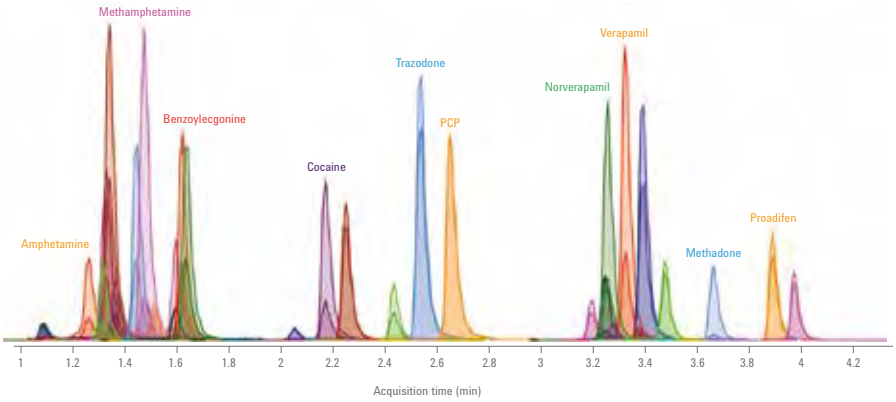
1 fg of chloramphenicol used to measure IDL (-1)



Improved precision (%RSD) and Instrument Detection Limit (IDL) achieved on the 6495 vs. the 6490.

FAST AND ROBUST FORENSIC SCREENING

Be more productive when analyzing Drugs of Abuse with LC/MS. Streamline sample preparation and analysis by eliminating the need for chemical derivatization, and using easy-to-use methods that can readily be adapted for new analytes. The 6420 Triple Quadrupole LC/MS system enables simultaneous quantitation, screening and confirmation of forensic compounds with the lowest overall cost of ownership.



Forensics test mixture results acquired using 25 pg of each compound injected on-column to the new 6420 Triple Quadrupole LC/MS System.

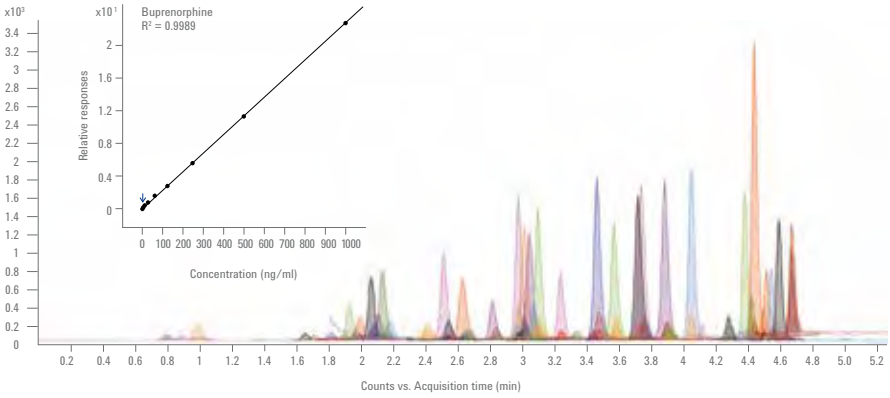
Simplify analytical method startup and reduce your time to technical mastery

Agilent's Forensic Toxicology Triggered MRM LC/MS Application Kit features pretested analytical methods, test mix, and database and library, to enable screening and confirmation of forensic compounds routinely monitored around the world.

- **Forensic Toxicology Triggered MRM database with over 2,500 compound names and retention times**, plus optimal MRM transitions, fragmentor voltages, and collision energies to allow you to rapidly screen forensic analytes.
- **Forensic Toxicology Triggered MRM library with reference library spectra for more than 100 compounds** to allow you to confirm the identity of forensic analytes with a library match score.

A SIMPLE AND ACCURATE APPROACH TO CLINICAL RESEARCH AND DRUG DISCOVERY

Agilent 6400 Series Triple Quadrupole Systems provide a simple and reliable approach for rapidly analyzing more samples. Eliminate laborious derivatization steps typically required for GC/MS analysis to increase throughput and productivity. Take advantage of MRM specificity to monitor more compounds of interests with exceptionally high sensitivity.



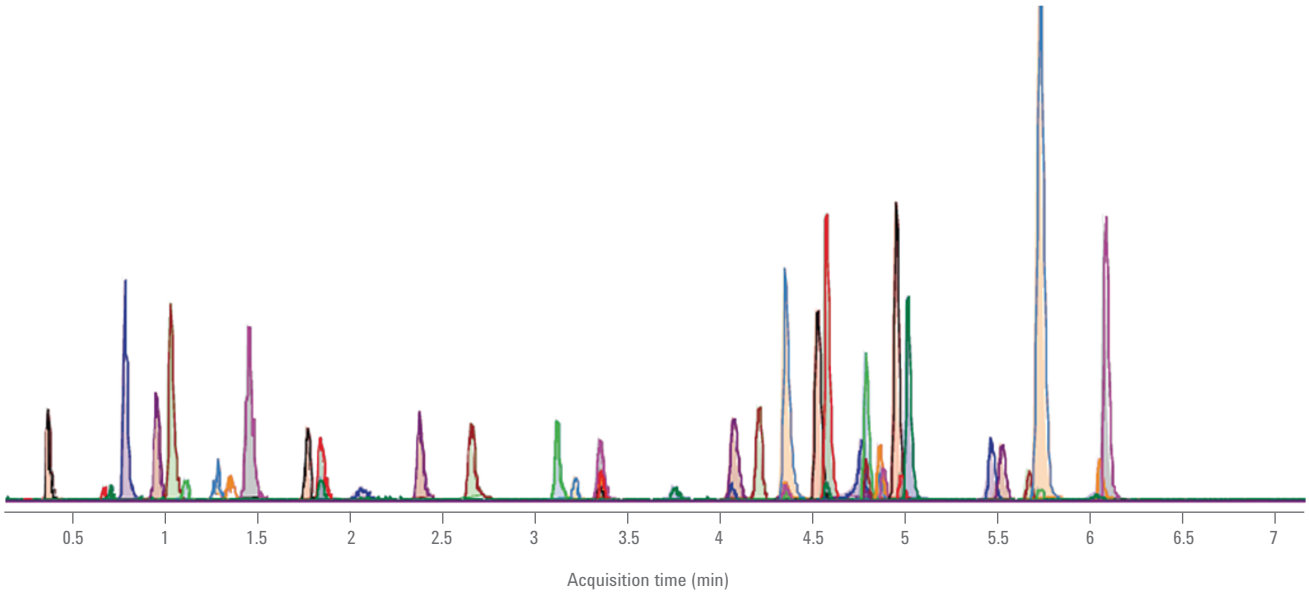
Extracted ion chromatograms of 174 transitions used in the simultaneous quantitation of drug compounds (amphetamines, benzodiazepines and opiates). A wide linear dynamic range was achieved with routine precision of less than 10% RSD in urine samples. (Inset) Calibration curve for buprenorphine demonstrates linearity from 4 to 1000 ng/mL.

Improve efficiency for drug discovery compound screening and bioanalysis with Study Manager

Study Manager delivers automated bioanalysis with LIMS connectivity and high-throughput *in vitro* screening for drug discovery applications. Designed for multi-user access instruments, Study Manager lets you submit batches of samples and perform a series of tasks including optimization of parameters, data acquisition, quantitative analysis, and reporting. New Study Creators can import sample information from electronic files, schedule and run Optimizer, control acquisition and quantitation, and produce a spreadsheet containing your results. Users can schedule Optimizer-only studies for workflows where all compounds can be optimized at the beginning of the week while assays run subsequently over several days.

SENSITIVE QUANTITATION OF EMERGING ENVIRONMENTAL POLLUTANTS

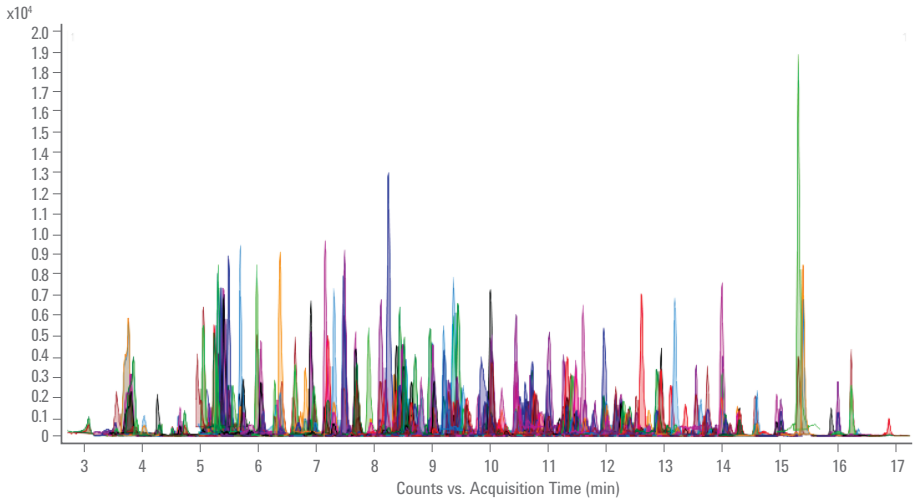
Pharmaceuticals and Personal Care Products (PPCPs), including drugs and their active metabolites, are an increasingly important water quality issue for the scientific community and public health authorities because they can have an adverse impact on marine life and humans. Sensitive and reliable analytical methods for water quality testing can be implemented using the Agilent 6400 Triple Quadrupole LC/MS Systems and following the guidelines in EPA method 1694. An updated version of EPA method 1694 that uses a ZORBAX Eclipse Plus-C18 column on an Agilent 1290 Infinity LC System provides a three-fold gain in throughput.



Analysis of 46 compounds with an improved version of EPA Method 1694 demonstrates outstanding sensitivity and a three-fold reduction in assay time.

RELIABLE, HIGH-THROUGHPUT QUANTITATION ENSURES FOOD SAFETY

Pesticide treatment is widely used in today's agricultural practices. Production agriculture comprises the main category of pesticide use and is subject to regulation. The number of pesticides and residues that must be monitored has continually increased over time. It is a common requirement that several hundred target compounds are screened in a single LC/MS experiment.



MRM chromatograms of 20-fold dilution of 250 pesticides spiked into black tea at 10 µg/kg with insert demonstrating the pesticide LLOQs and IDLs.

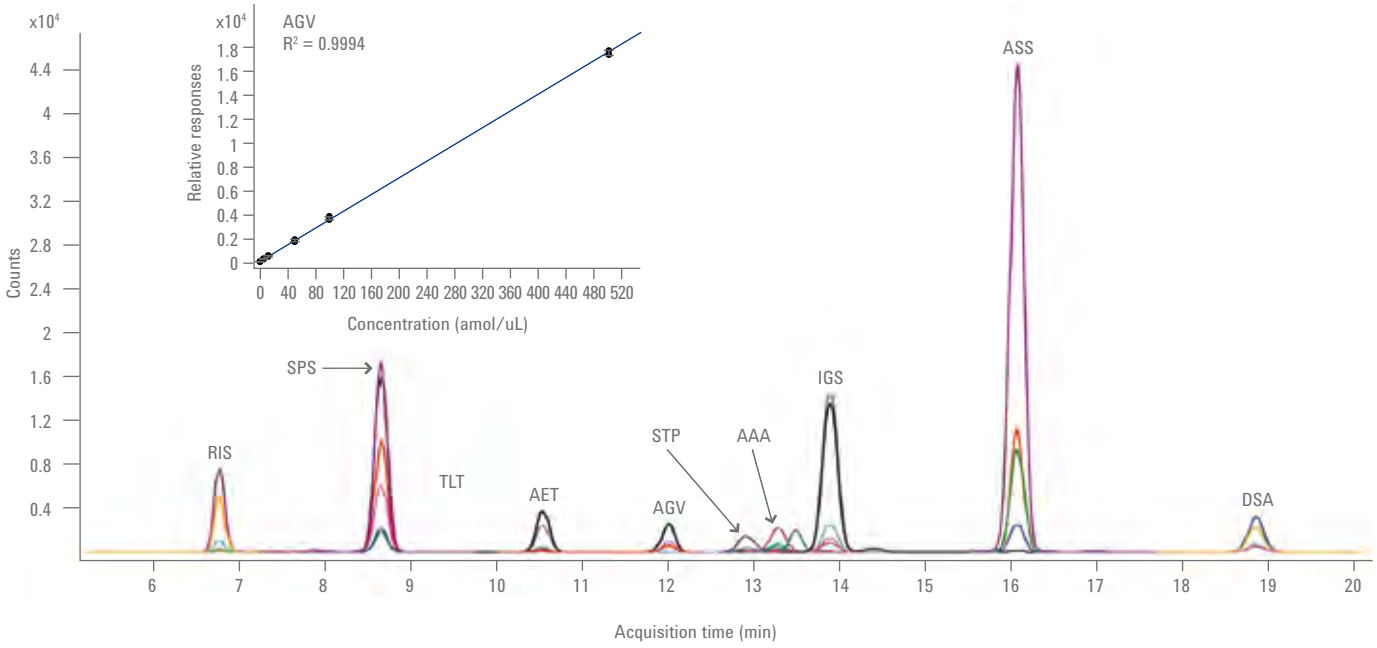
A faster, easier way to develop customized screening methods

Agilent's Pesticide Triggered MRM LC/MS Application Kit is a unique tool featuring pretested analytical methods, test mix, and database and library, to facilitate your screening and confirmation of pesticides that are routinely monitored around the world.

- **Over 700 pesticide Triggered MRM transitions** in a database that also includes compound names, voltages, collision energies, and retention times to facilitate reliable pesticide screening.
- **Pesticide Triggered MRM library with reference library spectra for more than 200 compounds** to allow you to confirm the identity of pesticides with a library match score.

HIGH SENSITIVITY PEPTIDE QUANTITATION WITH HPLC-CHIP/MS TECHNOLOGY

Detect and quantify extremely low level of peptides in complex samples using MRM acquisition on a triple quadrupole mass spectrometer. This approach provides superior sensitivity and selectivity for targeted compounds in the most challenging sample matrices. It also offers precise quantitation and fast scan speeds, making it an ideal technology for monitoring panels of peptides with high-throughput methodologies. Coupled with Agilent HPLC-Chip/MS technology, peptide quantitation using nano flow chromatography is a turn-key solution that delivers unmatched sensitivity and reproducibility. Software tools provide a complete workflow for quantitative proteomics research and biomarker validation.



MRM chromatograms for phosphopeptides (1 fmol) from trypsinized *E. coli* lysate (150 ng) using ProtID-Chip equipped with a 160 nL trap. (Inset) Calibration curve of the peptide AGVIQTSTEHS*FSK illustrates excellent linearity, dynamic range, and reproducibility with an on-chip LOQ of 1 amol.

MassHunter software simplifies and automates quantitative analysis

Agilent MassHunter Workstation software greatly simplifies sample management, mass spectrometer method optimization, data processing, and reporting for quantitative analyses. An impressive suite of tools enables key workflows, particularly for pharmaceutical and regulated laboratory environments.

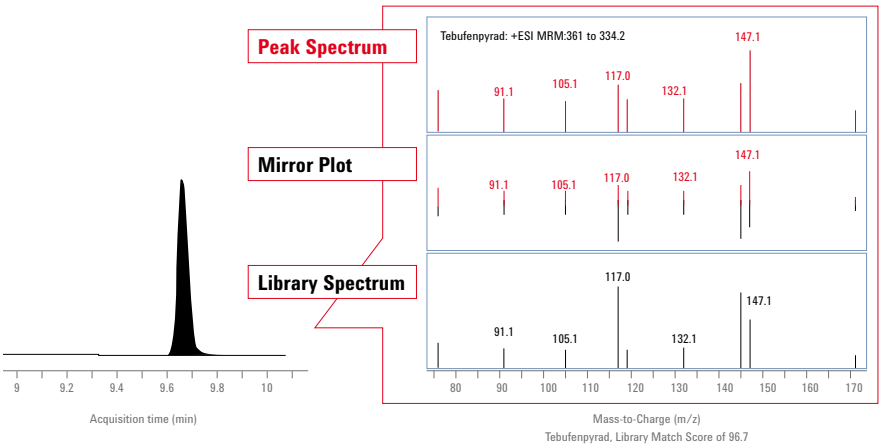
- Triggered MRM data-dependant acquisition yields fast, sensitive simultaneous compound quantitation and confirmation
- Dynamic MRM simplifies method development and shortens cycle time to maximize quantitative performance
- Optimizer software enables automated determination of compound MRM parameters in addition to source and iFunnel conditions
- Fully integrated with Skyline for automated peptide quantitation workflow

Quantitative and qualitative analysis in a single run using triggered MRM

Triggered MRM acquisition is available on all Agilent triple quadrupole LC/MS systems. It effectively combines MRM quantitative analysis with data-dependent acquisition of a product ion spectrum for use in library searches, identification, and confirmation.

Advantages of triggered MRM

- Faster and more sensitive than conventional product ion scanning
- Simultaneous compound quantitation and confirmation
- Superior sensitivity at parts-per-trillion level surpasses trapping technology
- Compatible with multi-residue analysis of hundreds of compounds



The above below, generated with data gathered using an Agilent 6460 Triple Quadrupole, shows how the acquired mass spectrum (upper window) can be compared to a stored library spectrum (bottom window). The mirror plot in the central window simplifies the comparison between the sample and library spectra. An excellent library match score of 96.75 confirms the identity of the compound.

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