

# OptiMass 9600

ICP-oTOFMS

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



ICP-oTOFMS







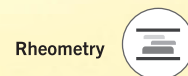
ISO 9001  
Quality Accreditation

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.

GBC's  
Product  
lines



## Visionary Technology

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





# Futuristic Technology



## Look into the elements of the new OptiMass 9600 ...

With the release of the third generation OptiMass 9600, GBC remains at the forefront in the development and marketing of ICP orthogonal Time-of-Flight Simultaneous Mass Spectrometry.

The OptiMass 9600 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 9600 speed of analysis is particularly suited to any fast transient type analysis.

**No matter what your Application, the OptiMass 9600 will analyse faster, more accurately and more cost effectively than ever before!**

The OptiMass 9600 acquires all masses simultaneously, analysis time is the same to analyse one mass or all masses.

The OptiMass 9600 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 9600 from any other ICP Mass Spectrometer.

**The third generation OptiMass 9600 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 9600 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 9600, however, requires only 25 seconds to analyse all elements.

### Lower Argon Consumption

The third generation OptiMass 9600 typically consumes <12 L/min of Argon. When you also factor in the equation that the OptiMass 9600 is more than 5 times faster than a quadrupole, this results in argon consumption being more than 10 times lower per element compared to using a Quadrupole. That's a lot of money saved!

### New Octopole Collision Cell

Octopole Collision Cell (OCC) with mass independence for interference management during sample analysis specially designed for simultaneous nature of the OptiMass 9600. The OCC removes all interferences across entire mass range. The OCC is conveniently located inside the OptiMass 9600.

## 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 9600 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 in 1% HNO<sub>3</sub>.

### 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 9600, 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

# 5 Times Faster Sample Analysis than a Quadrupole

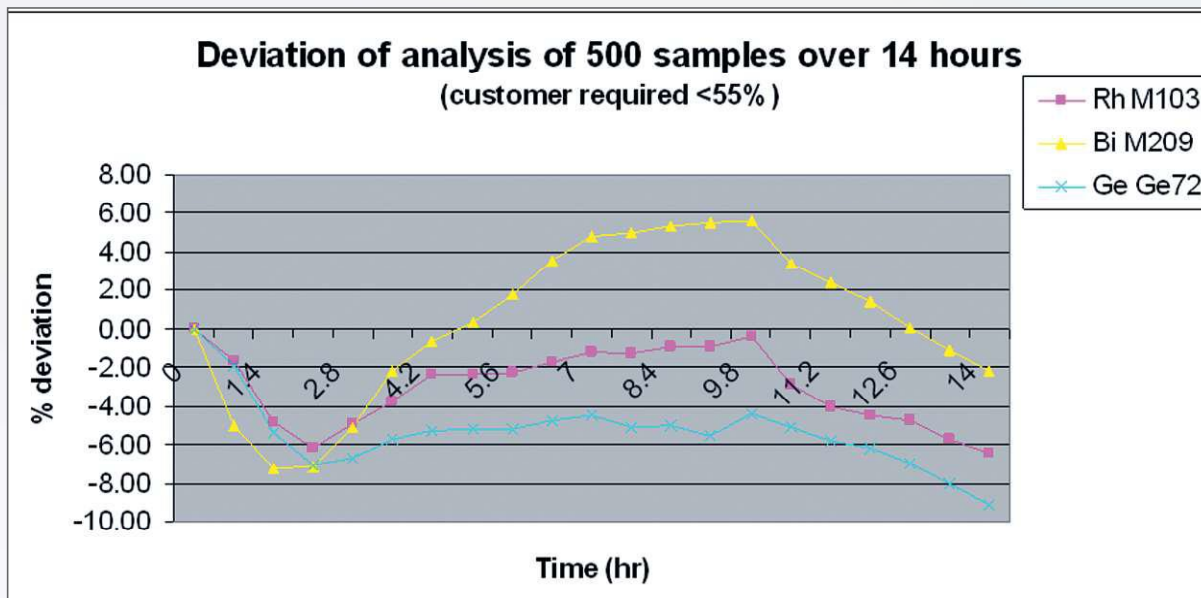
The OptiMass 9600 was successfully used for the analysis of water samples per the USEPA 200.8 method. 26 elements in a certified river water sample were quantified. In contrast to a quadrupole ICP-MS, which requires an 180 second acquisition time for 20 elements per sample, the OptiMass 9600 requires only 25 seconds per sample.

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 9600's 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.

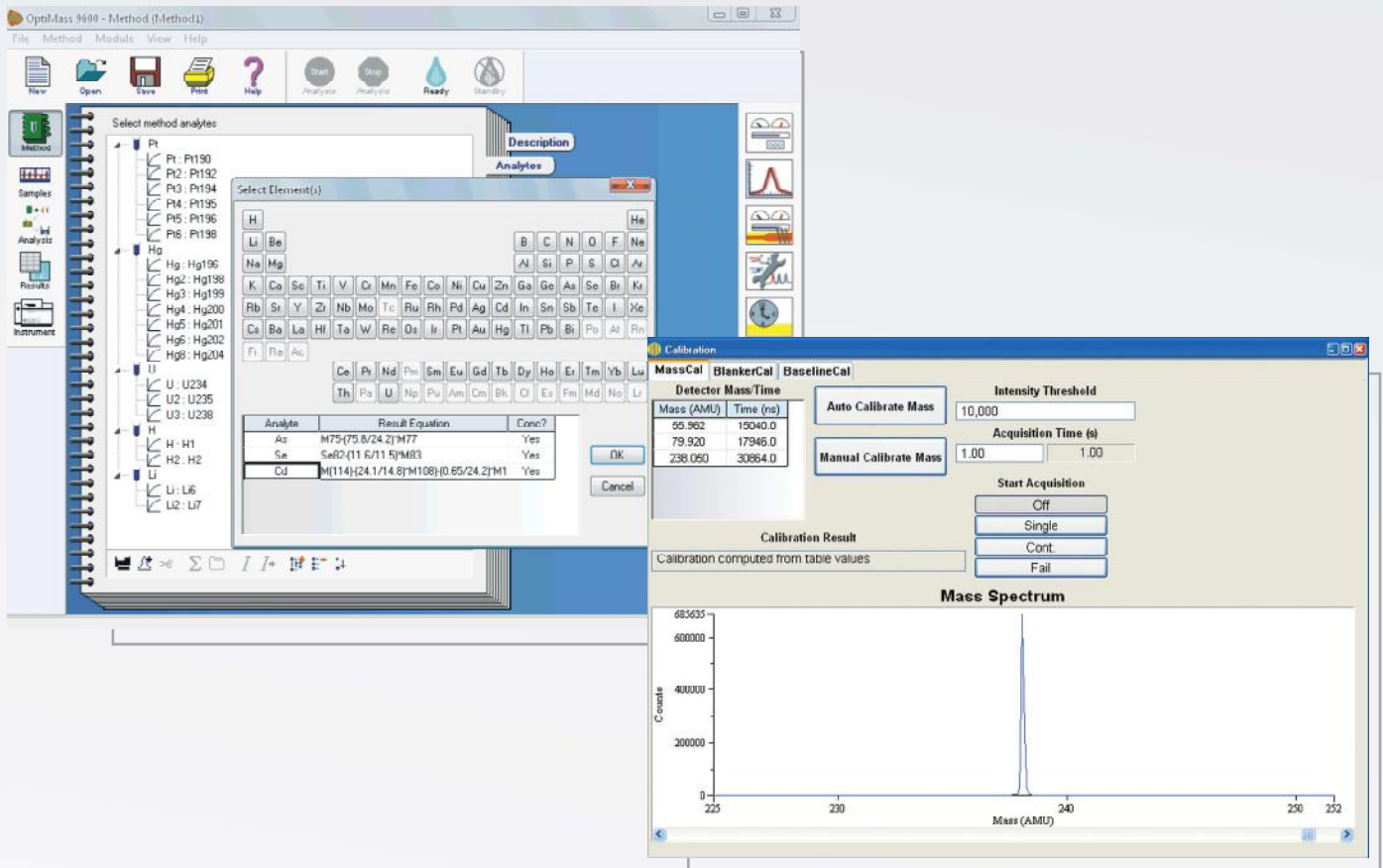
The OptiMass 9600 demonstrated that it is more than 5 times faster than any Quadrupole ICP-MS and is a valuable tool to cater for large sample throughput requirements.



Results show excellent reproducibility over 14 hours.

## Programmable

# Simple, Powerful and Intuitive: The OptiMass 9600 Software



## Easy to Use

The OptiMass 9600 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 9600 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 9600 allows direct correction of interferences with no further analysis time required. Interference equations can be easily entered into the analyte list. The OptiMass 9600 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.

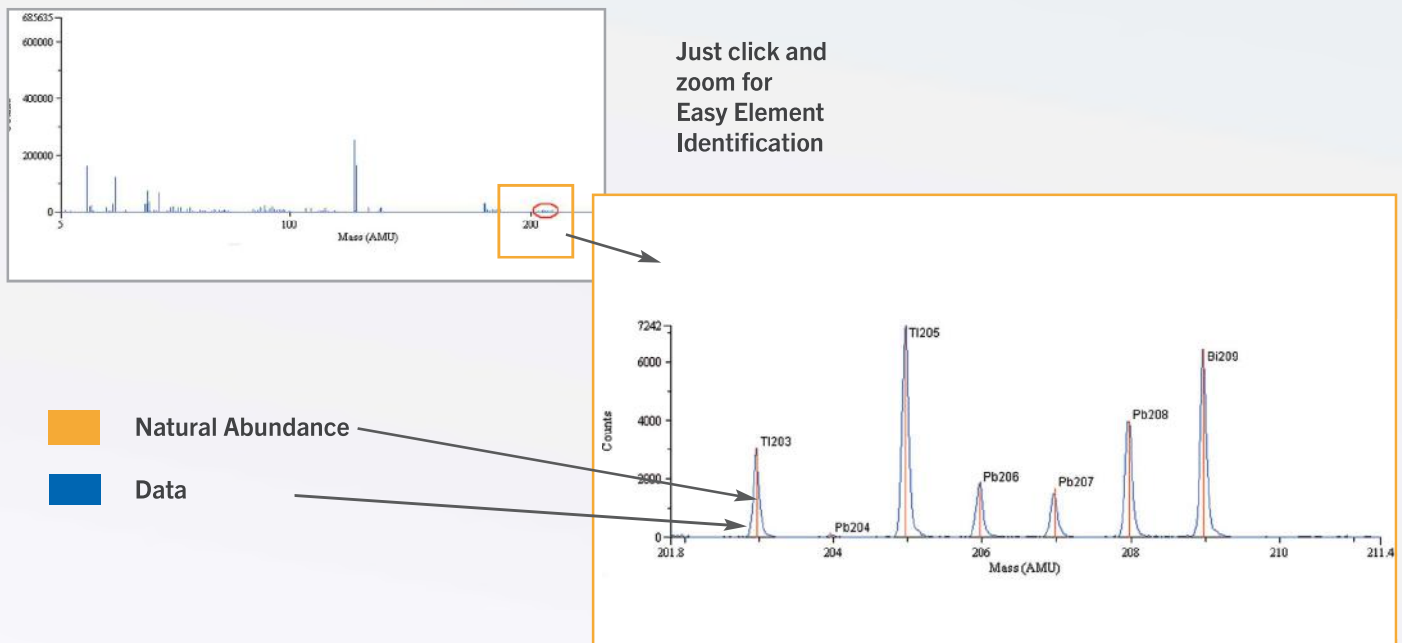
**With the click of a button, all instrumentation parameters can be easily controlled.**

# 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 9600 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 9600 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.



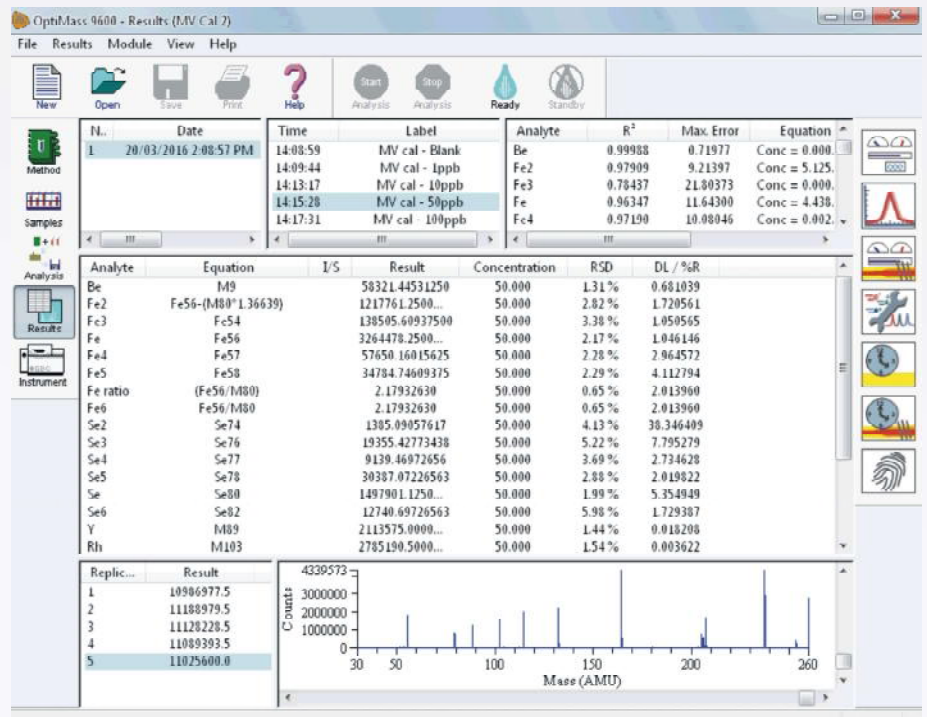
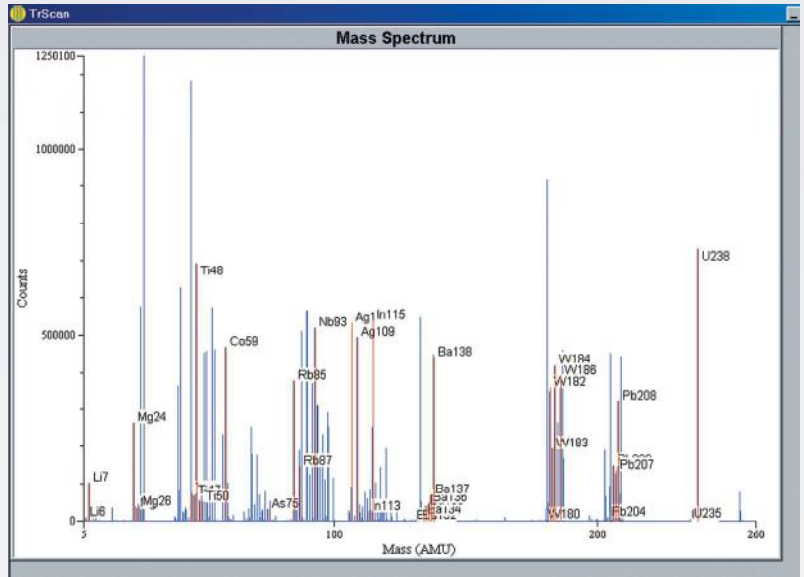
## Data for Future Reference

# 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 9600 allows not only semi-quantitative, but also retrospective semi-quantitative analysis (RSQ).

Every analysis contains data for every mass, the OptiMass 9600 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 calibrated.





# 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.

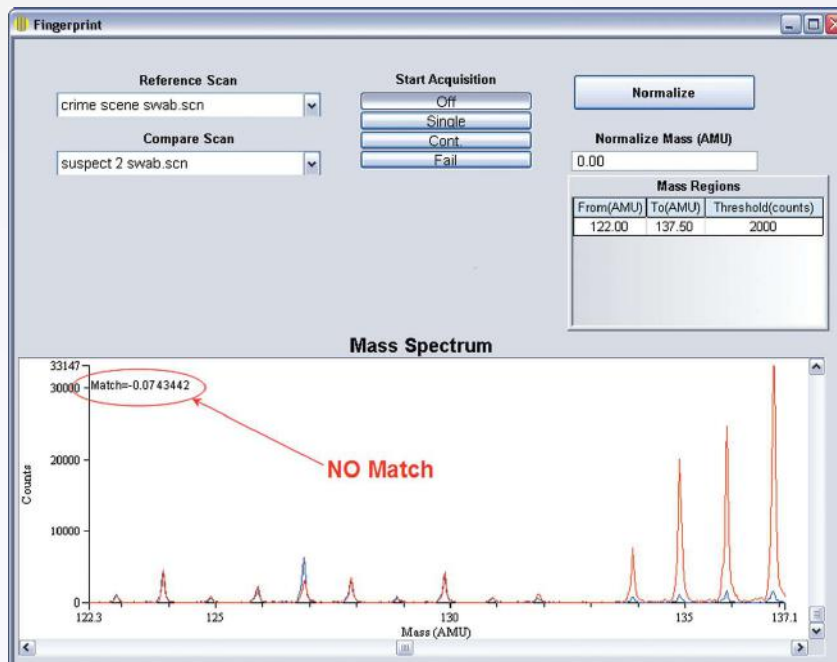
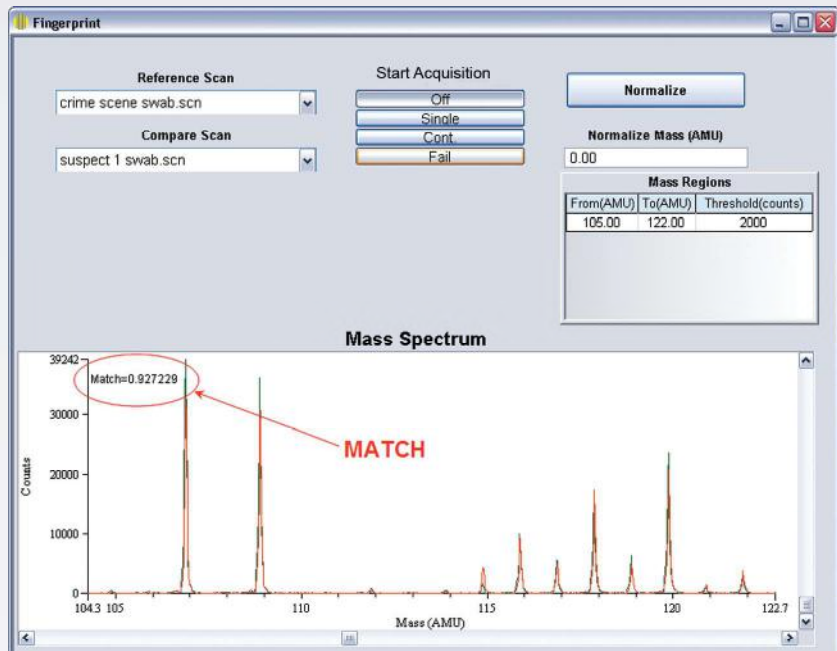
This can be a comparison of an SRM to sample material or the comparison of scene-of-crime evidence to samples recovered from suspect's residence, vehicle or personal belongings.

The OptiMass 9600 provides rapid multielement analysis enabling complete spectral data collection. This, coupled with the powerful statistical fingerprinting software of the OptiMass 9600, completes the package for comparative analysis.

### SMALL VOLUMES

The true simultaneous multielement capability of the Time-of-Flight technology used in the OptiMass 9600 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  $\mu\text{L}$  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 9600 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 9600 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).

The screenshot displays the 'Optimize (01 Torch position)' software interface. It is divided into several sections:

- Parameters Table:** A table listing various instrument parameters with columns for 'Parameter', 'Enabled', 'Min', 'Max', and 'Step Size'. Parameters include Extraction (V), Z1 (V), Y Mean (V), Y Deflection (V), Z Lens Mean (V), Z Lens Deflection (V), Lens Body (V), Skimmer (V), Reflector (V), Pushout Plate (V), Pushout Grid (V), Fill (V), Fill Bias (V), Fill Grid (V), Generator set power (W), Gasbox nebulizer flow (l/min), Gasbox plasma flow (l/min), Gasbox auxiliary flow (l/min), Torch X position (mm), Torch Y position (mm), Torch Z position (mm), and Pump motor speed (rpm).
- Mass Table:** A table with columns for 'Mass (AMU)', 'Width (AMU)', 'Function', and 'Target'. It lists three masses: 7.00 (Area, 1.0), 115.00 (Area, 1.0), and 238.00 (Area, 1.0).
- Stabilization Time (s):** A control field set to 10.0, with 'No' and 'Yes' buttons.
- Command:** A set of buttons including 'None', 'Initialize', 'Next', 'Measure', and 'Auto'.
- Results Table:** A large table at the bottom showing the results of the optimization process. It includes columns for 'Est.', 'Z1', 'Y Mn', 'Y Dr', 'ZL Mn', 'ZL Dr', 'Lens B', 'Sk', 'Rlt', 'Psh', 'Psh Gr', 'Fill', 'Fill B', 'Fill', 'Gen.Pwr', 'Neb.', 'Plat.', 'Aux.', 'X.pos', 'Y.Pos', 'Z.pos', 'Pump', and 'Result'. The table contains multiple rows of numerical data representing different optimization runs.

# 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 9600 software.

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

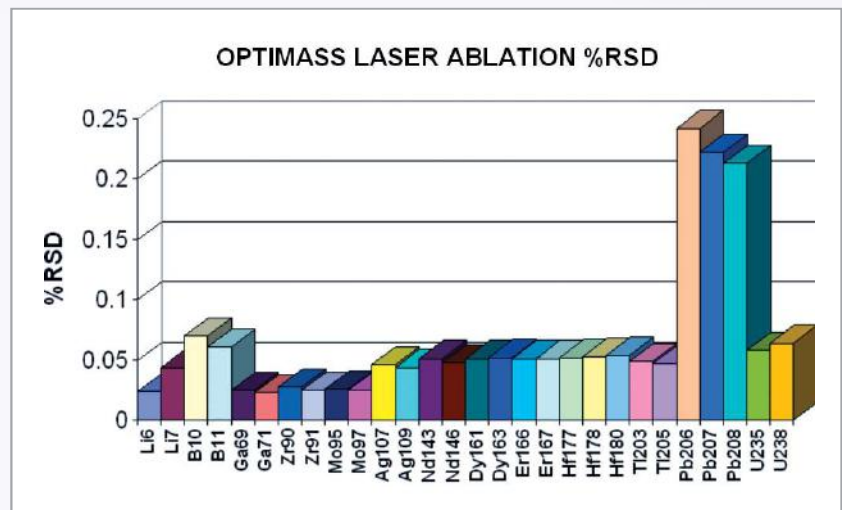
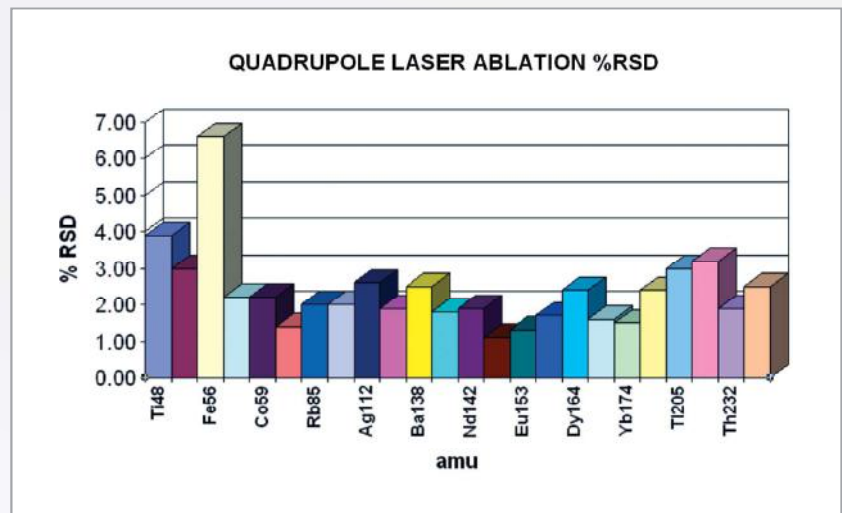
The OptiMass 9600 can acquire data at a rate of 30,000 full mass spectra per second.

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

The OptiMass 9600 offers 6 times greater stability than a standard Quadrupole ICP-MS.



Dual screens for easy viewing





# 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 9600 is typically 1,200 or greater for <sup>238</sup>U or 0.4 amu.

# Precision Components

## GBC OptiMass 9600

### Spares & Accessories



Precision glassware readily available



The OptiMass 9600 three-cone interface



SDS720 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.

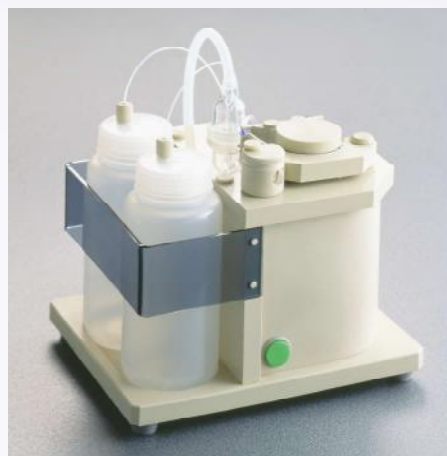
### SDS720 Auto Sampler

The SDS720 is a precision engineered X-Y-Z auto sampler. The SDS720 provides accurate and fast analysis due to its durable, simple, adaptable, reliable and sturdy design. Supplied with sample racks to hold 240 sample vials each of approximately 14 mL and a standards rack to hold 10 standard vials each with a volume of approximately 50 mL. Plastic sample and standard vials are supplied. PTFE and PEEK is used to provide 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. Optional clean enclosure also available.

### 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

## Ease of Use

# Spares & Accessories

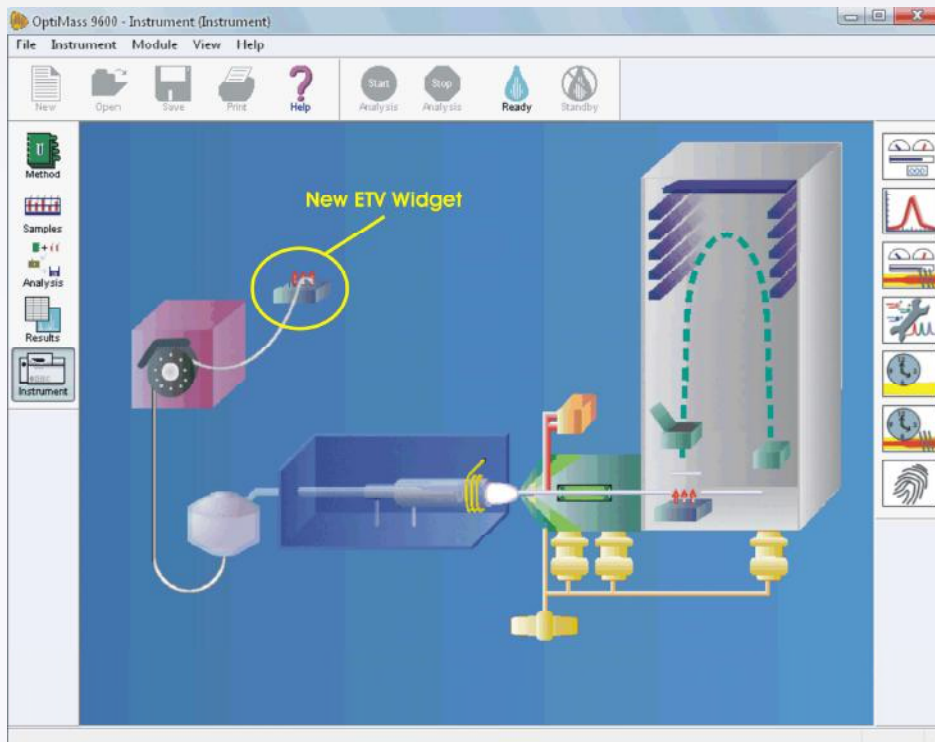
## ETV (Electro Thermal Vapourisation) Accessory

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  $\mu\text{L}$  to 100  $\mu\text{L}$ . 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.

## OptiMass 9600 SPECIFICATIONS

### OptiMass 9600 Dimensions

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

### OptiMass 9600 Weights

Packed 400 Kg  
Unpacked 280 Kg

### Electrical Requirements

200–240 V AC, 7 kVA, 20A, 50/60 Hz

### 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

## ORDERING INFORMATION

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

## Accessories

### Electro Thermal Vapourisation (ETV) Accessory

Part No. 99-5010-00

### SDS720 Auto Sampler

Part No. 99-0582-00

### HG3000PII Hydride Generator

Part No. 99-0126-03

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GBC SCIENTIFIC EQUIPMENT  
Manufacturer of world-class scientific instruments and accessories  
— AAS, HPLC, ICP-OES, ICP-oTOFMS, Rheometry, UV-Vis and XRD.

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