OptiMass

ICP-oTOFMS

Orthogonal Time-Of-Flight
The World's Fastest Simultaneous Benchtop
ICP Mass Spectrometer

ICP-oTOFMS

GBC

ISO 9001

ISO 9001
Quality Accreditation

GBC's
Product
Lines

AAS

HPLC

ICP-OES

UV-Vis

ICP-oTOFMS

XRD

GBC has always placed a strong emphasis on quality in all aspects of our operation, from design and manufacture to the provision of service and support to our customers, and we are fully committed to continuous evaluation and improvement in all areas.

The GBC Quality Management System has been accredited to the ISO 9001 quality standard by Lloyd's Register Quality Assurance Limited. This certification is your assurance that the procedures and processes used to produce the goods and services which GBC provides comply with the relevant International Standard, and demonstrates commitment to meeting the needs and expectations of our customers.

Since 1978 GBC has been at the forefront of scientific technological development, manufacturing and marketing a wide range of award winning, quality scientific instruments.

Visionary Technology

GBC Scientific Equipment will advance people's knowledge and their capacity to enhance the quality of life for all humankind.

GBC

Futuristic Technology

Look into the elements of the new OptiMass ...

With the release of the OptiMass, GBC remains at the forefront in the development and marketing of ICP orthogonal Time-of-Flight Simultaneous Mass Spectrometry.

The OptiMass has an impressive install base which covers both the traditional routine screening and sample analysis through to laser ablation, graphite furnace and HPLC interface applications. In fact, the OptiMass speed of analysis is particularly suited to any fast transient type analysis.

No matter what your Application, the OptiMass will analyse faster, more accurately and more cost effectively than ever before!

The OptiMass acquires all masses simultaneously, analysis time is the same to analyse one mass or all masses.

The OptiMass performs 30,000 acquisitions each second. Each acquisition simultaneously measures every mass and isotope from mass 1 to mass 260 amu. This unique feature represents a major advancement in technology and differentiates the OptiMass from any other ICP Mass Spectrometer.

The OptiMass is packed with lots of great features to give you the technological edge! Now at the lowest price ever!

Low Operating Cost

Whether running a commercial laboratory or a research facility, cost of operation is ALWAYS important. The OptiMass is both faster and consumes less Argon compared to a Quadrupole. When running USEPA method 200.8, a quadrupole ICP-MS requires 180 seconds to analysis 20 elements. The OptiMass, however, requires only 25 seconds to analyse all elements.

Lower Argon Consumption

The OptiMass typically consumes <12 L/min of Argon. When you also factor in the equation that the OptiMass is 10 times faster than a quadrupole, this results in argon consumption being 20 times lower per element compared to using a Quadrupole. That's a lot of money saved!

Continuous Improvement and New OptiMass Models

GBC has always followed a continuous improvement policy. Building on existing products we are able to advance the technology to increase performance and specification.

The OptiMass is now available in two models:

9500 – This model is the workhorse of GBC TOF mass spectrometer range offering proven performance that represents the benchmark in the ICP-TOFMS industry.

9600 – This model builds on the success of the 9500 and provides advanced Octopole Collision Cell (OCC) technology for superior interference management.

Precise Environmental Analysis

Simultaneous determination of trace elements in River Water using ICP-oTOFMS and USEPA 200.8 method

The USEPA 200.8 method has been the standard method for ICP-MS for the determination of waters and waste waters for many years.

Traditionally, this method requires 180 seconds acquisition time per sample for the 20 elements to be analysed. The OptiMass can accurately quantify all ICP-MS measurable elements in 25 seconds.

SAMPLE COLLECTION

A SLRS-4 River Water Reference Material for trace elements was analysed.

STANDARD PREPARATION

A series of four standards containing all the elements of interest were prepared. These were prepared in1% HNO_3.

RESULTS

The following tables show the results for the USEPA 200.8 elements. The second table shows the results for other elements certified but not required for the USEPA 200.8 method. As can be seen in both tables, the results obtained for the analysis show excellent correlation with the certified results.

26 elements were calibrated and analysed. In reality if **all** elements were calibrated and analysed the time required is still 25 seconds!

Results were generated for all ICP-MS measurable elements and isotopes in the periodic table for this sample. With the OptiMass, the same analysis time is required, regardless of the number of elements required to be analysed.

Results obtained for the USEPA 200.8 required elements. n/a - no certified values available.

Elements	Certified Result (ppb)	Result (ppb)
Al	54 ± 4	52.0
Sb	0.23 ± 0.04	0.24
As	0.68 ± 0.06	0.690
Ba	12.2 ± 0.6	12.60
Be	0.007 ± 0.002	0.006
Cd	0.012 ± 0.002	0.012
Cr	0.33 ± 0.02	0.343
Co	0.033 ± 0.006	0.029
Cu	1.81 ± 0.08	1.730
Pb	0.086 ± 0.007	0.093
Mn	3.37 ± 0.18	3.440
Mo	0.21 ± 0.02	0.190
Ni	0.67 ± 0.08	0.69
Se	n/a	0.23
Ag	n/a	0.13
Tl	n/a	0.14
Th	n/a	0.19
U	0.05 ± 0.003	0.049
V	0.32 ± 0.03	0.330
Zn	0.93 ± 0.10	0.98

Elements	Certified Result (ppm)	Result (ppm)
Ca	6.2 ± 0.2	6.13
Mg	1.6 ± 0.1	1.57
K	0.68 ± 0.02	0.67
Na	2.4 ± 0.2	2.33
Fe	103 ± 5	104.22
Sr	26.3 ± 3.2	26.340

Rapid Sample Throughput

10 Times Faster Sample Analysis than a Quadrupole

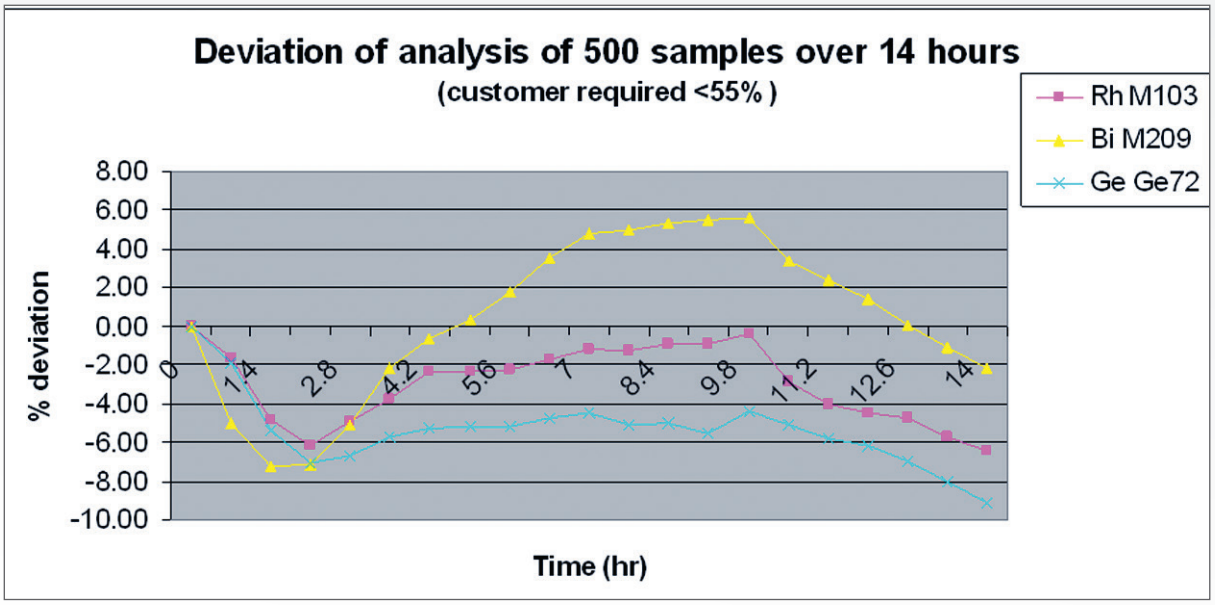
The OptiMass was successfully used for the analysis of water samples per the USEPA 200.8 method. 26 elements in a certified river water sample were quantified. In contrast to a quadrupole ICP-MS, which requires an 180 second acquisition time for 20 elements per sample, the OptiMass requires only 25 seconds per sample of entire mass range.

During this acquisition, it is possible to analyse and quantify all ICP-MS measurable elements and isotopes because of the true simultaneous nature of the OptiMass' data acquisition capabilities.

All masses are displayed simultaneously. This means that the user can view possible contaminants and elements not previously considered.

The additional information can prompt the user to investigate and quantify these newly identified contaminants and elements.

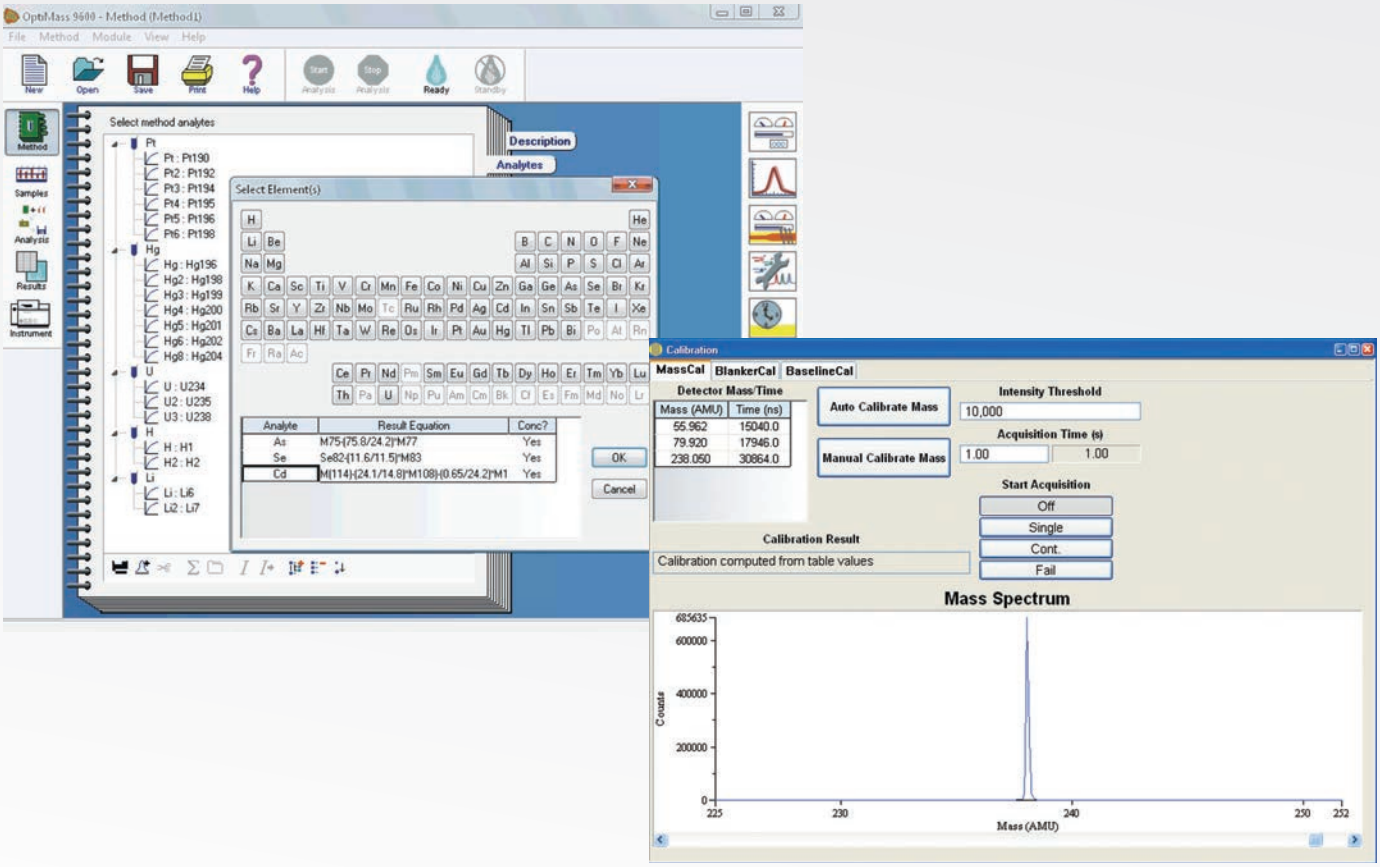
The OptiMass demonstrated that it is 10 times faster than any Quadrupole ICP-MS and is a valuable tool to cater for large sample throughput requirements.



Results show excellent reproducibility over 14 hours.

Programmable

Simple, Powerful and Intuitive: The OptiMass Software



Easy to Use

The OptiMass software is the most powerful and versatile available. Its functionality, programmability and ease of use, in addition to its diagnostic capabilities, lead the industry in excellence.

The OptiMass generates a vast quantity of information, which is easily managed and manipulated by the analyst through simple interfaces, recognizable icons, and easy to edit menus. The notebook style format keeps all parameters in a logical layout for ease of use.

As shown above, elements and/or all isotopes are easily selected from the periodic table. The multielement simultaneous nature of the OptiMass allows direct correction of interferences with no further analysis time required. Interference equations can be easily entered into the analyte list. The OptiMass can be easily calibrated on a mass basis and Smartgate can also be calibrated automatically.

The software incorporates easy to use automated acquisition functions including automatic tuning, setting of all ICP parameters, method development through to qualitative and quantitative analysis and results generation.

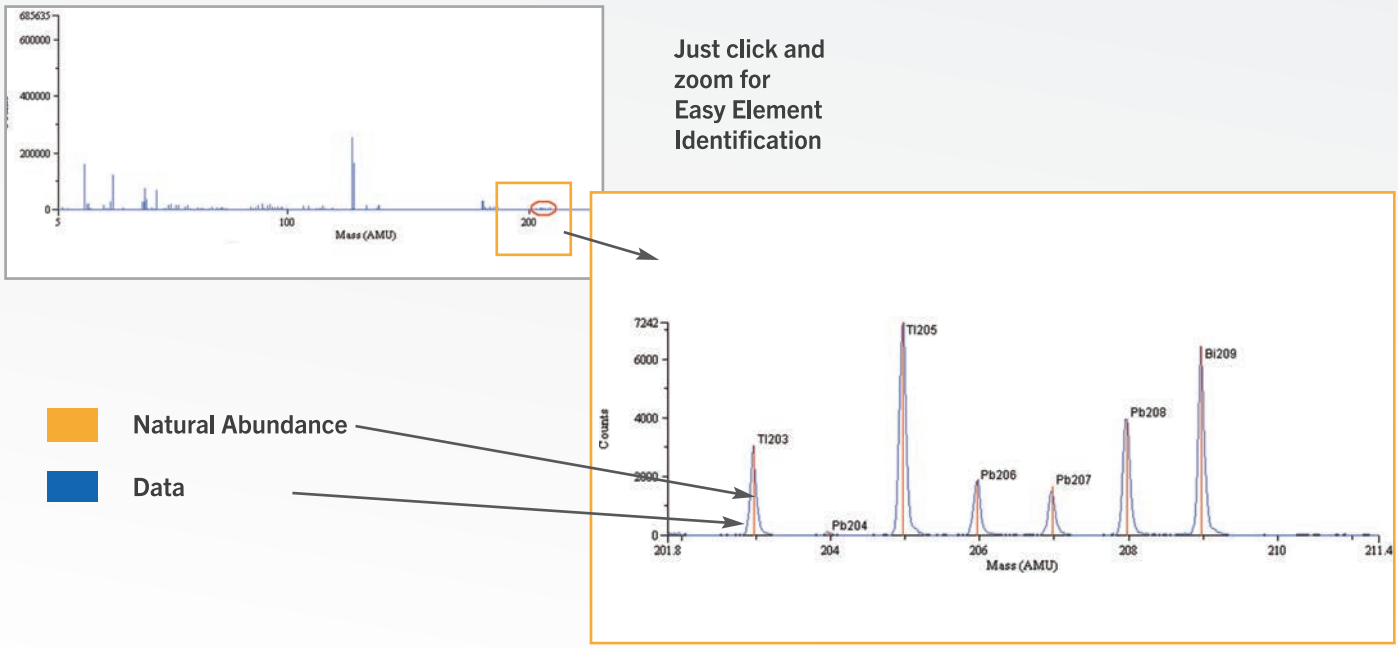
With the click of a button, all instrumentation parameters can be easily controlled.

Impressive Processing Power

Element Identification

The advanced library query and search feature provides access to the information needed for mass identification and for the interpretation of spectra in unknown samples. The peak mass, resolution, and isotopic abundance can be simply recalled.

As the OptiMass is truly simultaneous across the entire mass range, calibration graphs and results can be created for one or all isotopes of a particular element. This enables rapid method development as interferences are immediately obvious when concentration results from different isotopes are compared.



New Software Features

The OptiMass software now includes new features to enhance productivity making it easier to use. These include Auto-Optimisation, Fingerprinting, Semi-Quantitative, Retrospective-Semi-Quantitative analysis and Scan overlays.

The complete spectrum data is saved for every replicate reading. This enables the user to retrospectively analyse elements that were not previously considered.

Diagnostics

All instrument parameters can be user selected to create a customisable status panel. Status panels can be saved and accessed anytime by a simple click of an icon. In addition, many service parameters are available for remote online diagnostics.

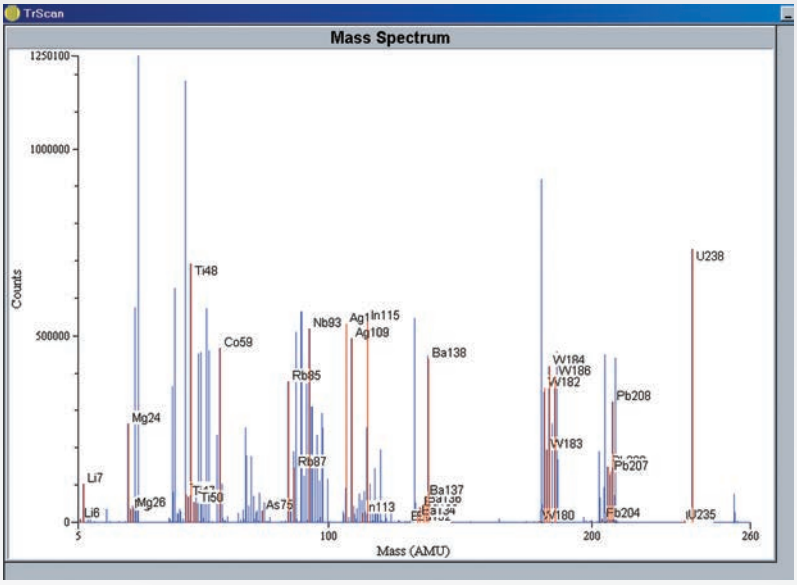
Data for Future Reference

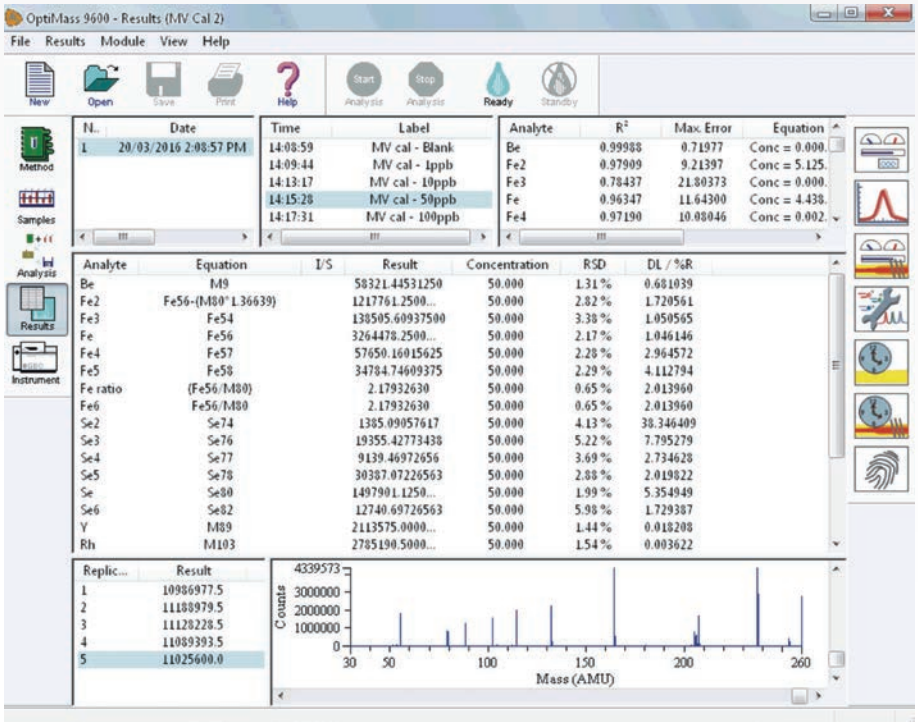
Unique Retrospective Semi-Quantitative Analysis

The ICP-oTOFMS offers the unique feature of powerful retrospective semi-quantitative analysis mode not available on any other form of ICP-MS.

The ICP-oTOFMS Semi-Quantitative analysis uses factory defined relative sensitivity factors (RSF) to define the detector response to an unknown concentration of analytes. The simultaneous nature of the OptiMass allows not only semi-quantitative, but also retrospective semi-quantitative analysis (RSQ).

Every analysis contains data for every mass, the OptiMass continuously acquires data from mass 1 through to mass 260 amu. Utilising the RSQ feature, this data is always available for future examination and quantification for masses not previously callibrated.





Sample Matching

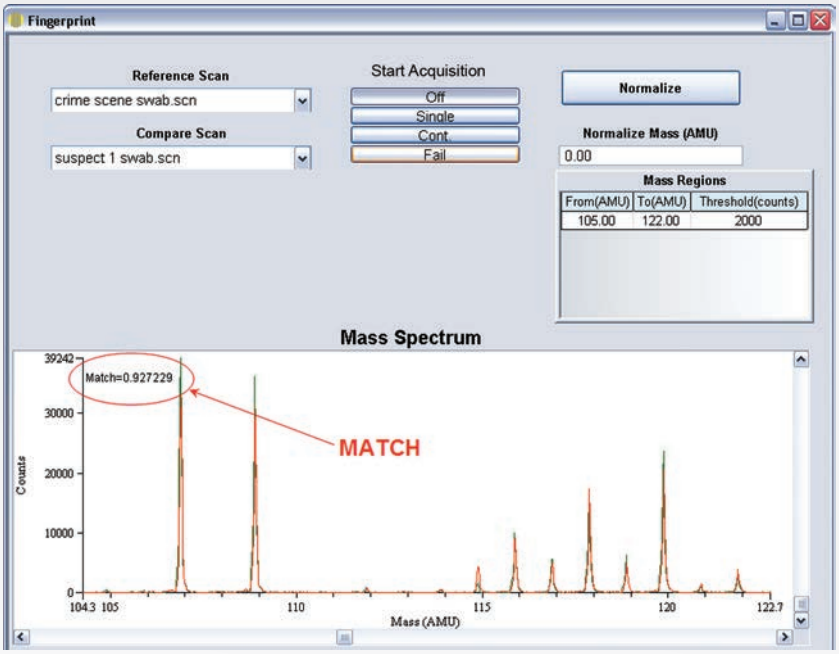
Multielement Spectral Fingerprinting Capability

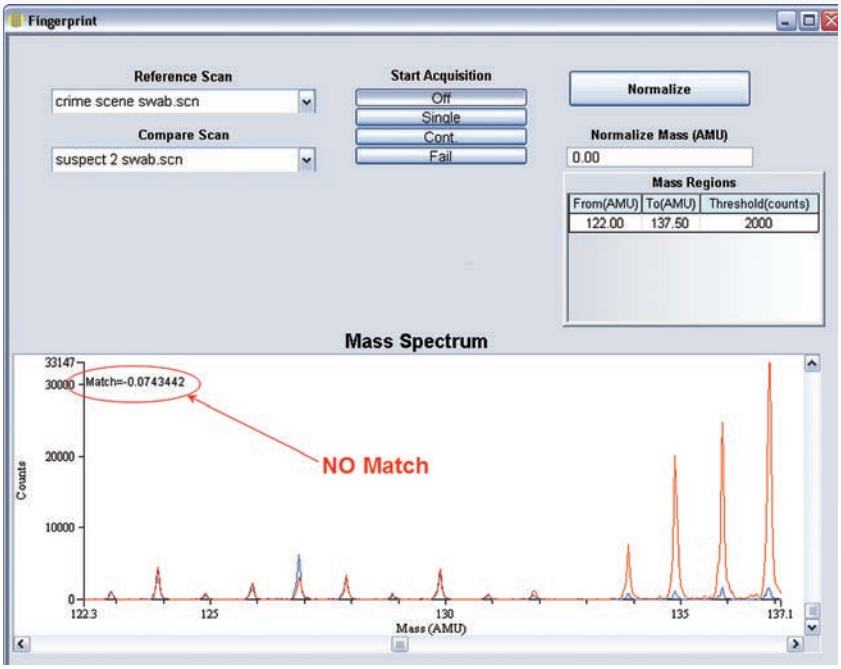
When comparative studies are required, such as in Forensic Science, it can be very useful to use spectral fingerprinting.

This type of analysis allows spectra to be compared to determine how closely they match by giving a figure from 0 to 1. This comparison is achieved using a statistical algorithm that compares a test spectrum to a known spectrum.

This can be a comparison of an SRM to sample material or the comparison of scene-of-crime evidence to samples recovered from suspect's residence, vehicle or personal belongings.

The OptiMass provides rapid multielement analysis enabling complete spectral data collection. This, coupled with the powerful statistical fingerprinting software of the OptiMass, completes the package for comparative analysis.





SMALL VOLUMES

The true simultaneous multielement capability of the Time-of-Flight technology used in the OptiMass ensures that all information can be obtained from the analysis of small volume samples often found in scene-of-crime scenarios. Samples as low as 1 µL can be analysed for all elements using the ETV accessory.

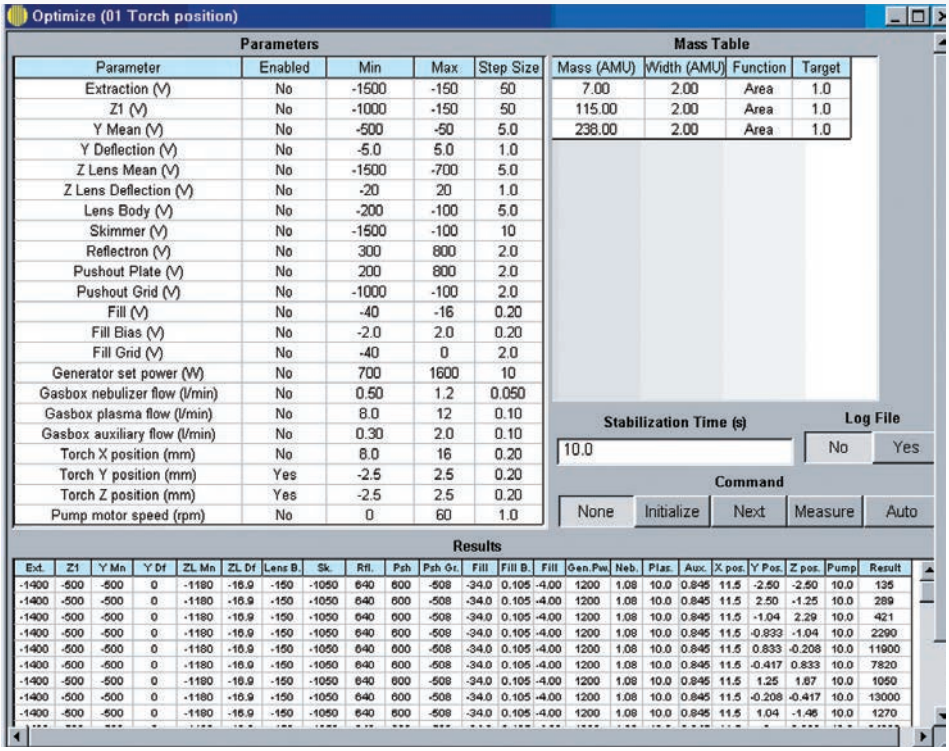
Spectral fingerprinting is also an extremely useful tool in screening samples for many applications. The use of this technique, coupled with the speed of Time-of-Flight, is an ideal tool for rapid screening of samples for international security purposes.

Simple, Automated and Fast

Auto-Optimisation

The Time-of-Flight technology used in the OptiMass allows rapid auto-optimisation of all instrument parameters across the entire mass range. The simultaneous acquisition of all masses from mass 1 to mass 260 amu means that this feature will automatically compensate for mass bias effects. The flexible OptiMass software allows the use of any combinations of instrument parameters to perform the optimisation.

The auto-optimisation software will optimise torch position, nebuliser flow, beam energy and other focusing parameters. Also, any isotope mass can be selected for optimisation on either sensitivity or resolution. Minimum and maximum parameter values can be defined as well as parameter step size during optimisation, to allow for settling of gas flow parameters. The comprehensive results panel supplies a complete report of the entire optimisation process (if required).



Optimize (01 Torch position)

Parameters

Parameter	Enabled	Min	Max	Step Size
Extraction (V)	No	-1500	-150	50
Z1 (V)	No	-1000	-150	50
Y Mean (V)	No	-500	-50	5.0
Y Deflection (V)	No	-5.0	5.0	1.0
Z Lens Mean (V)	No	-1500	-700	5.0
Z Lens Deflection (V)	No	-20	20	1.0
Lens Body (V)	No	-200	-100	5.0
Skimmer (V)	No	-1500	-100	10
Reflectron (V)	No	300	800	2.0
Pushout Plate (V)	No	200	800	2.0
Pushout Grid (V)	No	-1000	-100	2.0
Fill (V)	No	-40	-16	0.20
Fill Bias (V)	No	-2.0	2.0	0.20
Fill Grid (V)	No	-40	0	2.0
Generator set power (W)	No	700	1600	10
Gasbox nebulizer flow (l/min)	No	0.50	1.2	0.050
Gasbox plasma flow (l/min)	No	8.0	12	0.10
Gasbox auxiliary flow (l/min)	No	0.30	2.0	0.10
Torch X position (mm)	No	8.0	16	0.20
Torch Y position (mm)	Yes	-2.5	2.5	0.20
Torch Z position (mm)	Yes	-2.5	2.5	0.20
Pump motor speed (rpm)	No	0	60	1.0

Mass Table

Mass (AMU)	Width (AMU)	Function	Target
7.00	2.00	Area	1.0
115.00	2.00	Area	1.0
238.00	2.00	Area	1.0

Stabilization Time (s): 10.0

Log File: No Yes

Command: None Initialize Next Measure Auto

Results

Ext.	Z1	Y Mn	Y Df	ZL Mn	ZL Df	Lens B.	Sk.	Rfl.	Psh	Psh Gr.	Fill	Fill B.	Fill	Gen.Pw.	Neb.	Plas.	Aux.	X pos.	Y Pos.	Z pos.	Pump	Result
-1400	-500	-500	0	-1180	-16.9	-150	-1050	640	600	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.845	11.5	-2.50	-2.50	10.0	135
-1400	-500	-500	0	-1180	-16.9	-150	-1050	640	600	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.845	11.5	2.50	-1.25	10.0	289
-1400	-500	-500	0	-1180	-16.9	-150	-1050	640	600	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.845	11.5	-1.04	2.29	10.0	421
-1400	-500	-500	0	-1180	-16.9	-150	-1050	640	600	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.845	11.5	-0.833	-1.04	10.0	2290
-1400	-500	-500	0	-1180	-16.9	-150	-1050	640	600	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.845	11.5	0.833	-0.208	10.0	11900
-1400	-500	-500	0	-1180	-16.9	-150	-1050	640	600	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.845	11.5	-0.417	0.833	10.0	7820
-1400	-500	-500	0	-1180	-16.9	-150	-1050	640	600	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.845	11.5	1.25	1.67	10.0	1050
-1400	-500	-500	0	-1180	-16.9	-150	-1050	640	600	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.845	11.5	-0.208	-0.417	10.0	13000
-1400	-500	-500	0	-1180	-16.9	-150	-1050	640	600	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.845	11.5	1.04	-1.46	10.0	1270

Transient Analysis

Laser Ablation ICP-oTOFMS

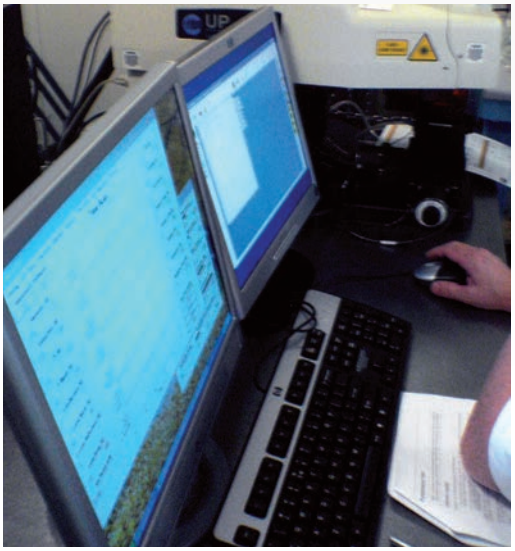
The Laser Ablation Sampling

GBC offers a packaged Laser Ablation-ICP-MS system. The integrated Dual Screen software control system facilitates easy viewing and control of both the Laser Ablation and OptiMass software.

This provides a flexible user friendly option for the rapid multielement analysis of solid samples.

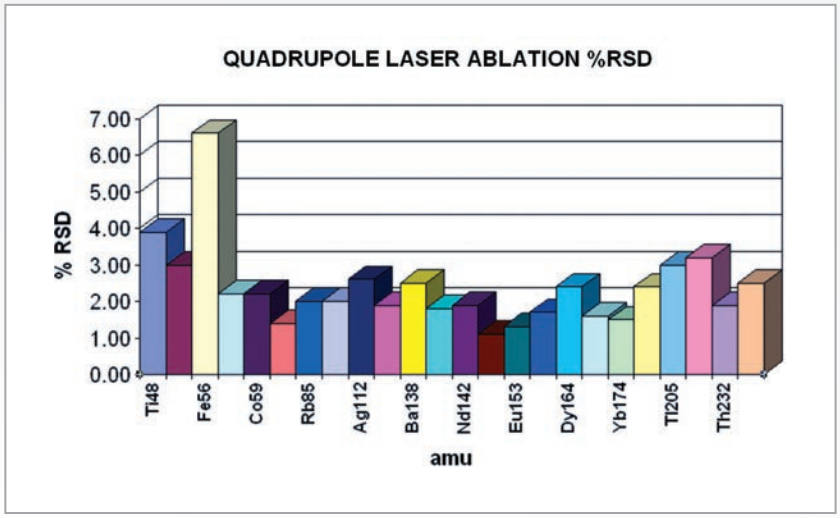
The OptiMass can acquire data at a rate of 30,000 full mass spectra per second.

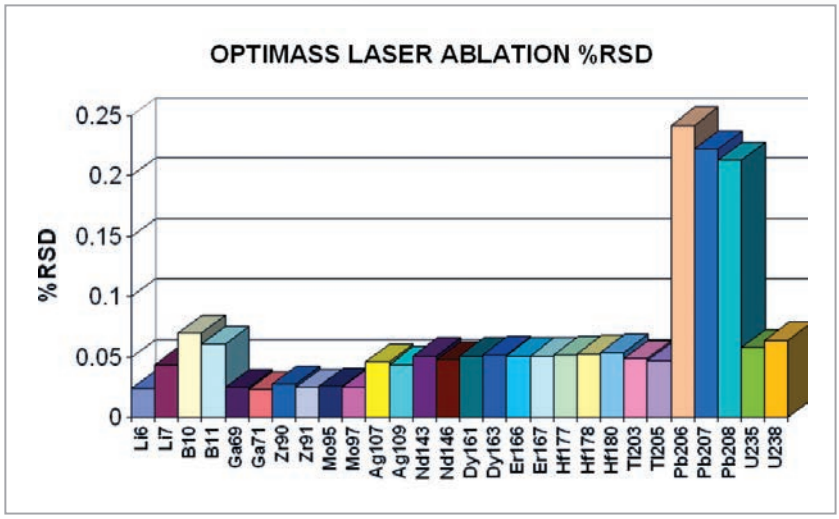
The fast data acquisition translates not only to faster speed of analysis but the quality of the data produced is significantly improved.



Dual screens for easy viewing

The OptiMass offers 6 times greater stability than a standard Quadrupole ICP-MS.





Parts per Trillion Detection Limits

Specifications

Description

Benchtop Inductively Coupled Plasma orthogonal acceleration Time-of-Flight Mass Spectrometer (ICP-oTOFMS), controlled by an external computer using Windows® based software.

RF Generator

Solid state 27.12 MHz generator.

- Computer controlled from 500 W to 1500 W with auto tuning.
- Auto-start from software.

Sample Introduction

Nebuliser and Spray Chamber. Concentric glass nebuliser with thermostatted glass jacketed spray chamber.

Torch

Low flow, low power, single piece quartz torch.

Torch Adjustment

Computer control of torch movement in the (x-y-z) planes to 0.1 mm resolution for optimal analytical positioning relative to the ion sampler interface.

Argon Flows

Individual gas flows under computer control.

- Mass flow regulation on all gas lines.
- <12 L/min total argon flow typical.

Peristaltic Pump

Computer controlled four-channel 12-roller pump, speed 0-60 rpm.

- Auto fast pump setting for rapid washout.

Interface and Ion Optics

Easily removable three cone system.

- Water cooled interface.
- Cone access via motorised retraction of the torch.
- Gate valve vacuum seal.

Clean Vacuum System

Conventional three-cone interface vacuum system with differential pumping utilising low maintenance turbomolecular pumps and rotary vane backing pump.

- Automatic sequencing and control.
- Interlocks to prevent damage to pumping system and high voltage elements in the event of a plasma extinction.
- Turbomolecular pumps protected from overload conditions.

Optional oil-free rotary pump allows extended detector life due to lower hydrocarbon components in the vacuum system.

Mass Analyser and Detector System

Orthogonal acceleration Time-of-Flight mass spectrometer.

- Mass range 1 to 260 amu.
- More than 30,000 full spectra per second ion extraction speed.
- Parts per trillion detection limits.

Automatic detector protection and user-selectable matrix ions elimination with SMARTGATE ion blanker.

- Up to 1 GHz detection system sampling rate.
- Unique detection system with discrete dynode multiplier for extended dynamic range.
- Transient signal acquisition rate of 100 integrated full mass spectra per second.

The resolution of the OptiMass is typically 1,200 or greater for ^{238}U or 0.4 amu.

Precision Components
GBC OptiMass

Spares & Accessories

Precision glassware readily available

OptiMass three-cone interface

SDS3000 Auto Sampler

Precision Components

The precision designed and engineered components and consumables (as shown on the left) are manufactured to very rigid specifications. Designed with durability and longevity in mind, the operator can still replace parts and consumables quickly when required to ensure any downtime is minimised.

SDS3000 Auto Sampler

The SDS3000 is a precision engineered X-Y-Z auto sampler. Designed and fabricated by GBC Scientific Equipment, this affordable auto sampler provides accurate and fast analysis due to its durable, reliable and sturdy design. Supplied with four sample racks to hold 240 sample vials each of approximately 14 mL and a standards rack to hold 10 standard vials plus a blank each with a volume of approximately 50 mL. PTFE and PEEK material is used to provided a metal free liquid flow path. Variable continuous flow sample probe rinse station with peristaltic pump minimises sample contamination and carryover. Software controls include rinse time, delay time, number of replicates, rescale rate, recalibration rate, measurement time and analysis order. Full random access capability is standard. Up to 360 samples can be loaded using 7 mL tubes.

HG3000PII Hydride Generator

The GBC Hydride Generator enables the analysis of the hydride forming elements using a vapour generation technique. Elements such as As, Bi, Sn, Sb, Te, Se, Ge, Pb and Hg can be determined with parts per trillion detection limits.

The HG3000PII hydride generator incorporates precision glassware for highly efficient mixing of reactants and gas liquid separation to ensure reproducibility and high sensitivity.

HG3000PII Hydride Generator

Spares & Accessories

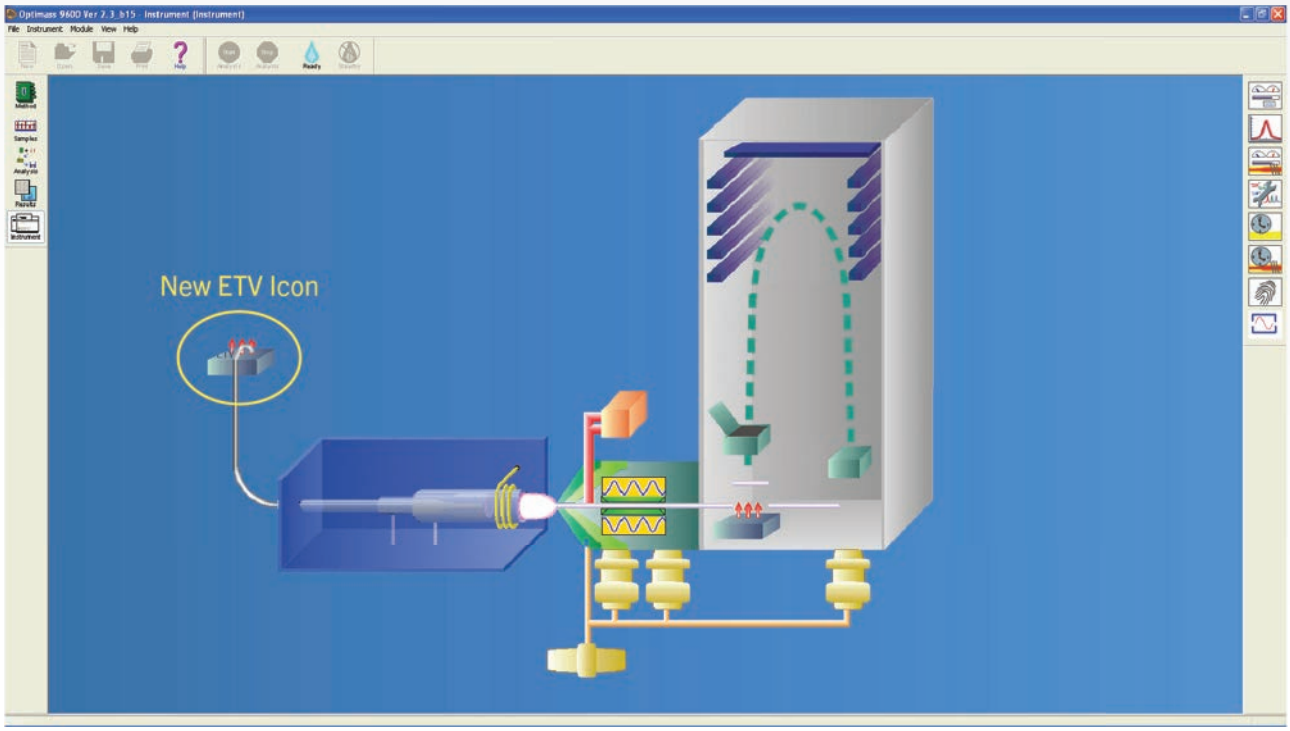
ETV (Electro Thermal Vapourisation) Accessory

Building on GBC's history of graphite furnace technology, the ETV accessory for sample introduction for the OptiMass is now available. This totally integrated and automated accessory allows high sample throughput of up to 40 samples and standards and modifiers, unattended, with capability to inject samples from 1 µL to 100 µL. The analyst can program dry, ash and atomise temperatures to 3000°C and associated times to allow the sample to have its solvent and matrix removed and remaining elements to be measured simultaneously by the OptiMass. The ETV also offers an automated solution for the analysis of slurries and viscous liquids. Solid samples can also be manually introduced allowing greater flexibility for sample introduction.

Software

True multi-tasking Windows® based operating software

- Modular design with Method, Samples, Analysis, Instrument Control and Results modules accessible from any part of the software.
- External and isotope dilution calibration.
- Automatic correction for interferences and measurement with internal standards.
- Measurement of transient signals.
- Isotope ratio measurement.
- Complete quality control protocols, including check samples, spike recoveries, calibration failure and QC limits.



Software

- Unlimited number of samples in a run.
- Comprehensive report generation.
- Complete computer control of instrument parameters.
- Auto-optimisation of plasma parameters and auto-tuning of mass analyser.
- Customisable instrument status display.
- Fingerprinting.
- Semi-Quantitative analysis.
- Retrospective Semi-Quantitative analysis.
- Access data base.
- Complete full spectrum results data saved for every replicate.

Rapid Service Response

Customer Service

You can be assured that GBC will provide you the service that you require. With more than 100 GBC trained distributors across the globe a technician will never be far away.

GBC Customer Service includes:

Rapid Service Response

GBC has many factory trained service representatives world-wide so you can be assured of a rapid response to your service requirements.

Personalised Instrument Installation and Training

An experienced product specialist is available to visit your laboratory site to perform installation, qualification and training.

Remote Diagnostics

Easy to install, user friendly software enables GBC to provide you with complete on-line remote instrument diagnostics and trouble shooting.

Ordering Information

OptiMass 9600
GBC OptiMass 9600 ICP orthogonal
Time-of-Flight Mass Spectrometer
with inbuilt Octopole Collision Cell
for interference management
Part No. 99-2155-03

OptiMass 9500
GBC OptiMass 9500 ICP orthogonal
Time-of-Flight Mass Spectrometer
Part No. 99-2155-01

Dimensions
1200 x 840 x 700 (W x D x H, mm)

Weights
Packed 400 Kg
Unpacked 280 Kg

Electrical Requirements
200–240 V AC, 7 kVA, 20A, 50/60 Hz

Accessories

Electro Thermal Vapourisation (ETV) Accessory
Part No. 99-5010-00

SDS3000 Auto Sampler
Part No. 99-0697-00

HG3000PII Hydride Generator
Part No. 99-0126-03

Laser Ablation System
Part No. 99-1475-00

Water Recirculator, 220 V, 50 Hz
Part No. 96-0101-00

Water Recirculator, 115 V, 60 Hz
Part No. 96-0101-01

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A.C.N. 005 472 686
GBC reserves the right to change specifications without prior notice.
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GBC SCIENTIFIC EQUIPMENT
Manufacturer of world-class scientific instruments and accessories
—— AAS, HPLC, ICP-OES, ICP-oTOFMS, UV-Vis and XRD.

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ISO 9001

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