C146-E121

Access to your success
SHIMADZU

LCMS-2020

Shimadzu
Liquid Chromatograph Mass Spectrometer

Seeing is Believing.

LCMS-2020

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Liquid Chromatograph Mass Spectrometer

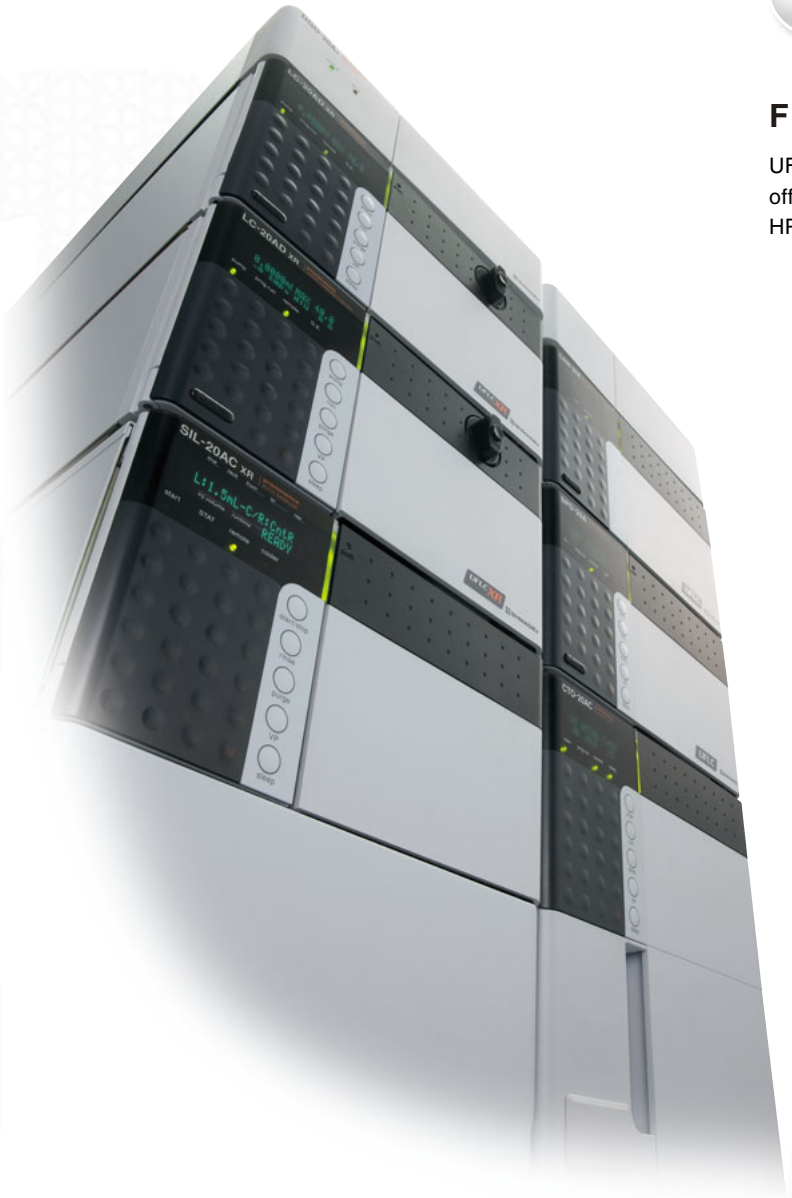
Seeing is Believing.

Building an LC/MS system that employs an MS as an LC detector can effectively reduce the limitations of LC analysis. In addition to this, reducing those limitations to the greatest extent possible requires an MS that can handle ultra high speed analysis.
The new "LCMS-2020" single quadrupole ultra-fast LC/MS, boldly addresses these requirements. It is capable of providing more data points and faster scans than any previous quadrupole LCMS instrument, allowing it to handle the fastest small-particle and high efficiency columns.

Contents

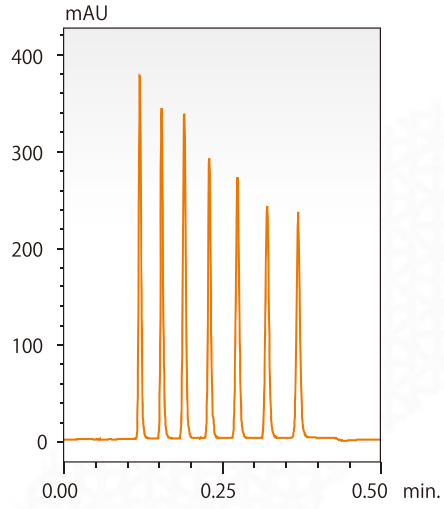
UFLC Quality

From HPLC to UFLC. Then to UFLC/MS.



From HPLC to UFLC.

UFLC achieves excellent speed and resolution, while offering the high precision not available with conventional HPLC and expandability options.



Ultra Fast
Not only high-speed analysis, but increased overall speed through rapid sample injection and fully automatic analysis functions.

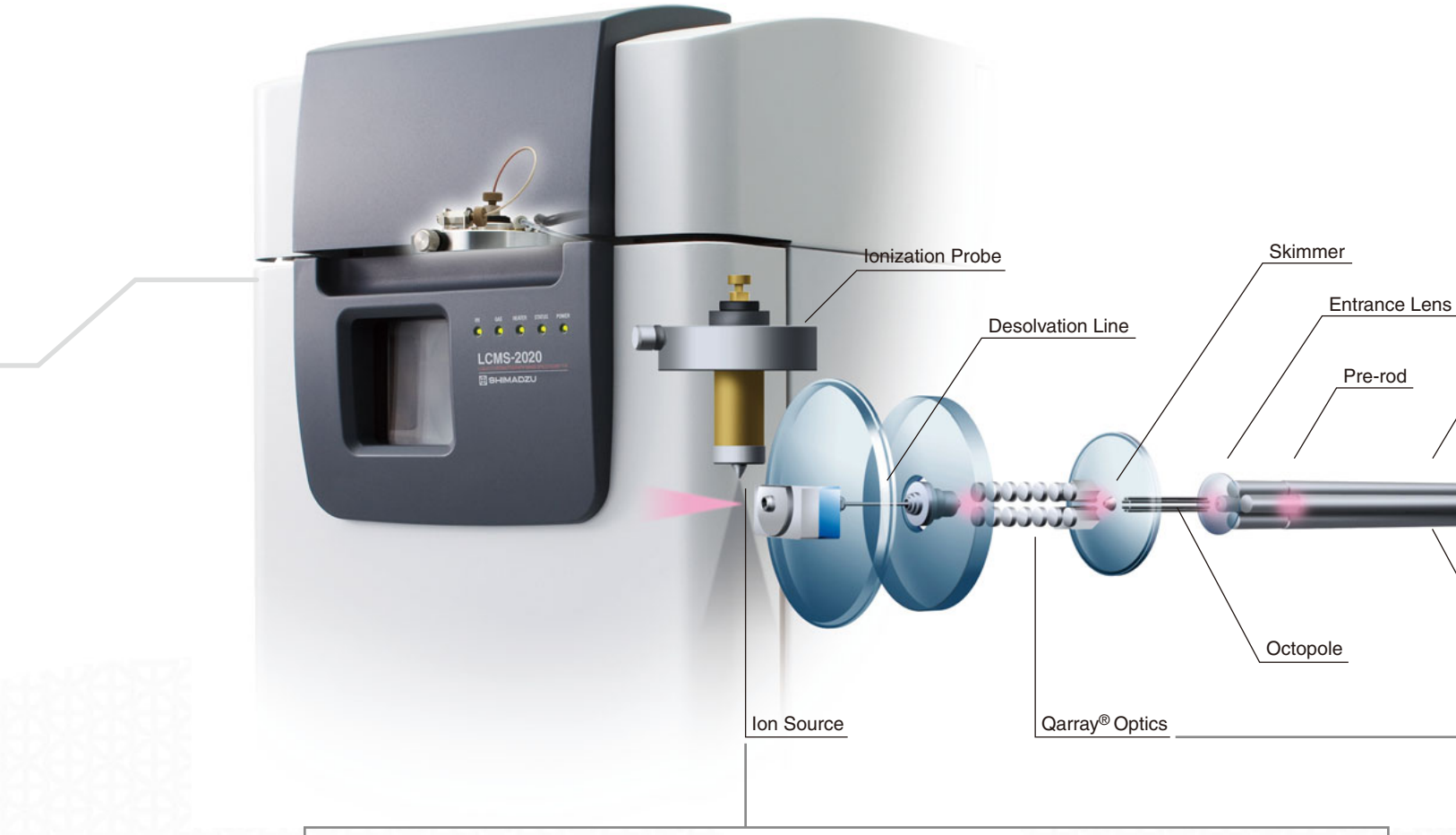
Unquestionable Fidelity
UFLC offers exceptional injection reproducibility as well as ultra high-speed operation.
In terms of minimizing sample carryover, essential in LC/MS analysis, the LCMS-2020 stays ahead of the competition.

Ultra Flexible
Covers an extensive range from ultra-fast analysis to conventional HPLC and semi-preparative analysis.

Ultra Fast - UFscanning, UFswitching, and UF

Speed is Power

Greater speed. Greater sensitivity.

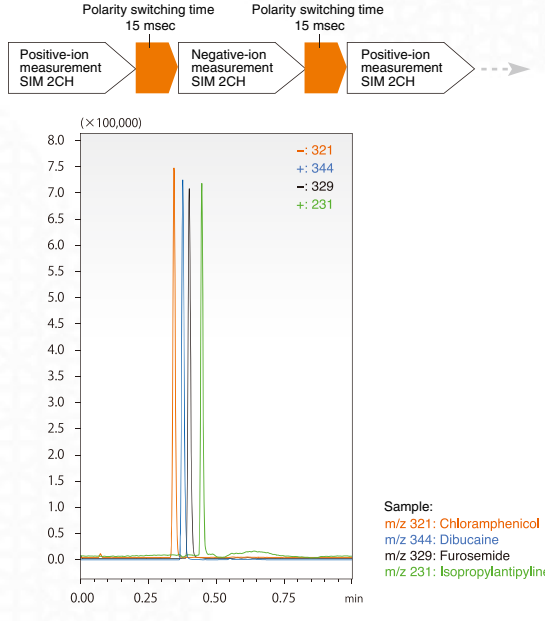


Ultra-fast

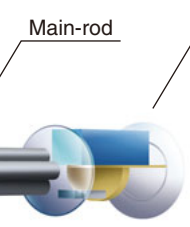
UFswitching

Rapid 15-millisecond positive/negative ionization switching

To detect both positive and negative ions, analysis is performed while switching between the positive and negative ionization modes.
The LCMS-2020 adopts a high-voltage power supply featuring novel technology (patent pending) to achieve an ultra-fast polarity switching time of just 15 ms.



Accurate mass analysis of sharp chromatographic peaks obtained by UFLC requires ultra-fast MS detection capabilities.
The LCMS-2020 offers UFswitching for rapid switching between the positive and negative ionization modes and UFscanning for ultra-fast scan measurements to capture the sharpest UFLC peaks.



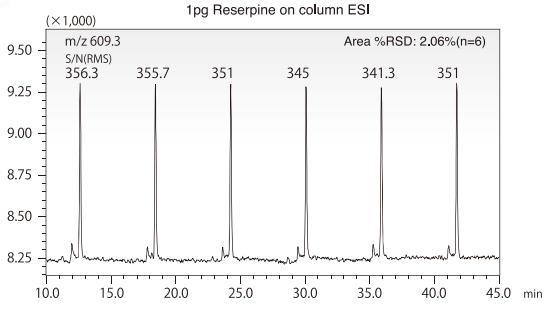
Enhances sensitivity by preventing ion divergence

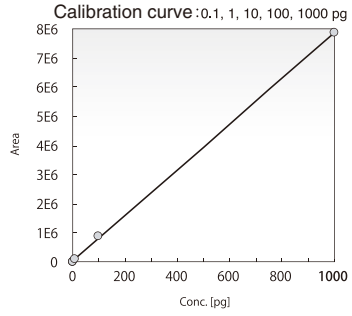
Ultra-fast

UFsensitivity

Superior sensitivity from UFLC

The newly developed Qarray® Optics achieves superior sensitivity, reproducibility, and linearity.





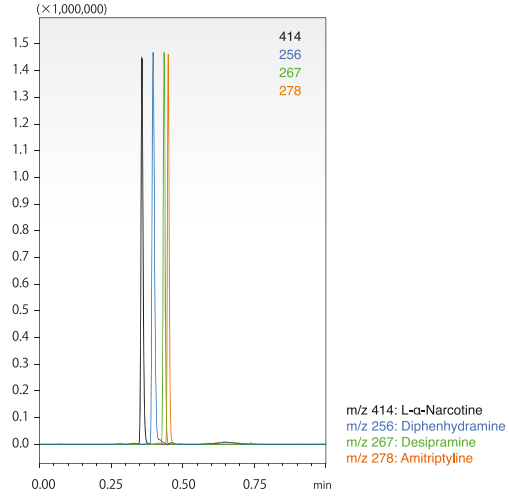
pg	Area
0.1	802.5
1	7743.5
10	84799.7
100	891423.7
1000	7864342.1

Ultra-fast

UFscanning

15,000 u/sec fast scanning speed

Controls the voltage applied to the Quadrupole according to the scan speed and m/z.
This new technology (patent pending) maintains resolution and achieves high ion transmittance even at high scanning speeds.

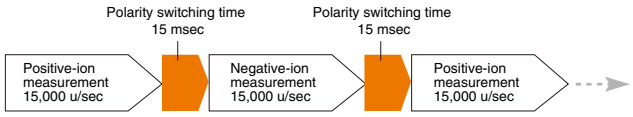


sensitivity

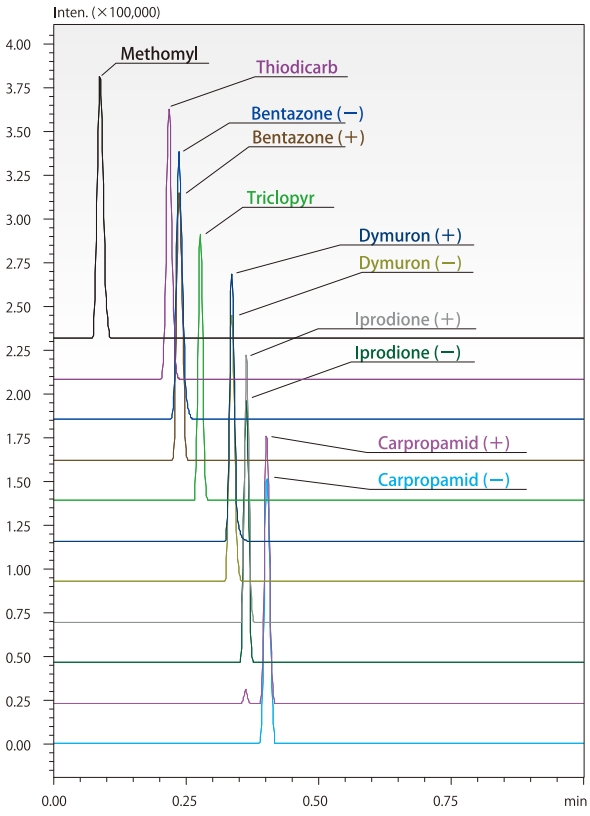
UFscanning & UFswitching

Necessity of UFswitching and UFscanning for ultra-fast analysis

Ultra-fast detection (MS measurement) is required for ultra-fast analysis with elution of six components per minute, for example. The UFswitching and UFscanning functions permit the required ultra-fast mass spectrometry.

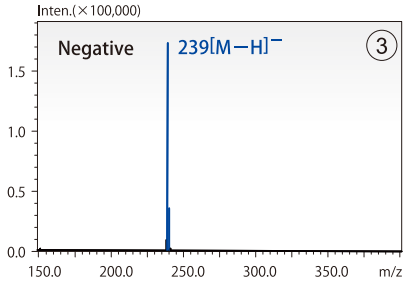


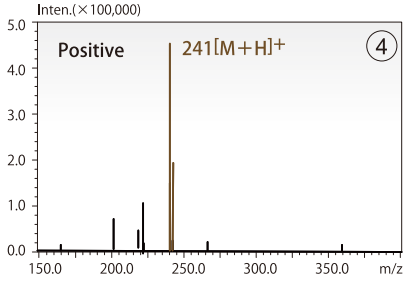
Sample : Polarity	
① Methomyl	: m/z 163 (+)
② Thiodicarb	: m/z 355 (+)
③ Bentazone	: m/z 239 (−)
④ Bentazone	: m/z 241 (+)
⑤ Triclopyr	: m/z 256 (−)
⑥ Dymuron	: m/z 269 (+)
⑦ Dymuron	: m/z 313 (−)
⑧ Iprodione	: m/z 330 (+)
⑨ Iprodione	: m/z 243 (−)
⑩ Carpropamid	: m/z 334 (+)
⑪ Carpropamid	: m/z 378 (−)



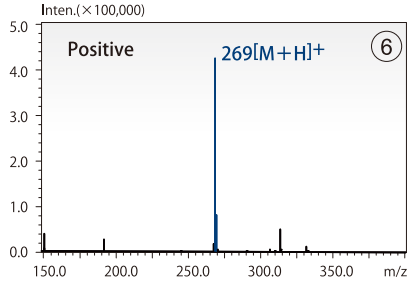
Examples of ionization in positive and negative modes

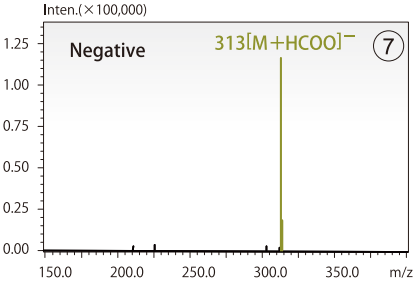
MS Spectra of Bentazone



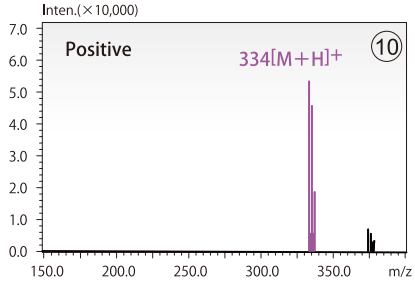


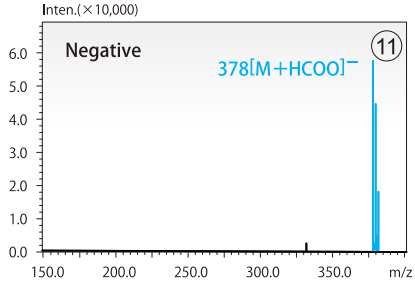
MS Spectra of Dymuron





MS Spectra of Carpropamid

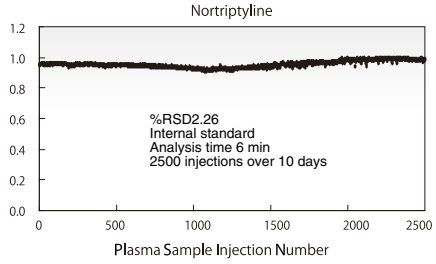




Hardware Features that to Powerfully Support Three UFs

Toughness against dirty samples

In order to check the toughness of the LCMS-2020 against dirty samples, plasma samples simply precipitated with only acetonitrile were injected 2,500 times over 10 days (1μL volume per injection). Excellent reproducibility of peak area was demonstrated and its RSD was 2.26%.



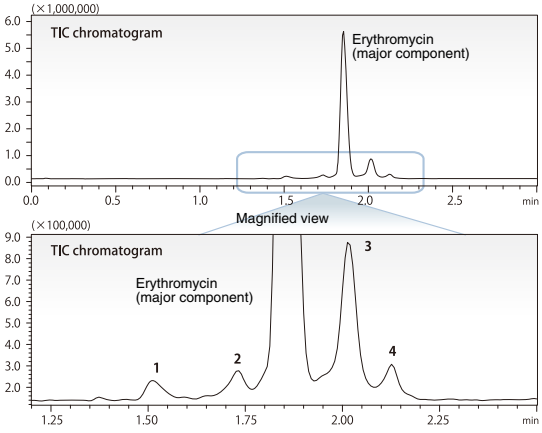
Easy Maintenance

The desolvation line (DL) that introduces the sample from the ion source into the vacuum can be installed and uninstalled without breaking the vacuum, which dramatically enhances ease-of-maintenance.

Creating Fragment Ions by In-source CID

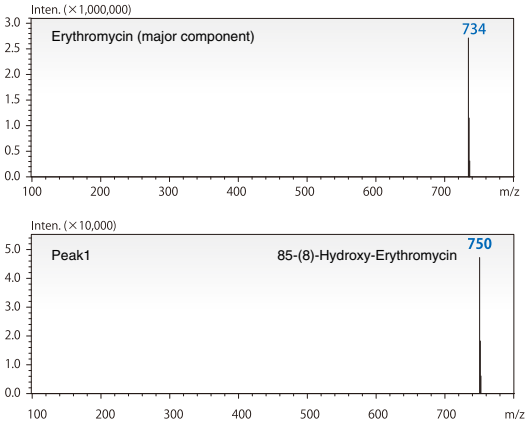
In-source CID (collision-induced dissociation) is effective for confirming the molecular weight of synthetic compounds and for the quantification of impurities.

MS Chromatogram for Erythromycin Measurements DL=0V, Qarray DC=0V

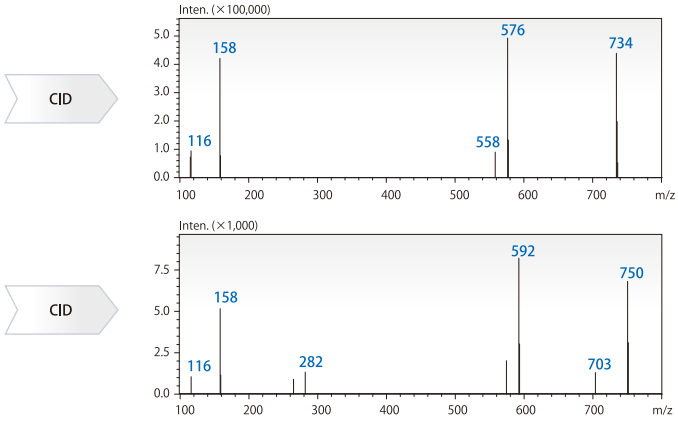


Using in-source CID allows the generation of fragment ions. This example shows the composition of impurities in erythromycin estimated from fragment ions generated by in-source CID.
The multi-sequence mode permits several other methods within a single analysis, such as CID, positive/negative ion switching modes, and SCAN/SIM modes.
Precisely setting the parameters reduces the risk of erroneous evaluations and enhances the reliability of analysis results.

MS Spectra (Normal mode) DL=0V, Qarray DC=0V



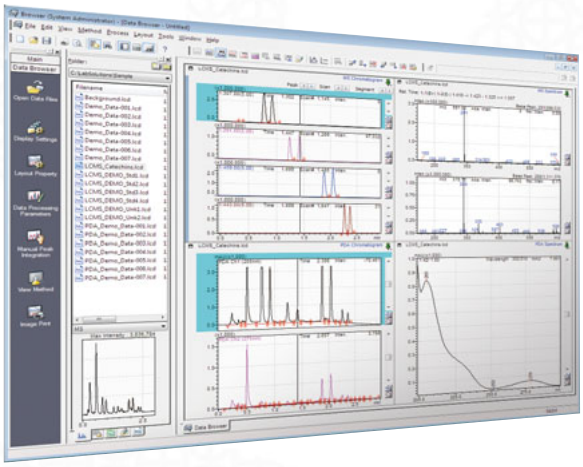
MS Spectra (In-source CID mode) DL=0V, Qarray DC=60V



LabSolutions

LCMSsolution Ver.5 for LCMS-2020

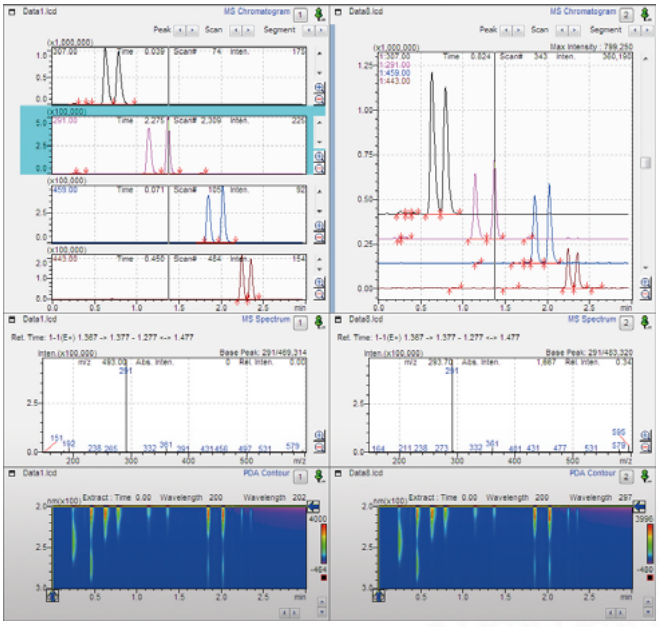
Powerful support for UFLC/LCMS-2020 high-speed performance.
This software maximizes analysis performance.



Rapidly analyzes huge volumes of data in browser windows. The comprehensive, clear display provides a stress-free working environment.

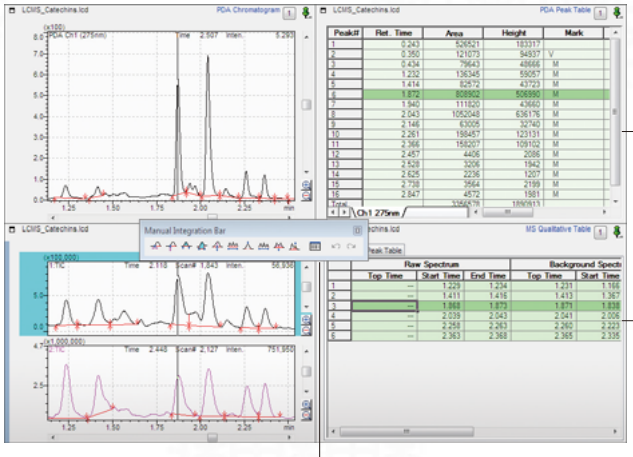
Comparison of Control and Target

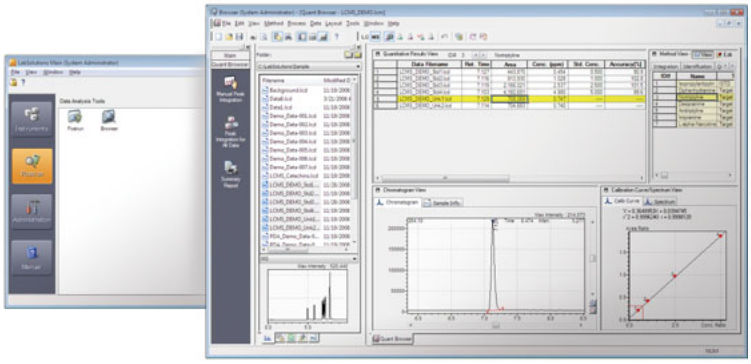
Multiple data items are displayed sequentially on the same screen. To view the diverse information in a data file in the optimal layout for comparison, the data can be browsed like flipping through the pages of a book to discover differences between the data.



Peak Integration

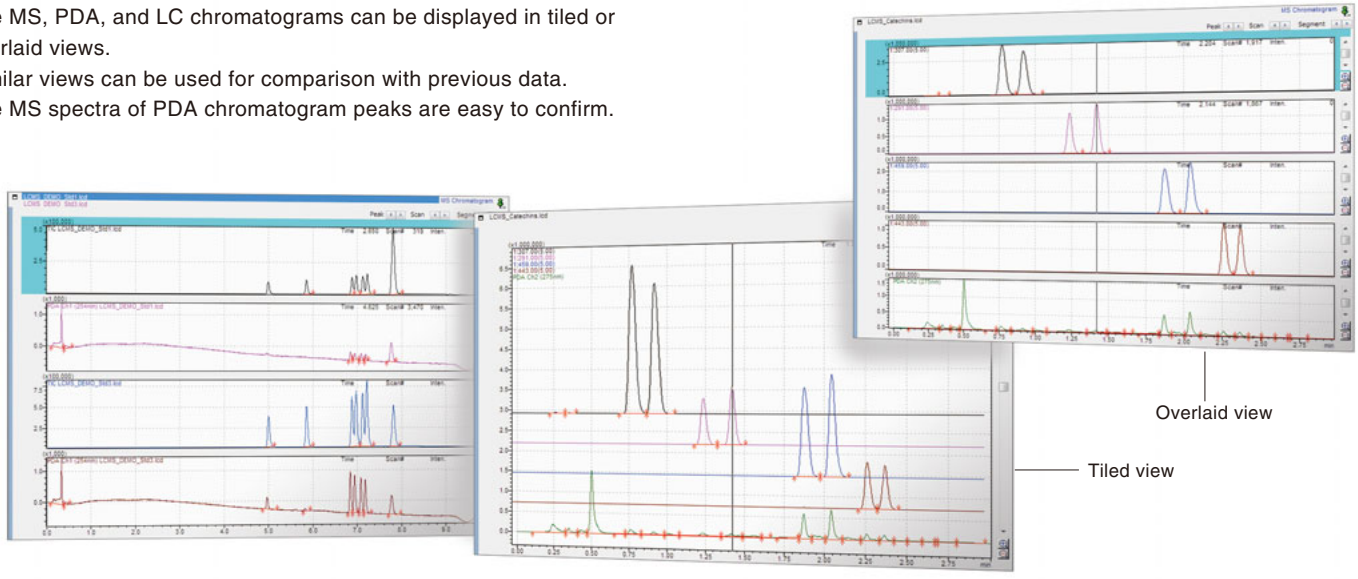
Manual peak integration can be conducted on both LC and MS chromatograms simultaneously. Both the peak table and MS spectrum table are displayed. The peak table and chromatograms/spectra are interlinked for easier operation.





Comparing MS, PDA, and LC Data

The MS, PDA, and LC chromatograms can be displayed in tiled or overlaid views.
Similar views can be used for comparison with previous data.
The MS spectra of PDA chromatogram peaks are easy to confirm.



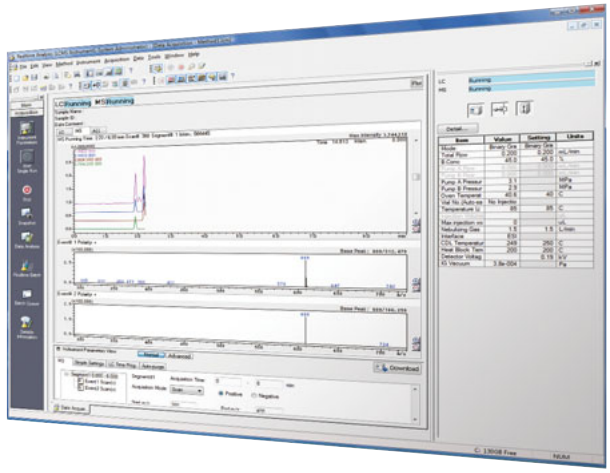
Flexible Report Formats

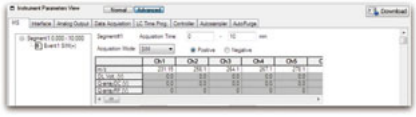
Enhanced layout customization for reports.
Even easier and more convenient.

LCMSsolution Ver.5 for LCMS-2020

Optimization of Analysis Parameters

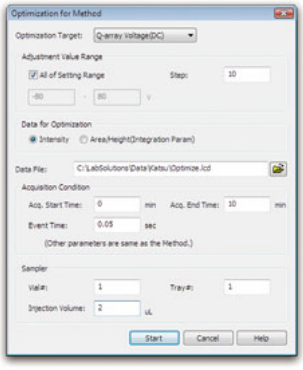
Automatically searches and sets the voltages that affect the ion transmittance (DL/Qarray voltage) to the optimal values for the target compounds.





SIM Table

Enter the target m/z

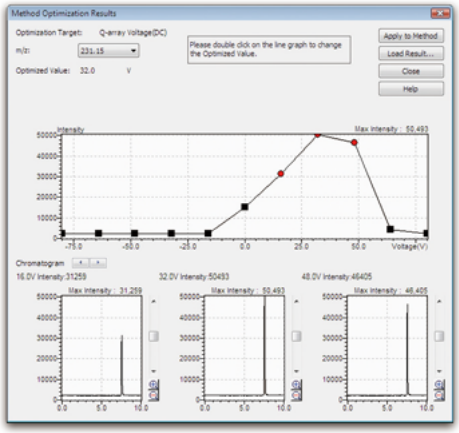


Method Optimization Window

Specify the conditions to search for the optimal voltage

↓

Automatic analysis execution



Method Optimization Result Window

The Search results of the optimal voltage value are displayed

SIM Table

The optimal voltage value is set into the SIM table automatically

Analytical conditions are optimized

Diverse Ionization Methods Expand the Range of Applications

Selecting the ionization method appropriate for the target compound achieves superior analysis results.

LCMS-2020 offers APCI and DUIS in addition to ESI. Diverse ionization methods support a wide range of applications.

Selecting the most appropriate Ionization Method

		ESI	APCI	DUIS
Compounds	DNA	B	—	B
	Proteins	A	—	B
	Peptides	A	—	B
	Amino acids	B	—	B
	Macromolecules	B	C	B
	Carbohydrates	B	A	A
	Triglycerides	B	A	A
	Aromatic hydrocarbons	C	C	C
	Aliphatic hydrocarbons	—	C	C

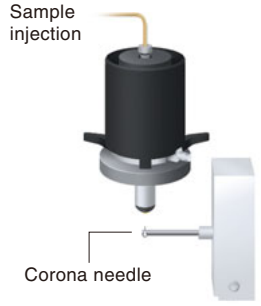
		ESI	APCI	DUIS
Properties	Polar	A	B	A
	Non-polar	—	B	B
	Volatile	A	A	A
	Non-volatile	A	—	A
	Thermostable	A	A	A
	Thermolabile	A	—	C

		ESI	APCI	DUIS
Functional groups	Acid	A	B	A
	Alcohol	C	B	B
	Aldehyde	C	B	B
	Alkane	—	C	C
	Alkyne	—	B	B
	Amino	A	A	A
	Carbonyl	C	B	B
	Ester	B	A	A
	Ether	C	B	B
	Phenol	B	A	A

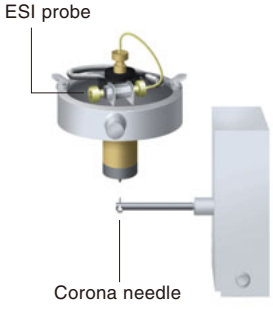
A	Extremely suitable
B	Suitable
C	Analysis possible with appropriate parameters
—	Inherently unsuitable

Ionization Options

APCI-2020

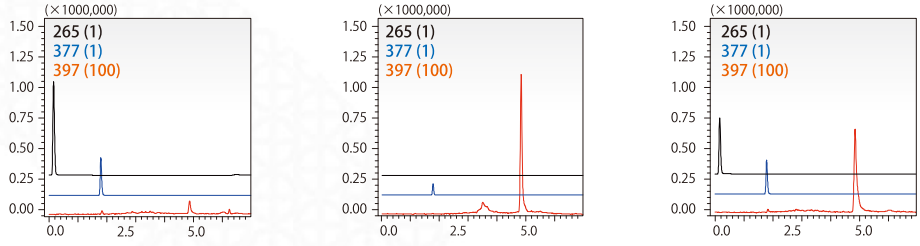


DUIS-2020

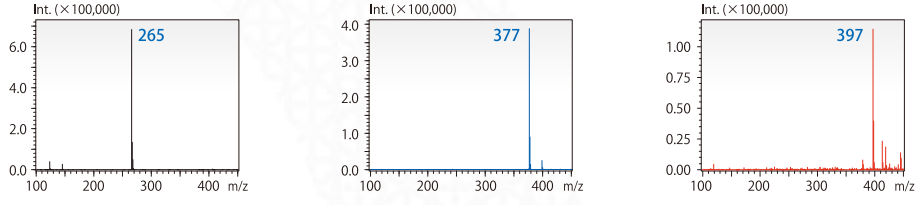


While the water-soluble vitamins thiamine and riboflavin can be detected by ESI, they are virtually undetectable by APCI. Conversely, the fat-soluble vitamin calciferol can be detected by APCI but ESI does not offer adequate detection sensitivity.
DUIS-2020 allows detection of a mixture of compounds suited to ESI or APCI, without missing any compounds.

MS Chromatograms



MS Spectra from DUIS Measurements



Mixed Sample of Three Water-soluble/Fat-soluble Vitamins
1. Thiamine: m/z 265; cation, generated by ionization, water-soluble vitamin
2. Riboflavin: m/z 377; protonated molecule, water-soluble vitamin
3. Calciferol: m/z 397; protonated molecule, fat-soluble vitamin

JQA-0376

Founded in 1875, Shimadzu Corporation, a leader in the development of advanced technologies, has a distinguished history of innovation built on the foundation of contributing to society through science and technology. We maintain a global network of sales, service, technical support and applications centers on six continents, and have established long-term relationships with a host of highly trained distributors located in over 100 countries. For information about Shimadzu, and to contact your local office, please visit our Web site at **www.shimadzu.com**

SHIMADZU

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Printed in Japan 3295-10809-30ANS