C146-E232E

SHIMADZU
Excellence in Science

Liquid Chromatograph Mass Spectrometer

LCMS-8050

UFMS
ULTRA FAST MASS SPECTROMETRY

Speed and


SHIMADZU
LCMS-8050
LIQUID CHROMATOGRAPH MASS SPECTROMETER
POWER
STATUS
HEATER
GAS
HV

Sensitivity Beyond Comparison

Continuing the evolution of Shimadzu's UF technology,
Shimadzu introduces the LCMS-8050 triple quadrupole mass spectrometer,
offering unparalleled measurement speeds and high-sensitivity performance.

High-sensitivity quantitation delivered at high speed
Multi-component analysis performed more rapidly
Simultaneous qualitative and quantitative analyses

The high performance of the LCMS-8050 defies expectations,
redefining high-sensitivity, high-speed analysis.

Experience a New Realm of High-Sensitivity & High-Speed Performance

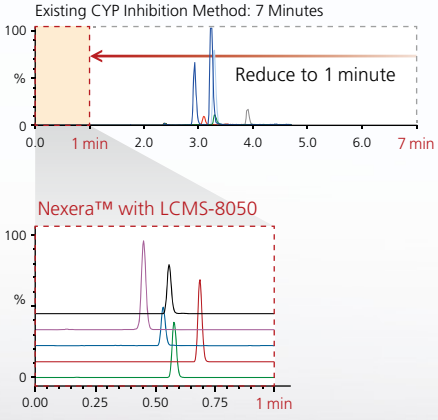
UFsensitivity™

Combining Speed and High Sensitivity

UFswitching™ ■ High-Sensitivity & High-Speed Positive/Negative Ionization Switching in 5 msec

A Case Study Using High-Speed Positive/Negative Ionization Switching

High-speed polarity switching has a high impact on LC-MS/MS method design and capability by optimizing the signal response for each target compound resulting in a single injection analysis cycle, faster rates of sample throughput and a greater number of target compounds in a single method.



High-speed polarity switching pushes the boundaries further;

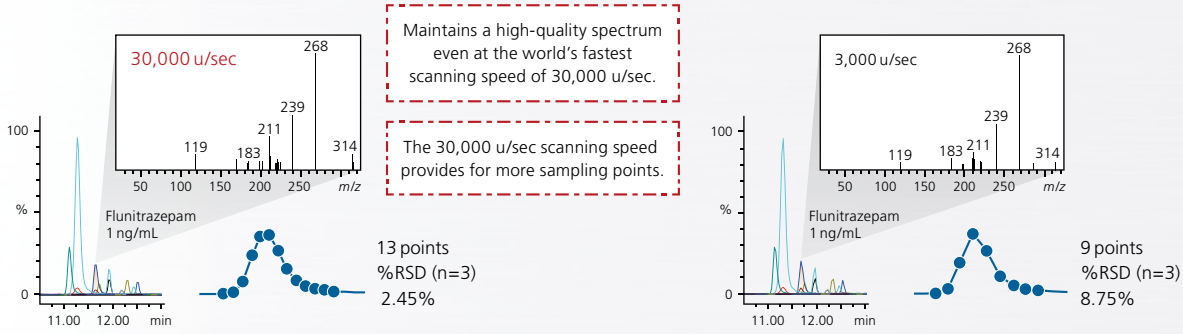
- Supports high data sampling rates delivering over 20 points across a UHPLC peak
- Improves reproducibility even at the lowest calibration level
- Enhanced dynamic range compared to other triple quadrupoles

Compound	Polarity	Legacy HPLC Method 7 min			Nexera with LCMS-8050 1 min		
		Dynamic range (nmol/L)	Points/ peak	%RSD 0.6 nmol/L (n=4)	Dynamic range (nmol/L)	Points/ peak	%RSD 0.6 nmol/L (n=4)
Resorufin	+	0.6–300	19	4.66	0.6–1000	21	4.30
1′-Hydroxy Bufuralol	+	0.6–300	21	2.39	0.6–1000	24	1.82
(+/–)-4′-Hydroxy Mephenytoin	+	0.6–300	20	2.75	0.6–1000	23	2.18
Oxidized Nifedipine	+	0.6–300	19	5.58	0.6–1000	23	5.07
Hydroxy Tolbutamide	–	0.6–300	20	5.68	0.6–1000	23	2.96

UFscanning™ ■ High-Sensitivity & High-Speed Scanning at 30,000 u/sec

Simultaneous Quantitative and Qualitative Analysis
Simultaneous High-Speed Screening of 12 Toxicological Drugs

The LCMS-8050 is capable of simultaneously obtaining both qualitative and quantitative information in a single analysis. Acquisition occurs so rapidly that MS/MS scans and MRM measurements can be performed concurrently while maintaining quantitative accuracy. MS/MS scans are usable and reliable because even at 30,000 u/sec, Shimadzu uses a 0.1 u scan step.



Maintains a high-quality spectrum even at the world's fastest scanning speed of 30,000 u/sec.

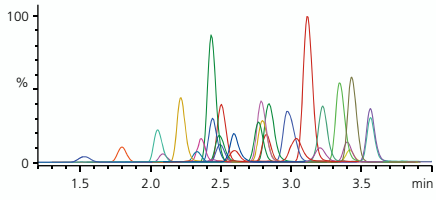
The 30,000 u/sec scanning speed provides for more sampling points.

MRM Triggered Product Ion Scanning of a Mixture of 12 Benzodiazepines (1 ng/mL each)

UF-MRM™ ■ High-Sensitivity & High-Speed MRM at 555 MRM/sec

Detect Target Compounds at Trace-Level Concentrations
Simultaneous Analysis of 29 Pesticides for Water Quality Analysis

The LCMS-8050 is capable of simultaneously acquiring 555 MRM transitions per second without sacrificing accuracy and precision. A high sampling rate delivers precise and accurate quantitation for quantitation ions, reference ions, and internal standard ions even in chromatographic regions with unresolved peaks. The high sensitivity of the LCMS-8050 allows for trace-level analysis, such as pesticides in drinking water, without the need for sample pre-concentration. This high sensitivity is maintained even when monitoring large panels of target compounds.



MRM Chromatogram of 29 Pesticides
for Water Quality Analysis (100 pg/mL each)

LCMS-8050 has achieved LOQs that fulfill the 1/100 target value without sample pre-concentration.

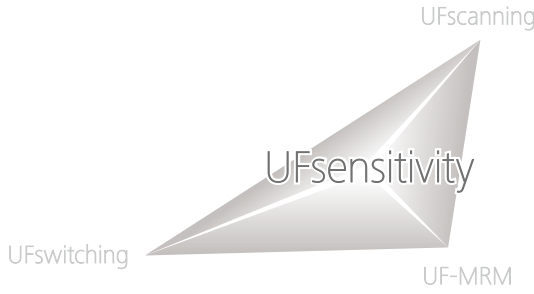
No.	Compound	LOQ pg/mL	1/100 of target pg/mL*	No.	Compound	LOQ pg/mL	1/100 of target pg/mL*
1	Thiuram	2.0	200	16	MPP oxon sulfoxide	4.2	10
2	Bentazone	3.9	2000	17	MPP oxon sulfone	5.7	10
3	Carbofuran	1.6	50	18	Dymron	0.65	8000
4	2,4-D	46.7	300	19	Methomyl	2.3	300
5	Triclopyr	45.3	60	20	Probenazole	5.2	500
6	Iprodione	1.7	3000	21	Diuron (DCMU)	0.7	200
7	Asulam	2.3	2000	22	Bensulfuron-methyl	4.4	4000
8	Bensulide	4.8	1000	23	Tricyclazole	2.7	800
9	Mecoprop (MCPP)	6.1	50	24	Azoxystrobin	2.7	5000
10	Carbaryl (NAC)	2.3	500	25	Halosulfuron-methyl	0.52	3000
11	Carpropamid	1.3	400	26	Flazasulfuron	0.47	300
12	Fenthion (MPP)	3.1	10	27	Thiodicarb	3.4	800
13	MPP sulfoxide	1.7	10	28	Siduron	0.82	3000
14	MPP sulfone	5.1	10	29	Fipronil	4.7	5
15	MPP oxon	4.9	10				

*Note: Official analytical methods require detection to 1/100th of regulatory targets.

UFsensitivity

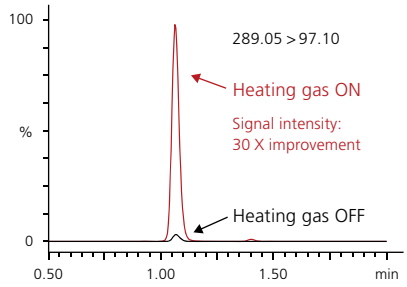
High Sensitivity for Trace Quantitative Analysis

Scientists who demand trace-level quantitation will benefit from a newly designed heated ESI probe and a new high-efficiency CID cell, the UFsweeper™ III.
These technological improvements combined with Shimadzu's patented ion optics system deliver robust high-sensitivity performance.

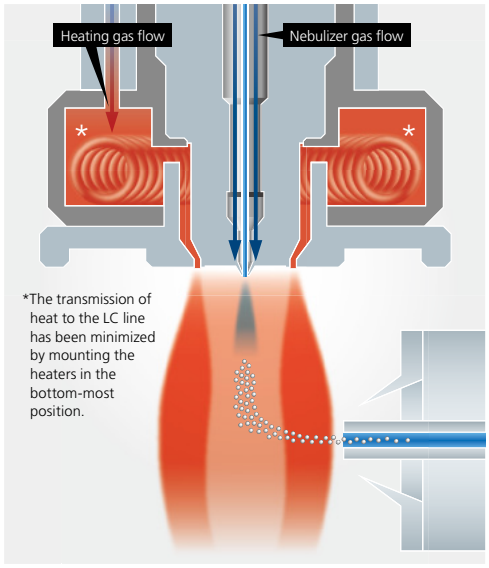


Heated ESI Probe

In order to improve desolvation efficiency, the newly developed heated ESI probe combines a high-temperature gas with the nebulizer spray, assisting in the desolvation of large droplets and facilitating ionization. This development allows for high-sensitivity analysis of a wide range of target compounds.



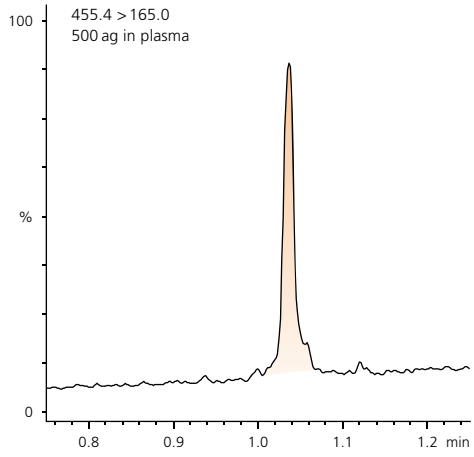
MRM Chromatogram of Testosterone



Excellent Reproducibility Even at Attogram (ag) Levels

Both sensitivity and reproducibility are essential when establishing low limits of quantitation. High-precision quantitative results obtained with the LCMS-8050 in the analysis of Verapamil in blood plasma at levels between 500 ag and 50 pg are shown below. Excellent reproducibility with a % RSD of 2.77 % was obtained when analyzing just 500 ag of Verapamil. The LCMS-8050 demonstrates optimal performance for quantitative analysis of even trace components of a complex matrix.

Concentration actual ng/mL	Calculated concentration ng/mL	% RSD (n = 6)	Accuracy (%) (n = 6)
0.000500	0.000501	2.77	100.2
0.00500	0.00496	3.98	99.2
0.0500	0.0506	1.21	101.2
0.500	0.493	1.31	98.6
5.00	4.89	1.81	97.8
50.0	51.6	0.65	103.2



MRM Chromatogram of Verapamil

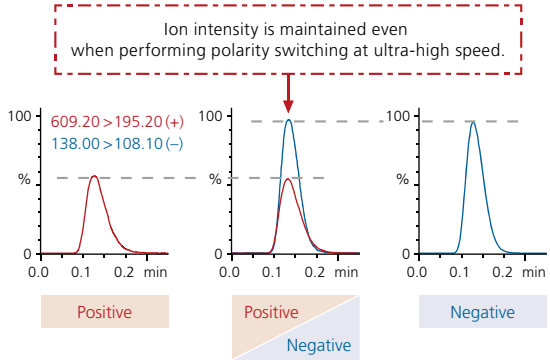
UFswitching

Polarity Switching Technology with No Compromise in Quality or Sensitivity

Ultra-high speed positive/negative ionization switching technology [UFswitching] maintains constant data quality and sensitivity with no loss of quantitative accuracy. Laboratories can now use a single method for both positive and negative ions, increasing sample throughput and saving method development time.

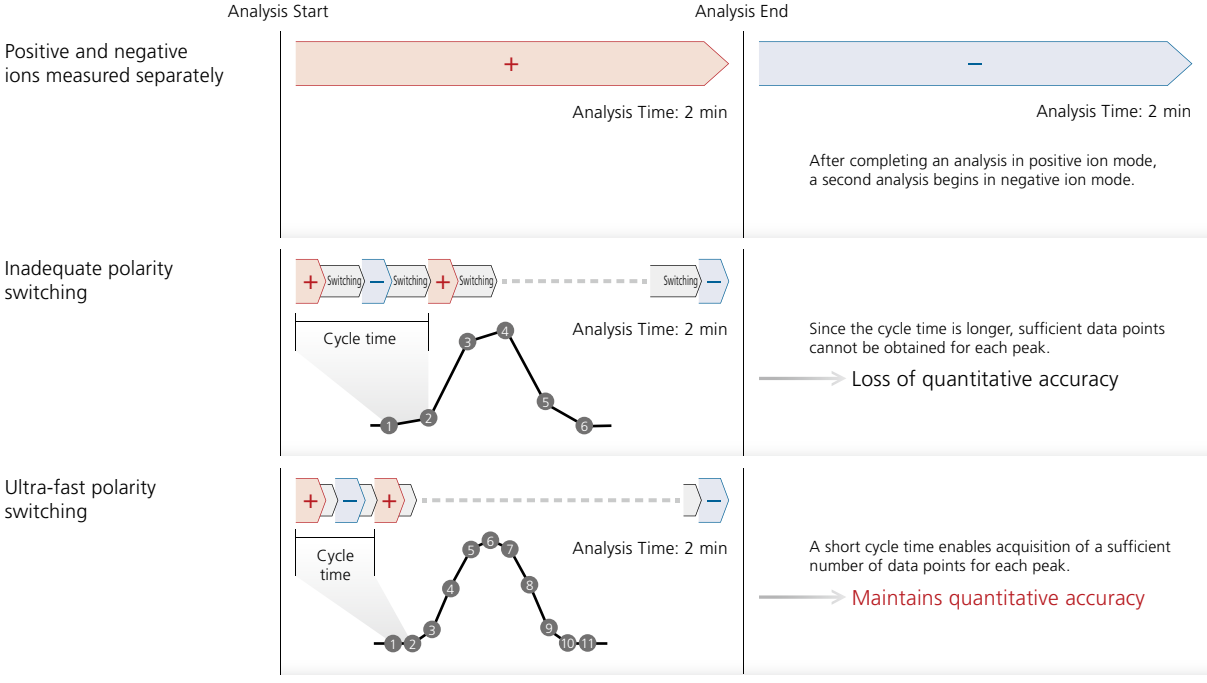
Only 5 msec to Achieve Stable Quantitative Accuracy with Positive/Negative Ionization Switching

The LCMS-8050 uses unique high-voltage power supply technology to achieve an ultra-high-speed positive/negative ionization switching time of just 5 msec. The LCMS-8050 is also the only instrument of its type to maintain ion intensity even when performing polarity switching at ultra-high speed, yielding consistent, reproducible data. Excellent quantitative results can be obtained from UHPLC peaks no more than 2-3 seconds wide, even when multiple components are eluted simultaneously.



Comparison of measurement using the ultra-fast polarity switching (5 msec) and individual measurement of positive and negative ions.

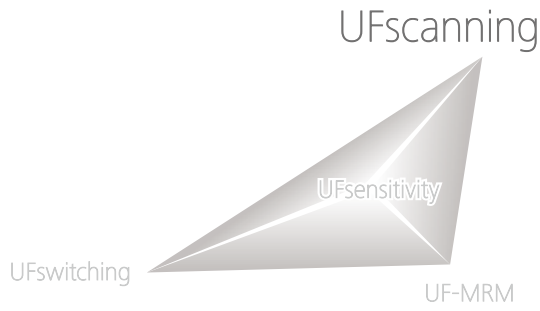
Outstanding Throughput and Quantitative Accuracy



UFscanning

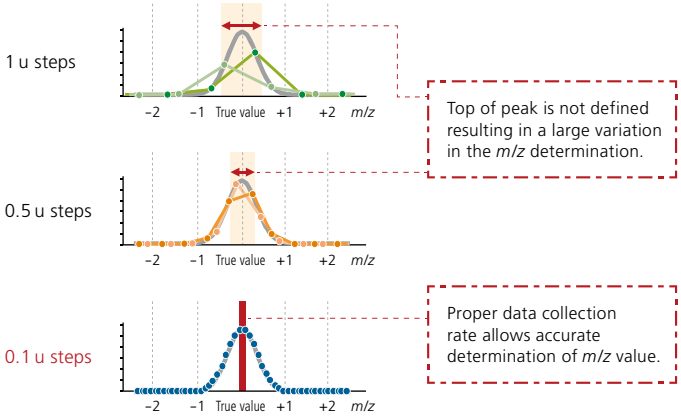
Simultaneous, Highly Reliable Quantitative and Qualitative Analysis

With the development of a unique approach to ultra-high-speed scan technology [UFscanning], the LCMS-8050 maintains spectrum quality and ion intensity at any scan speed. Perform quantitative and qualitative analysis simultaneously with a maximum high-speed scan rate of 30,000 u/sec.

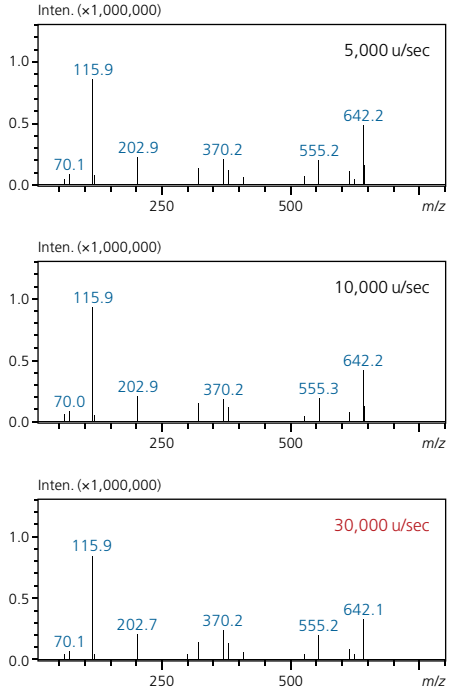


Maintain Sensitivity and Mass Accuracy Even at 30,000 u/sec

Greater ion transmission at any scan speed has been achieved by precisely controlling the voltage applied to the quadrupoles across the mass scale. As Shimadzu quadrupole technology using a data collection interval of 0.1 u high quality mass spectra are acquired without loss of sensitivity or mass accuracy.



Variation in *m/z* Caused by Different Sampling Intervals for Spectral Data

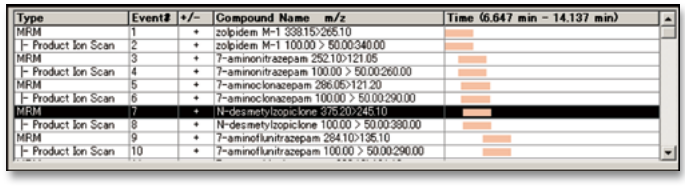


Bradykinin (MW 756.4) Product Ion Scan Spectrum
Precursor Ion *m/z* 379.4

Efficient Qualitative Analysis Using Synchronized Survey Scan™

The Synchronized Survey Scan (SSS) function allows MRM acquisition to be combined with other scan modes including library searchable spectra using a MRM triggered product ion scan.

One thousand events can be registered within a single method supporting the analysis of large panels of target compounds with high data quality and greater information.



Type	Event#	+/−	Compound Name m/z	Time (6.647 min – 14.137 min)
MRM	1	+	zolpidem M-1 338.15>265.10	
├ Product Ion Scan	2	+	zolpidem M-1 100.00 > 50.00:340.00	
MRM	3	+	7-aminonitrazepam 252.10>121.05	
├ Product Ion Scan	4	+	7-aminonitrazepam 100.00 > 50.00:260.00	
MRM	5	+	7-aminoclonazepam 286.05>121.20	
├ Product Ion Scan	6	+	7-aminoclonazepam 100.00 > 50.00:290.00	
MRM	7	+	N-desmetylzopiclone 376.20>245.10	
├ Product Ion Scan	8	+	N-desmetylzopiclone 100.00 > 50.00:380.00	
MRM	9	+	7-aminoflunitrazepam 284.10>135.10	
├ Product Ion Scan	10	+	7-aminoflunitrazepam 100.00 > 50.00:290.00	

An Example Method for Performing an MRM-Triggered Product Ion Scan

UF Technologies Combine Sensitivity and High Speed

The LCMS-8050 combines the following technologies to ensure highly sensitive, high-speed performance:

[UFsensitivity] achieves high-sensitivity performance utilizing a new heated ESI probe and new UFsweeper III collision cell.
[UFswitching] high-speed positive/negative ionization switching and high-speed MRM [UF-MRM] maintain data quality and sensitivity.
[UFscanning] high-speed scan rate obtains high-quality mass spectra, even during high-speed analysis.

Heated ESI Probe NEW

High-temperature gas supplements the nebulizer gas, improving desolvation efficiency. This facilitates the ionization of a wide range of compounds.

Ionization Unit NEW

Designed without cables or tubes; utilize a one-touch lever to perform simple attachment and detachment of the unit.

Ultrafast Response High-Voltage Power Supply for Polarity Switching

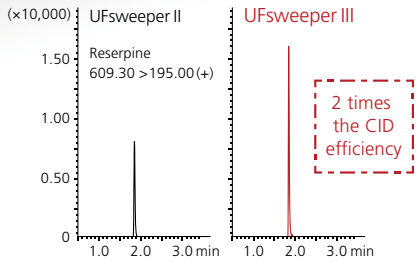
Qarray™

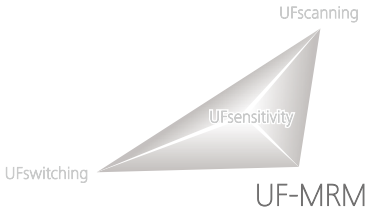
Patented Qarray ion guide is designed to effectively focus ions over a wide *m/z* range by overlapping multiple electric fields.

DL (Desolvation Line)

UFsweeper III Collision Cell NEW

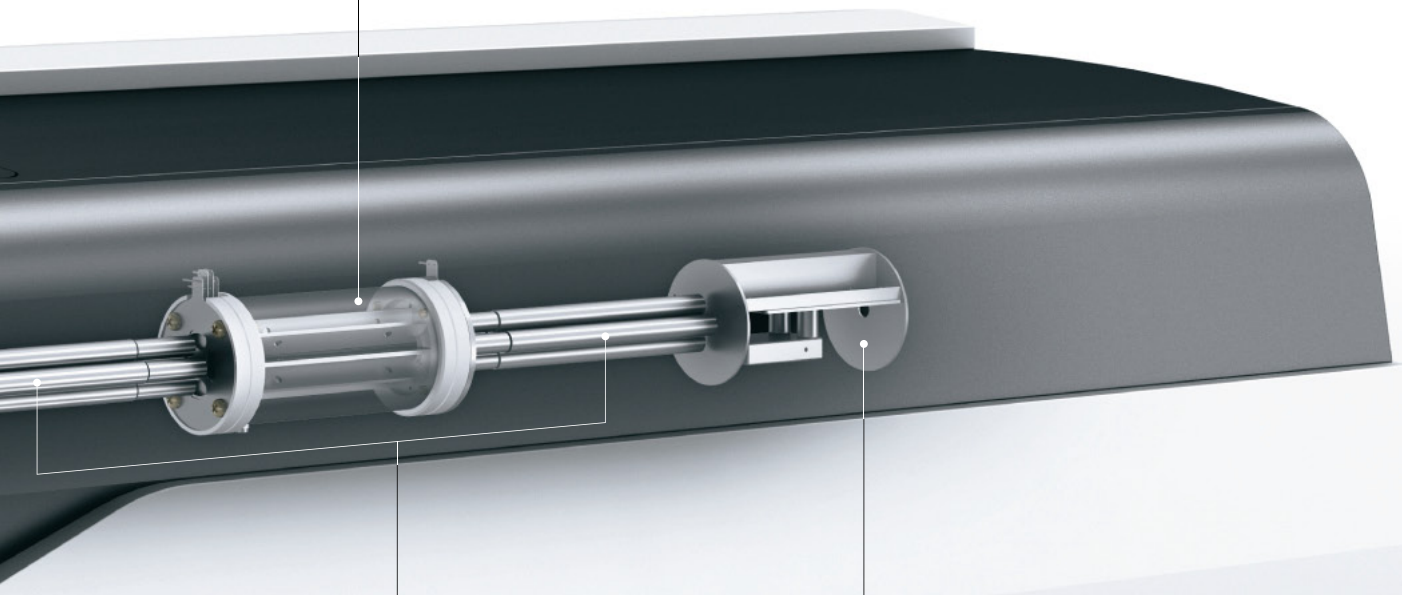
A high-sensitivity, high-speed collision cell, the proprietary UFsweeper III accelerates ions out of the collision cell without loss of momentum. Achieving fast sweeping on successive scans, it offers twice the CID efficiency of UFsweeper II, maintains signal intensity, and suppresses crosstalk, even for high-speed or simultaneous multi-component analysis.





UF-MRM

UFsweeper III high-speed ion transport technology minimizes ion loss even at a dwell time of 0.8 msec. High-speed MRM transitions up to 555 MRMs/sec accelerate laboratory throughput for simultaneous multi-component analyses.



Ultrafast Response Detector

The ultrafast high-voltage power supply allows high-speed positive/negative ion mode switching of the detector voltage.

Quadrupole Rod

A high-performance hyperbolic mass filter with a proven track record in LC/MS, it maintains high ion transmittance and high sensitivity, even at a high-speed scanning rate of 30,000 u/sec.

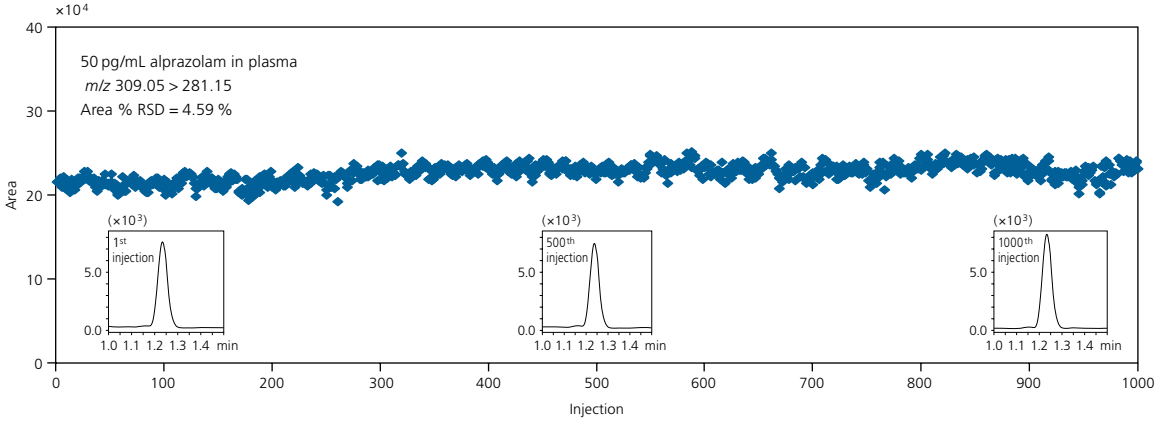
UF-Lens™

Combines two multi-pole RF ion guides to achieve efficient ion transport and high sensitivity.

Engineered for Robustness and Easy Operation/Maintenance

Maintains High Sensitivity Even During Successive Demanding Analyses

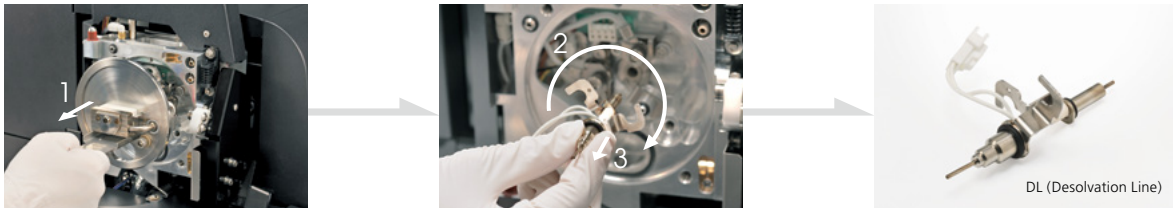
In addition to speed and sensitivity, Shimadzu designed the LCMS-8050 for robustness to meet the most demanding laboratory requirements and most difficult matrices. The figure below plots the area results from 1000 consecutive analyses of a deproteinized blood plasma sample spiked with alprazolam. The LCMS-8050 achieves excellent reproducibility with a 4.59 % RSD for the area results over the 1000 analyses.



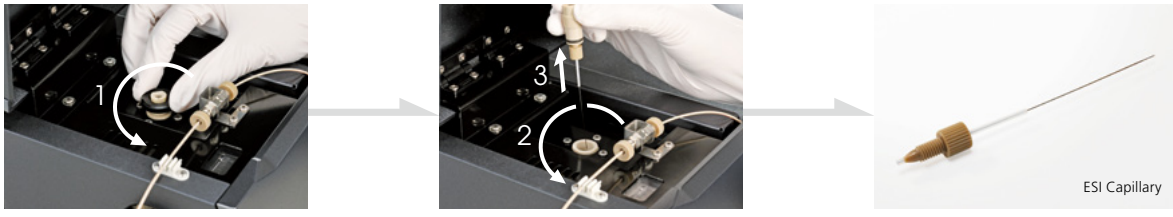
Easy System Maintenance Reduces Downtime

As with Shimadzu's other triple quad systems, maintaining the LCMS-8050 is simple. Replacing the desolvation line (DL) and ESI capillary is quick and easy. Additionally, the design allows users to replace the DL without breaking vacuum, providing greater uptime and usability.

● Steps for DL Replacement

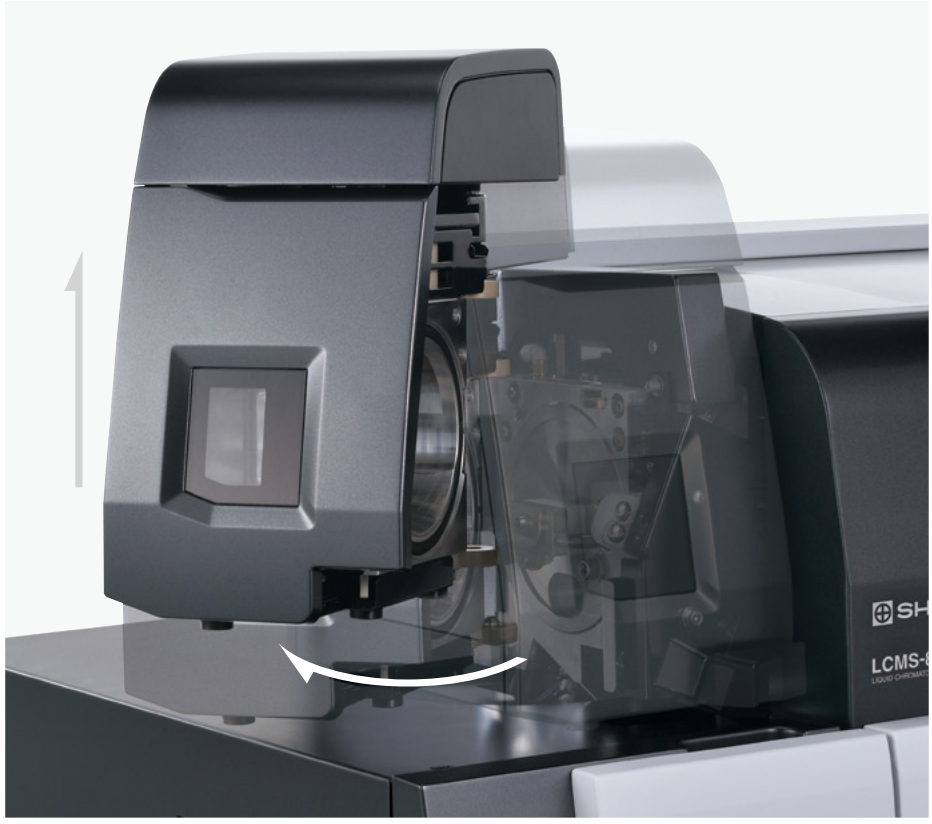


● Steps for ESI Capillary Replacement



Newly Designed Ionization Unit

Designed without cables or tubes, removing the new ionization unit is simple: release a one-touch lever to open the unit and lift it out. In addition, no tools are needed to detach the needles fitted in APCI and DUIS units, allowing for easy maintenance.



ESI-8050 (standard)

APCI-8050 (optional)

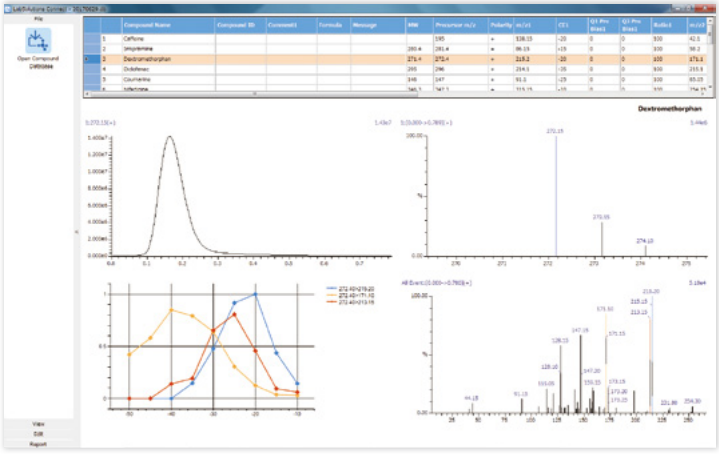
DUIS™-8050 (optional)

Smart Software for Anyone Doing LC-MS/MS LabSolutions Connect™

LabSolutions Connect is the smart way to work for all routine laboratories. Simplifying workflows to run samples on the LC-MS/MS with tools to help MRM optimization.

Get Better Results

Laboratories with the need for expanding target compound panels or building up new methods also need to consider how to get the highest sensitivity without manual compound optimization. The automated MRM optimization tool, which is part of the LabSolutions Connect platform, delivers MRM transitions for quantitation and for MRM Spectrum for library searchable identification.

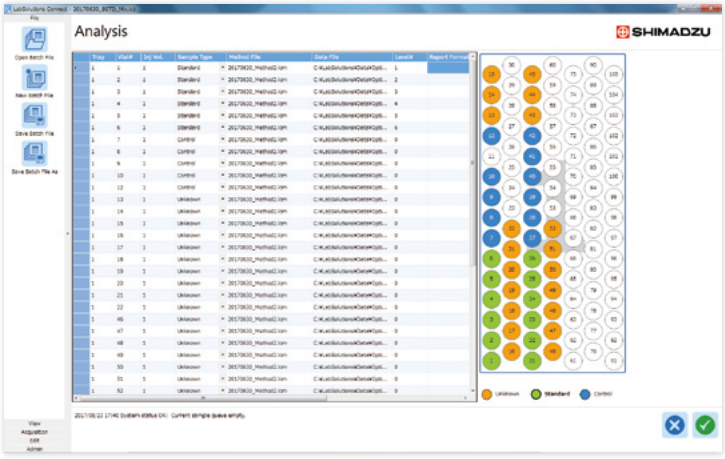


MRM Data Review

A simple graphical interface showing the collision energy profiles for multiple product ions

Tablet-like UI for Sample Analysis

In routine laboratories, the sample to result cycle time defines efficiency and productivity. To help reduce the sample to result cycle time and open LC-MS/MS technology to everyone the user experience has been redefined making running samples easy. LabSolutions Connect is designed with an intuitive layout to show the sample list as a simple table and the position of the sample in the autosampler tray.



Designed for Everyone in The Lab

By redesigning the user experience, analytical scientists across multiple disciplines can run sample lists, check the sample vials are in the right position and see the status of the instrument in one smart layout.

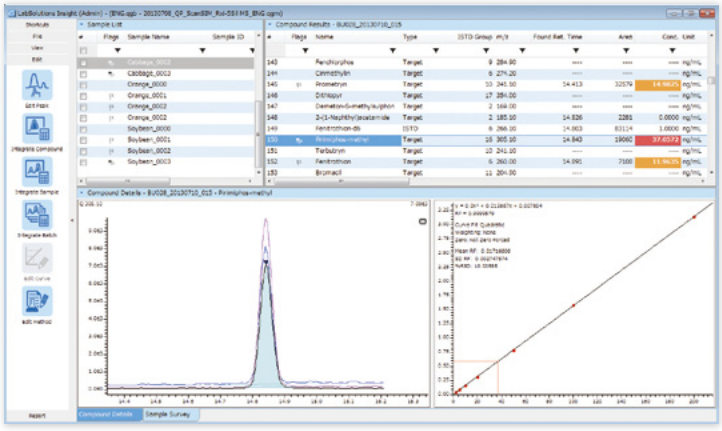
Its simple, intuitive and streamlines workflows in any laboratory environment.

LabSolutions Insight™
Rethinking Quantitative Data Review

LabSolutions Insight has powerful data mining and analytics capabilities for reviewing LC-MS/MS results. It is designed to support review-by-exception enabling quality rules to identify exceptions quickly. LabSolutions Insight now has the added capability to work seamlessly with the LabSolutions DB/CS environment and audited regulatory requirements, it also has the flexibility to adapt to different reporting workflows with multiple results files.
The new Insight software also supports library identification by either full scan or MRM spectrum mode helping to provide tools for both quantitation and identification in one workspace.

Brings A New Way to Review Actionable Data

LabSolutions Insight enables quantitative data to be reviewed in different ways, each connected workspace environment helps to check peak integration, find outliers, show chart trends and calibration curve data. Visualizing data, finding specific information, sorting actionable data is made easy by applying filters to each field in the table.



LabSolutions Insight

Finds actionable data faster.

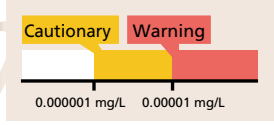
LabSolutions Insight has a panel of quality rules that can be set-up to find outliers at the touch of a single click. Outliers are color coded and can be easily visualized, sorted and reported.

Survey Panel View to Quickly Review Actionable Data

Checking and reviewing individual data files can have a marked impact on laboratory productivity. Survey mode helps to change productivity by simply visualizing positive samples, outliers or simply to check data quality. As Insight uses dock-able pane technology, the survey mode screen can be shared on multiple monitors helping to improve productivity and data quality review for large panels of target compounds.

Sample Survey View

Color-coded flags

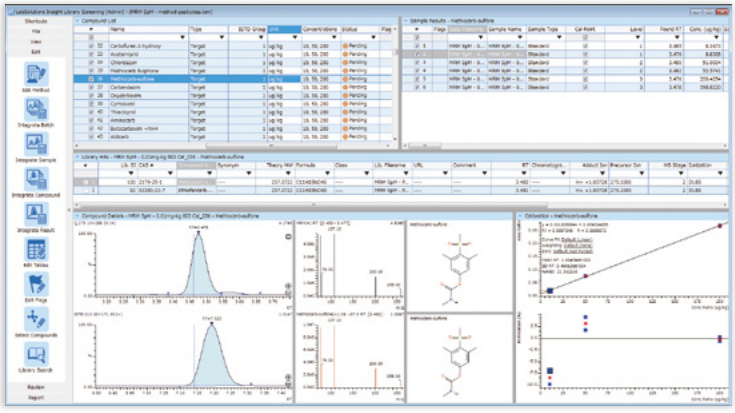


Color Coded Review

By supporting a range of quality rules, samples can be flagged if the concentration is considered cautionary or as a warning. But the possibilities can be focused to specific needs highlighting retention time variation, ion ratio tolerance outside a set range, calibration curve regression outside an expected range. The list of quality rules helps to find actionable data quickly.

Compound Identification
LabSolutions Insight Library Screening

LabSolutions Insight offers MS/MS library search capabilities. Instrument parameters and MS/MS library spectra are available to deliver faster data acquisition, higher data quality, and enhanced identification. Shimadzu's LabSolutions Insight software offers easy viewing of the compounds of interest, including structural information, retention time and library similarity score. LabSolutions also enables you to produce high-quality results without the need to define a threshold value to trigger a spectrum, decreasing the chance of false negative reporting. This feature, MRM Spectrum Mode, acquires all compound fragments of interest in MRM mode and can be used to create accurate spectra from even trace concentrations.



Example of the screening of veterinary drugs using MRM spectrum mode

In MRM Spectrum Mode, known compound fragments are selectively acquired using multiple MRM channels, enhancing signal for low abundance analytes. Shimadzu's ultra-fast quadrupole technology makes this a practical approach for large panels of analytes.

■ LC/MS/MS Method Packages and MRM Libraries

Shimadzu offers a wide variety of method packages containing LC separation conditions and a number of predetermined MRM conditions. Laboratories can bypass time-consuming method development steps and realize results sooner.

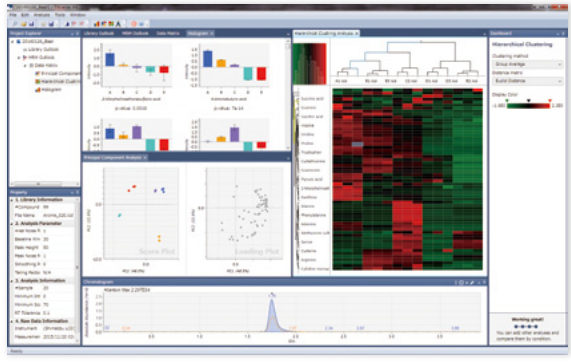
	Description	Flyer code	Description	Flyer code
Method Packages	Residual Pesticides	C146-E348	Cell Culture Profiling	C146-E279
	Veterinary Drugs	C146-E161	D/L Amino Acids	C146-E336
	Water Quality Analysis	C146-E180	Short Chain Fatty Acids	C146-E355
	Rapid Toxicology Screening	C146-E224	Mycotoxins	C146-E351
	Primary Metabolites	C146-E227	Aminoglycoside Antibiotics	C146-E352
	Lipid Mediators	C146-E225		
MRM Libraries	Metabolic Enzymes in Yeast	C146-E275	Phospholipid Profiling	C146-E314

Note: Check your local sales office to learn which packages are compatible with each LCMS model.

■ Traverse MS™

Multivariate Analysis Software

Traverse MS data analysis software enables mutivariate analysis of high complexity data in the field of metabolomics. Both Shimadzu GCMS and LCMS MRM data can be analyzed to align, identify, and quantitate component peaks. Large sample sets can be displayed graphically, statistical analysis can be performed, and metabolite pathways can be mapped.



* Traverse MS is provided by Reifycs Inc.

Nexera UHPLC

Our unique approach to delivering high-quality, high-speed LC/MS/MS analysis is combining the Nexera UHPLC and LCMS-8050 as a seamlessly integrated system.

Key elements of Nexera and LCMS-8050 performance to maximize your productivity

Nexera

- The fastest gradient cycle and sample injection time
- Eliminates carryover even with high-sensitivity LC/MS/MS
- Solvent blending, and sample handling are possible

LCMS-8050

- 0.8 msec dwell time and 1 msec pause time
- 5 msec polarity switching speed
- No signal loss even at lower dwell time by UFsweeper technology

Nexera X2

Brochure: C196-E079

Nexera XR

Brochure: C196-E082

Nexera MP

Brochure: C193-E030

Nexera-i

Brochure: C196-E084

Nexera UC
On-line SFE-SFC-MS System

This revolutionary system combines on-line SFE and SFC in a single flow path. Target compounds are extracted from solid samples and then automatically transferred to SFC/MS so that no human intervention is required. The Nexera UC on-line SFE-SFC system reduces the time for pretreatment of samples and acquires highly accurate data.

Brochure: C190-E185

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