Are you?

- Analyzing dioxins and related compounds?
- Required to satisfy regulatory requirements?
- Looking for sensitivity, selectivity and dynamic range?

The AutoSpec Premier™ is the latest development in magnetic sector instrumentation from Waters. It incorporates the Waters® Micromass® unique tri-sector (EBE), double-focusing geometry with the wide gap magnet of the proven Ultima NT system, providing a unique combination of high sensitivity, high resolution and low background noise. The AutoSpec Premier is the optimal choice for ultra low-level trace detection applications, such as monitoring for dioxins and related compounds like Polychlorinated Biphenyls (PCB's) and Polybrominated Diphenyl Ethers (PBDE's), or drugs of abuse, by high resolution/ selected ion recording (HR/SIR) gas chromatography/mass spectrometry (GC/MS).

Waters Micromass AutoSpec Premier.

AutoSpec Premier New Technology

The AutoSpec Premier has a dual GC interface to allow the use of two GC injectors with two GC columns installed for alternate or dual simultaneous injection. The pumping configuration and capacity allows change of the GC column without venting the instrument, reducing instrument downtime and increasing productivity. The dual GC interface of the AutoSpec Premier enables direct line-of-sight GC column installation into the source region, as well as giving an improved thermal variation profile.

Electronics development has enhanced the precision with which the accelerating voltage can be set during voltage selected ion recording (VSIR). This ultimately improves mass precision, which can lead to superior data quality, especially in circumstances where a background peak is close to the analytical mass.

A cold reference probe is included with the system enabling liquid introduction at room temperature. This gives superior lock mass stability over an extended time period, as well as increased functionality; the result is the ability to immediately switch between course and fine control to satisfy calibration and sample analysis requirements.

EBE Geometry

The AutoSpec Premier incorporates unique tri-sector (EBE geometry) ion optics, designed to give maximum sensitivity in all modes at both high and low resolution.

The EBE design has one electric sector positioned before and one after the magnetic sector. The first electric sector has demagnifying optics to give a high dispersion to magnification ratio, allowing high resolutions to be obtained with a wider source slit and higher sensitivity. The mass resolution is continuously variable to 80,000 (10% valley definition). The second electric sector reduces background noise, improves abundance sensitivity and automatically rejects metastable ion interferences.

Premier Magnet

The AutoSpec Premier magnet is fully laminated utilizing grain orientated rolled steel sheet with high permeability and low hysteresis. The extra-wide gap magnet design allows use of a wider flight tube, giving higher transmission and reducing susceptibility to contamination. The patented post-acceleration photomultiplier detection system enables detection of positive or negative ions without switching dynode voltages. This detector has single ion detection capability; and the long-term stability of the photomultiplier gain ensures excellent and reproducible long-term performance.

Ion Optics and Pumping

The ion optics are supported by a pneumatic suspension bench to isolate the analyzer from floor vibrations and maximize instrument performance.

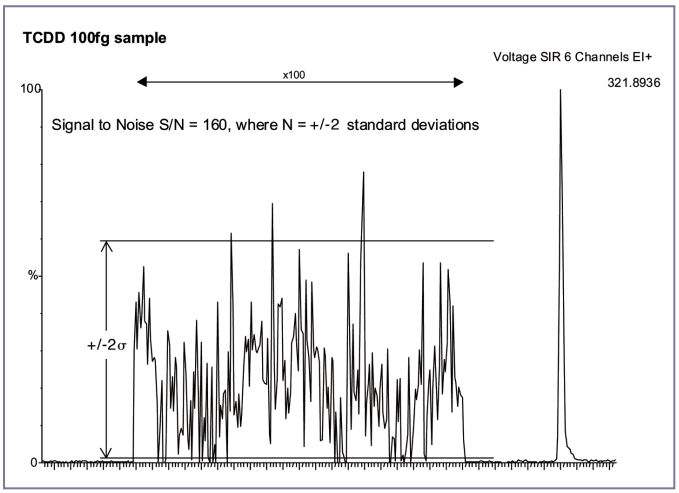
The instrument is pumped with low maintenance, high capacity diffusion pumps (or optional turbomolecular pumps), with the analyzer double differentially pumped to ensure high abundance sensitivity. The vacuum system pumping, monitoring and protection is fully automatic.

Sources and Options

Plug-in ion sources are provided for Electron Impact (EI) and Chemical Ionization (CI), allowing rapid and convenient source change without venting the instrument. GC is most often the sample introduction mode of choice, but it is not necessary to physically remove the GC to utilize the solids probe or Desorption Chemical Ionization probe (DCI).

Sensitivity

To achieve the highest sensitivity, HR/SIR acquisition is used. In this mode, at 10,000 resolution (10% valley definition), an injection of 100 fg of 2,3,7,8-TCDD will give a signal-to-noise ratio at 321.8936 Da of > 125:1 on raw data (no smoothing applied). Noise, in this case, is taken to be equivalent to 4 standard deviations (+/- 2σ). It is important to note that some other protocols for dioxin analysis quote signal-to-noise with the noise defined as 2 standard deviations (+/- 1σ). For this definition of noise, the signal-to-noise value is > 250:1.

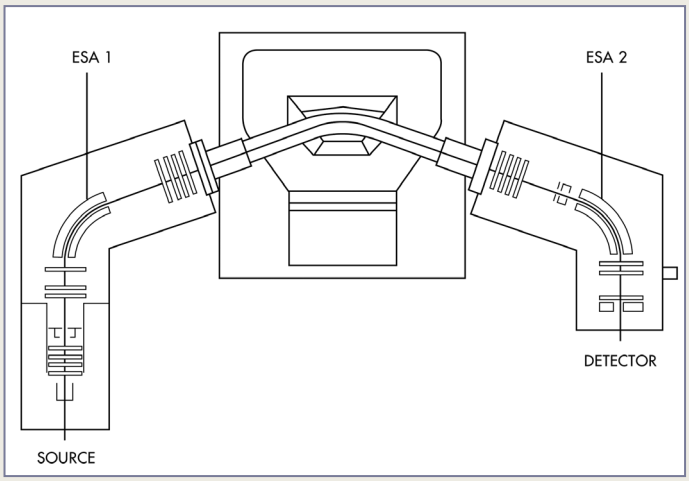


Unmatched HR/SIR sensitivity on raw, unsmoothed data.

Stability

The AutoSpec Premier gives superb stability of response over an extended period of analysis.

This reduces the frequency of tuning and calibration necessary and increases productivity by reducing instrument downtime for routine maintenance.



AutoSpec Premier's patented double-focusing, tri-sector geometry.

Mass accuracy

Masses can be measured accurately to < 2 mDa or < 5 ppm RMS.

Dynamic range

The AutoSpec Premier offers > 5 orders of linear dynamic range enabling quantification over a wide concentration range and analysis of mixtures containing components at high and low concentrations in one analytical run.

Congener	RRF	%RSD
2,3,7,8-TCDF	1.10	5.49
1,2,3,7,8-PeCDF	0.93	4.39
2,3,4,7,8-PeCDF	0.96	3.97
1,2,3,4,7,8-HxCDF	1.07	3.85
1,2,3,6,7,8-HxCDF	1.05	3.13
2,3,4,6,7,8-HxCDF	1.09	4.66
1,2,3,7,8,9-HxCDF	1.15	5.81
1,2,3,4,6,7,8-HpCDF	1.34	3.16
1,2,3,4,7,8,9-HpCDF	1.28	5.43
OCDF	1.23	3.69
2,3,7,8-TCDD	1.07	5.27
1,2,3,7,8-PeCDD	0.95	4.17
1,2,3,4,7,8-HxCDD	1.05	3.02
1,2,3,6,7,8-HxCDD	0.95	4.00
1,2,3,7,8,9-HxCDD	1.11	5.60
1,2,3,4,6,7,8-HpCDD	0.95	3.90
OCDD	0.98	4.40

Percent deviation of the natural dioxin and furan congeners, monitored using an EPA-1613 five function acquisition over 72 hours.

AutoTune

The optimization of instrument tuning is made rapid and easy with the AutoTune facility.
A sophisticated tuning algorithm combined with automated ion optics gives optimum tuning in a matter of minutes. The duration of the AutoTune routine is minimized by 'fast' slits, which have a response time of <0.2 seconds regardless of the positional change; this allows for extremely rapid manipulation of the source and collector slits for optimum resolution and transmission.

Automated resolution verification

Regulatory requirements for some analyses require instrument resolution to be checked at regular intervals. Some US EPA Methods, for example, specify resolution checks every 12 hours during analysis. MassLynx software can automatically check instrument resolution after any sample in the Sample List, and will verify the resolution of all reference peaks in the mass window of the experiment. A hardcopy of these results can be provided, showing the peaks checked and the resolution measured for each. If the resolution of any of the reference peaks is outside user-specified tolerances, the sample list will be halted, preventing the loss of valuable samples.

Acquisition Modes

The following acquisition modes are supported:

- Voltage Selected Ion Recording (VSIR)
- Magnet Scanning
- Voltage Scanning
- B/E Product Ion scanning
- B^2/E Precursor Ion Scanning
- Constant Neutral Loss Scanning
- MIKES
- Multiple Reaction Monitoring (MRM)

Unmatched performance

The AutoSpec Premier gives unmatched performance in a compact footprint—the ultimate in high resolution MS.

With the AutoSpec Premier, you will benefit from:

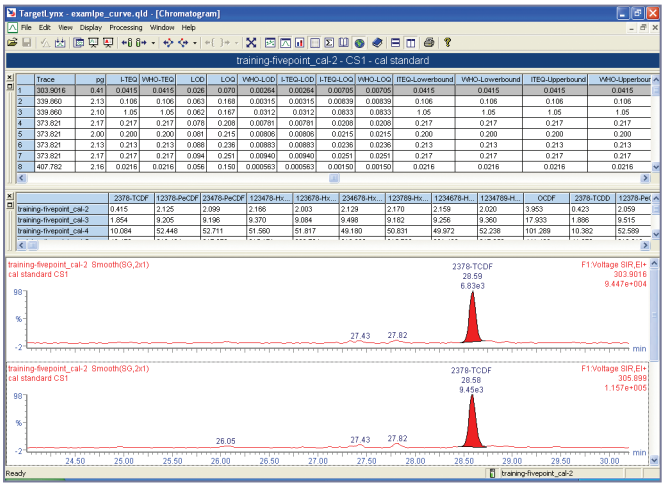
- Full control with MassLynx™ Software in a Microsoft Windows environment
- TargetLynx™ Application Manager included as standard
- Unique tri-sector (EBE) ion optics
- Extra wide gap magnet for higher transmission
- Ultra high resolution > 80,000
- $>10^5$ linear dynamic range
- Constant gain, long-life photomultiplier detection system
- Plug-in EI and CI sources for rapid changeover
- Dual GC Interface, column change without venting instrument
- Low maintenance high capacity diffusion pumps as standard. Optional turbomolecular pumping configurations.
- Integrated GC (Agilent 6890) and autosampler (Agilent 7683, CTC-GCPal and CombiPal) control
- AutoTune and automated resolution checking
- Optional novel split detector for the elucidation of isobaric interferences

Dioxin quantification using TargetLynx™

Over the past decade, regulatory environmental agencies and industry have worked together to dramatically reduce dioxin emissions. The detection and quantification of dioxins is a particularly demanding analysis due to the low level of regulatory exposure limits and the variety of complex sample matrices encountered.

As standard, TargetLynx is an integral part of the core AutoSpec Premier package. TargetLynx supports all of the major dioxin and furan protocols, including Asian, Canadian (EPS 1/RM/19), European (CEN 1948), US EPA Method (1613 and 8290), method 23 and NCASI, along with user-defined protocols. EPA Method 1668 for the quantification of PCBs (Polychlorinated Biphenyls) is also supported.

Dioxin quantification is simplified by the provision of acquisition methods, including GC methods, for standard protocols such as EPA Method 1613. The results from TargetLynx data processing are displayed in the TargetLynx browser to allow for convenient data review and is enhanced with several dioxin-dedicated features. Features include Congener Selection from a pull down list to quickly view congener-specific quantification data and similarly sample select to locate samples from large batches with ease. The browser can be saved as a single results file containing all raw data, peak integration, calibration curves and quantification methods. The result file is complete with an audit log showing all processes, both manual and automatic, performed on a batch of samples or standards. Reports are customizable for printing and the data can also be exported as a text file or in XML format (for transfer to LIMS systems), or the browser file can be emailed allowing remote review of data.



Typical dioxin chromatogram (US EPA 1613) as viewed in the TargetLynx browser.

Worldwide services and support

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- Analytical Instrumentation and Software Services include Total Assurance Plans and Warranties that extend and enhance the original warranty you receive when you buy a Waters product. These plans minimize the level of insurance investment and deliver the value you need to avoid costly and time-consuming system downtime.
- Connections Compliance Services provide you with timely and cost-efficient solutions for your regulatory compliance challenges. You can use Waters Compliance Services to verify proper equipment operation for CGMP/GLP compliance, significantly reducing operating costs.
- Connections University is the center of our Educational Services, providing extensive HPLC and MS training and education at your site, at our corporate headquarters or at our local offices around the world.
- Representatives of Waters Global Customer Assurance Organization, trained and certified in all Waters products and current in LC and MS applications, are available in person, on the phone, via FAX or at www.waters.com to answer questions and provide you with service, support and information.

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