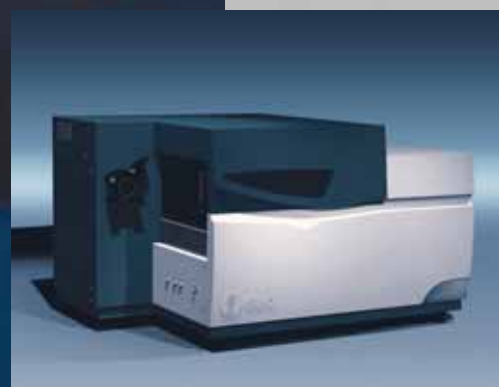




OptiMass 9500 ICP-oTOFMS

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



www.**GBC**sci.com
SCIENTIFIC EQUIPMENT



“Sensitive Technology
for a Sensitive World”

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.

For almost 30 years GBC has been at the forefront of scientific technological development, manufacturing and marketing a wide range of award winning, quality scientific instruments.

GBC Scientific Equipment

will advance people’s knowledge and
their capacity to enhance the quality of life
for all humankind.



GBC’s product lines...



AAS



HPLC



ICP-OES



ICP-oTOFMS



Rheometry

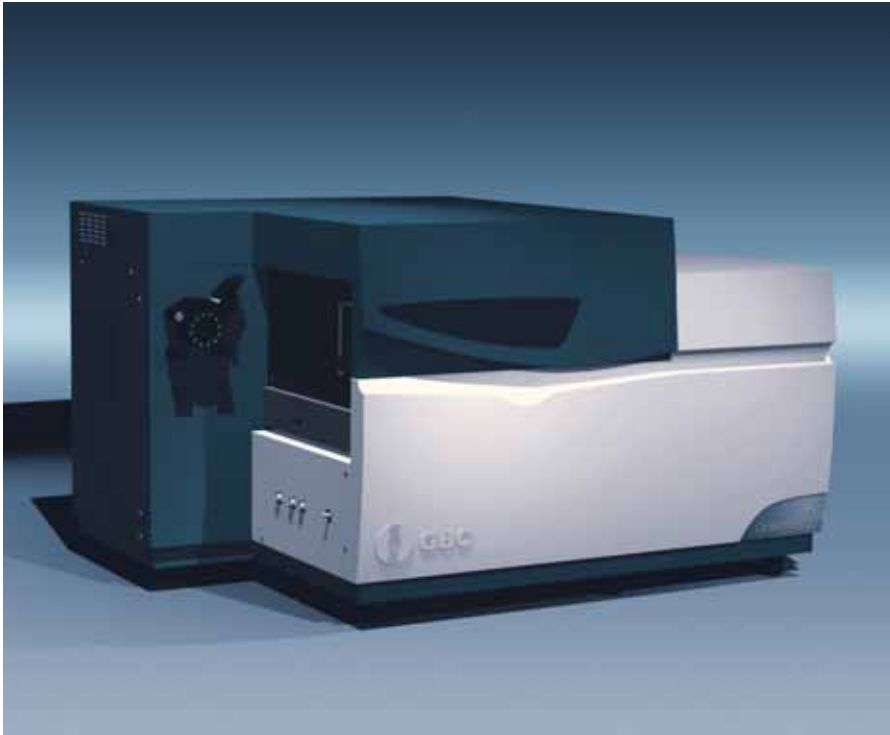


UV-Vis



XRD

Look into the elements of the new OptiMass 9500 ...



With the release of the second generation OptiMass 9500, GBC remains at the forefront in the development and marketing of ICP orthogonal Time of Flight Mass Spectrometry.

The OptiMass 9500 has an impressive install base which covers both the traditional routine screening and sample analysis through to unique laser ablation, graphite furnace and HPLC interface applications. In fact, the OptiMass 9500 speed of analysis is particularly suited to any fast transient type analysis.

No matter what your application, the OptiMass 9500 will analyse faster, more accurately and more cost effectively than ever before!

The OptiMass 9500 acquires all masses simultaneously, analysis time is the same for one mass or all masses.

The OptiMass 9500 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 9500 from any other ICP Mass Spectrometer.

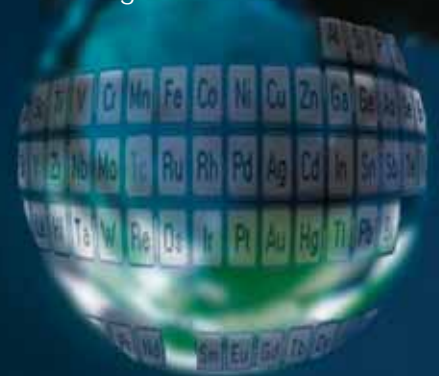
The 2nd Generation OptiMass 9500 packed with lots of great features to give you the technological edge!

Low Operating Cost

Whether running a commercial laboratory or a research facility, cost of operation is ALWAYS important. The OptiMass 9500 is both faster and consumes less Argon compared to a Quadrupole. When running USEPA method 200.8 a quadrupole requires 180 seconds per suite of elements. The OptiMass 9500, however, requires only 25 seconds to analyse all elements.

Lower Argon Consumption

Due to the speed of analysis, the 2nd generation OptiMass 9500 requires less operating time than competing ICP-MS instrumentation, resulting in a 40% decrease in Argon consumption translating to cost savings.



Futuristic Technology

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 9500 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% HNO₃.

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.

Results were generated for all ICP-MS measurable elements and isotopes in the periodic table for this sample. With the OptiMass 9500, the same analysis time is required, regardless of the number of elements required to be analysed.

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

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

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

Precise Environmental Analysis

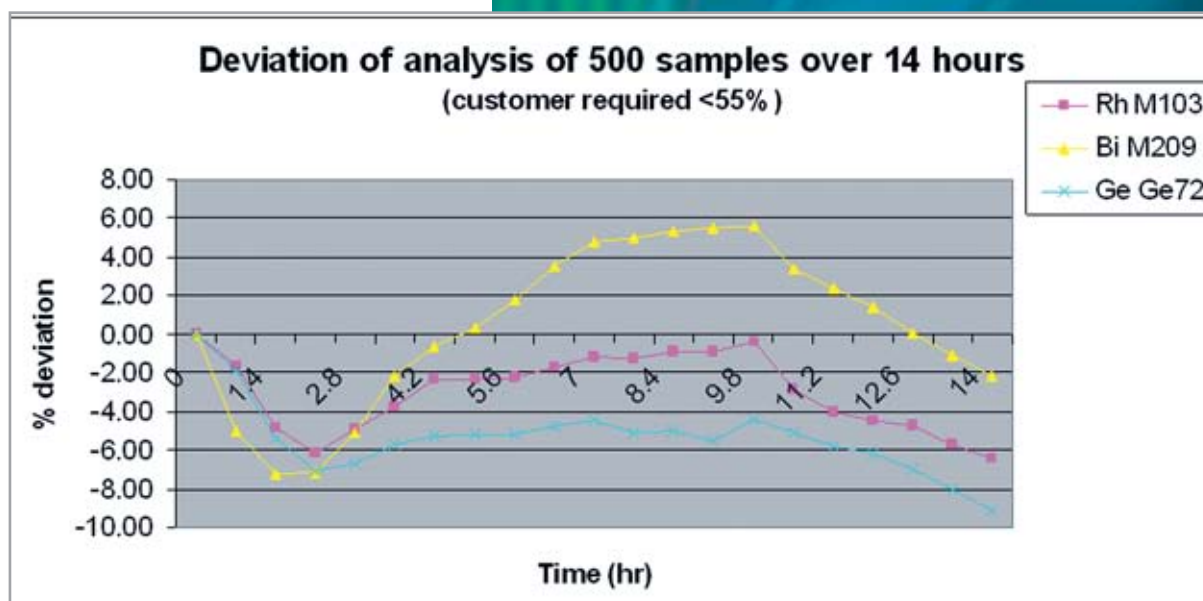
5 Times Faster Sample Analysis than a Quadrupole

The OptiMass 9500 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 9500 requires only 25 seconds per sample.

During this acquisition, it is possible to analyze and quantify all ICP-MS measurable elements and isotopes because of the true simultaneous nature of the OptiMass 9500's data acquisition capabilities.

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

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



Results show excellent reproducibility over 14 hours.

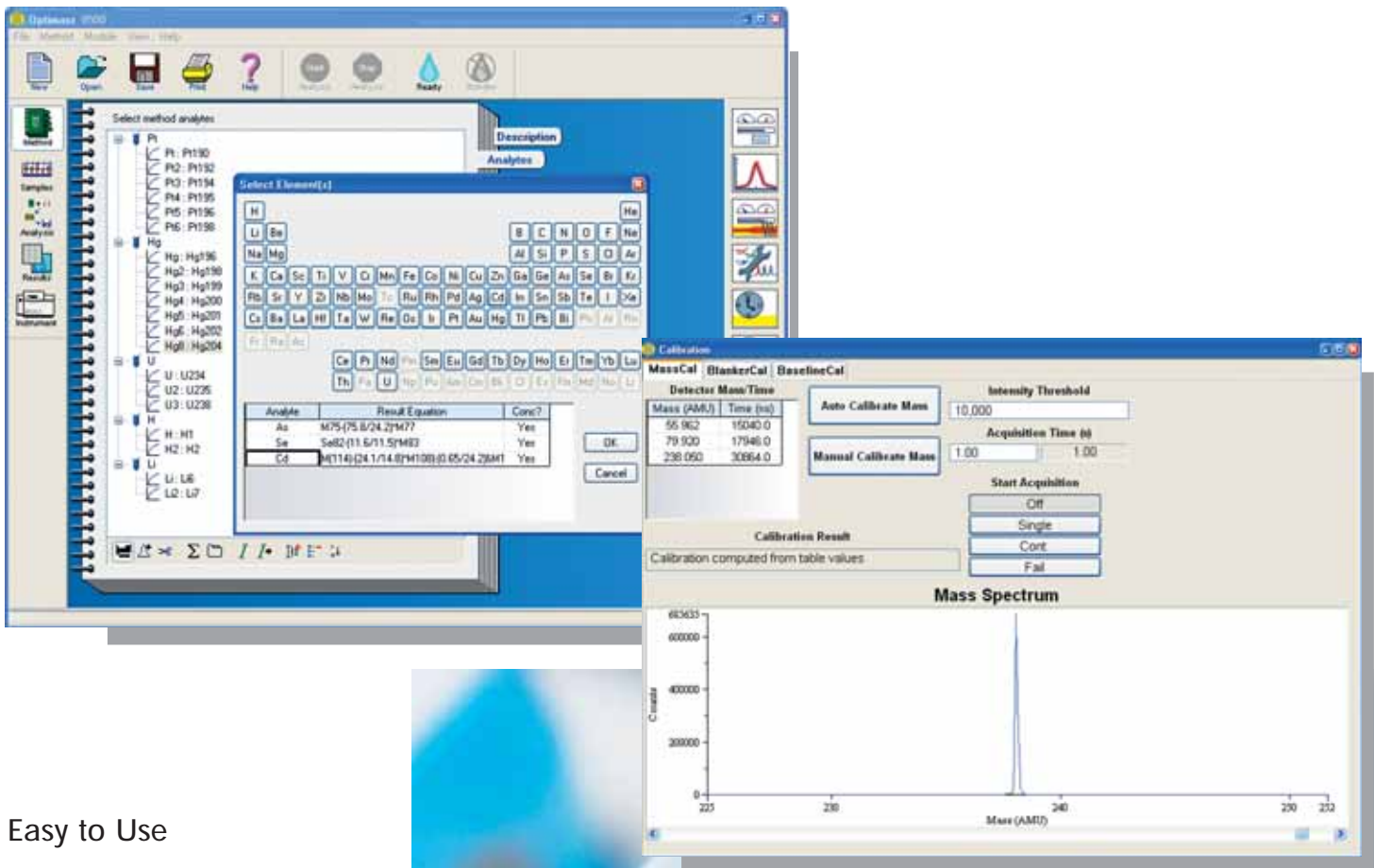
One of the largest European analytical laboratories commissioned GBC to conduct a feasibility study to demonstrate how the OptiMass 9500 would benefit their analytical environment. This laboratory analyzes more than 2 million samples per year, generating revenue in excess of USD\$50M. With more than 700 employees the laboratory is responsible for the safe drinking water of 8 million Europeans.

The objective of the laboratory was to increase sample throughput beyond the capabilities of their existing quadrupole ICP-MS. Detection limits in the ppb range, rapid service response, minimal maintenance and maximum mean time between failures were all critical considerations for this laboratory.

The OptiMass 9500 clearly demonstrated that it could not only meet, but exceed, this customer's stringent requirements and also demonstrated that it is a valuable analytical instrument which can increase sample throughput by a factor of five.

Rapid Sample Throughput

Simple, Powerful and Intuitive: The OptiMass 9500 Software



Easy to Use

The OptiMass 9500 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 9500 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 9500 allows direct correction of interferences with no further analysis time required. Interference equations can be easily entered into the analyte list. The OptiMass 9500 can be easily calibrated on a mass basis and Smartgate can also be calibrated simply and 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.

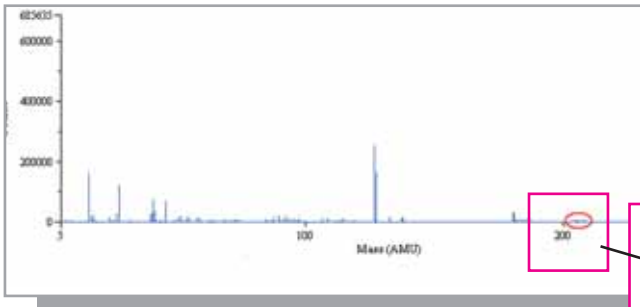
With the click of a button, all instrumentation parameters can be easily controlled.

Programmable



Element Identification

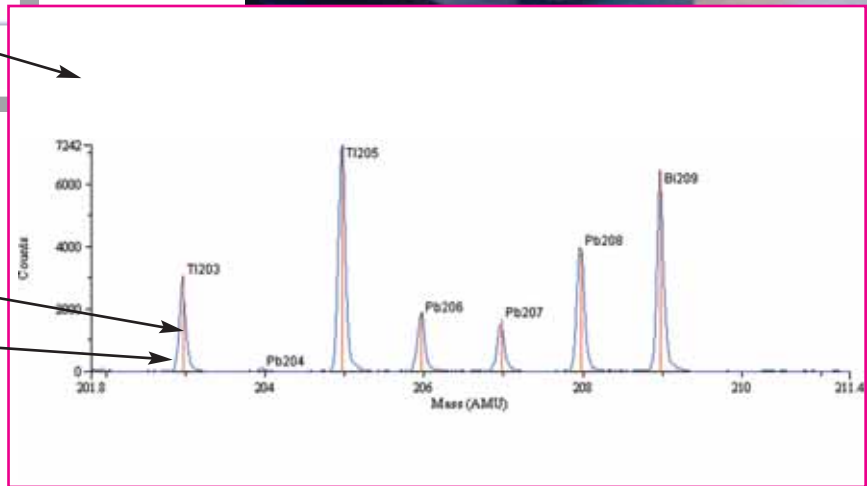
The advanced library query and search feature provides access to the information needed for mass identification and for the interpretation of spectra in unknown samples. The peak mass, resolution, and isotopic abundance can be simply recalled.

As the OptiMass 9500 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.



Just click and zoom for Easy Element Identification

 Natural Abundance
 Data



New Software Features

The OptiMass 9500 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.

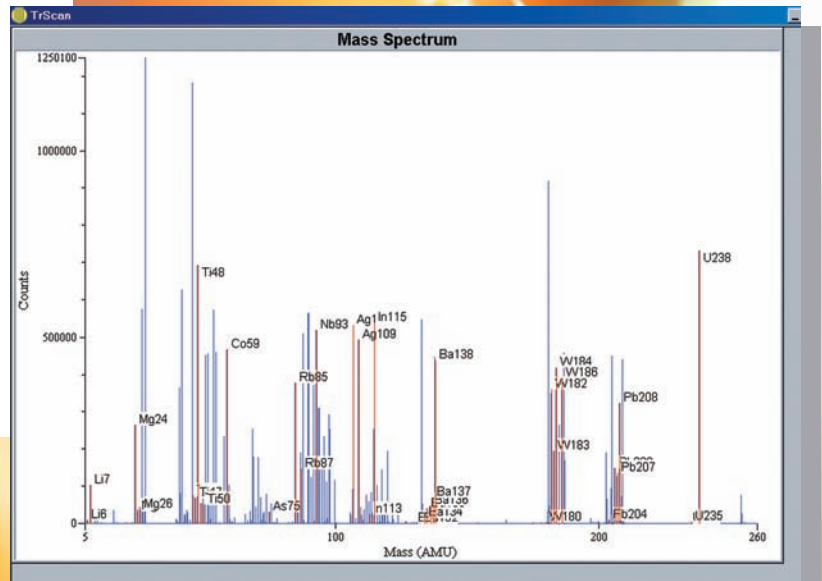
Impressive Processing Power

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 9500 allows not only semi-quantitative, but also retrospective semi-quantitative analysis (RSQ).

Every analysis contains data for every mass, the OptiMass 9500 continuously acquires data from mass 1 through to mass 260 amu. Utilizing the RSQ feature, this data is always available for future examination and quantification for masses not previously calibrated.



Optimass 9500

File Results Module View Help

Start Analyze Stop Analyze Ready Standby

No	Date	Time	Label	Analyte	R ²	Max Error	Equation
1	21/01/05 2:51:15 PM	15:00:40	Blank	Ag	0.99475	0.42499	Conc = 1.11
		15:02:57	Blank	Ag2	0.99479	0.42291	Conc = 1.15
		15:05:16	Sample SLRS 4	Cd5	1.00000	0.00000	Conc = 0.00
		15:07:33	Sample SLRS 4	Cd6	1.00000	0.00000	Conc = 8.14
		15:09:52	Blank	Cd7	1.00000	0.00000	Conc = 9.89
		15:12:11	Recovery cal std SQ 1.0ppb	Cd	1.00000	0.00000	Conc = 6.86
		15:14:30	Recovery cal std SQ 5.0 ppb	In	0.99492	0.41652	Conc = 9.43
		15:16:50	Recovery cal std SQ 10.0 ppb	Sn6	1.00000	0.00000	Conc = 0.00
		15:19:09	Blank				

Analyte	Equation	I/S	Result	Concentration	RSD	DL / %R
Pd	M106	54348.18359...	9.072	1.80 %		
Ag	M107	842293.4375...	9.749	2.22 %		
Ag2	Ag109	812742.8125...	9.733	2.23 %		
Cd5	Cd111	61148.54296...	10.393	3.31 %		
Cd6	Cd112	127359.0312...	10.335	2.39 %		
Cd7	Cd113	99212.00000...	9.796	2.22 %		
Cd	M114	148078.6406...	10.130	2.76 %		
In	M115	998923.3750...	9.793	1.81 %		

Replic...	Result	Anal.	1	2	3	4	5
1	840198.8	Ag	870501.875	850671.813	834466.688	833157.063	822669.625
2	820212.4	Ag2	840198.750	820212.438	807841.125	801940.938	793520.875
3	807841.1	Cd5	63532.156	63030.953	59106.531	60541.742	59531.336
4	801940.9	Cd6	130994.734	130116.930	125926.906	125870.906	123885.695
5	793520.9	Cd7	101209.969	101770.375	98552.758	97896.953	96629.945
		Cd	154202.266	149712.047	144530.016	147577.625	144371.219
		In	1024752.750	1008473.688	994893.813	987874.375	978622.313
		Sn6	76330.031	73828.617	74415.820	71343.602	71898.406
		Sn7	239717.953	235293.328	232834.109	227944.281	226840.875
		Sn8	97151.148	93555.328	95862.938	92487.922	92912.922
		Sn	333719.281	323545.406	320713.219	318209.781	315493.188
		Sn9	48420.473	45682.457	46393.660	47137.266	45065.453
		Sn10	61086.543	59053.332	56969.320	59462.934	59297.734
		Te6	448.803	449.403	354.402	488.403	483.203

Data for Future Reference

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 9500 then provides rapid multielement analysis enabling complete spectral data collection. This, coupled with the powerful statistical fingerprinting software of the OptiMass 9500, completes the package for comparative analysis.

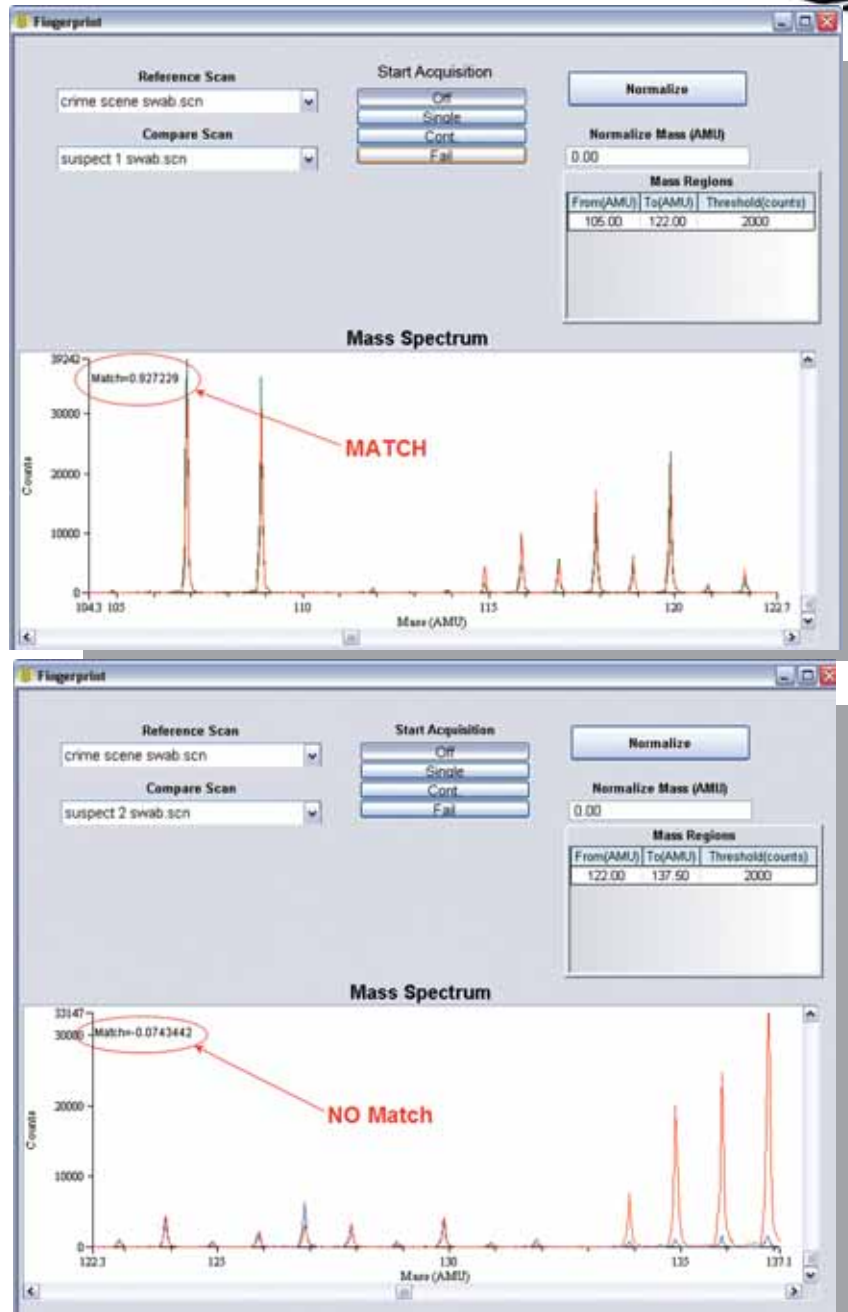
SMALL VOLUMES

The true simultaneous multielement capability of the Time-of-Flight technology used in the OptiMass 9500 ensures that all information can be obtained from the analysis of small volume samples often found in scene-of-crime scenarios.

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.

For example, in the event of the detonation of so called, "dirty" weapons, the speed and portability of the OptiMass 9500 make it ideal for "on site" fingerprinting of radio-nuclides released during the event.

This would allow authorities to quickly implement the correct safety procedures.



Sample Matching

Auto-Optimisation

The Time-of-Flight technology used in the OptiMass 9500 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 9500 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 (W1 Torch position)' window. It is divided into several sections:

- Parameters:** A table listing various instrument parameters, their status (Enabled/Disabled), and their minimum, maximum, and step size values.
- Mass Table:** A table showing the results of mass measurements, including Mass (AMU), Width (AMU), Function, and Target.
- Stabilization Time (s):** A field set to 10.0.
- Log File:** A section with 'No' and 'Yes' buttons.
- Command:** A section with 'None', 'Initialize', 'Next', 'Measure', and 'Auto' buttons.
- Results:** A large table at the bottom showing a detailed log of optimization results for multiple mass points.

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 Gas (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 (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

Ext	Z1	Y Me	Y Df	ZL Me	ZL Df	Lens B	Sk	RR	Fin	Pub Sk	Fill	Fill B	Fill	Gen. Pow	Reb.	Plas.	Aux.	C. pos.	Y Pos.	Z pos.	Pump	Result
-1400	-800	-800	0	-1180	-18.0	-150	-1050	040	000	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.846	11.8	-3.85	-2.50	10.0	135
-1400	-800	-800	0	-1180	-18.0	-150	-1050	040	000	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.846	11.8	-1.24	2.28	10.0	286
-1400	-800	-800	0	-1180	-18.0	-150	-1050	040	000	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.846	11.8	-0.832	-1.04	10.0	421
-1400	-800	-800	0	-1180	-18.0	-150	-1050	040	000	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.846	11.8	-0.832	-0.208	10.0	1180
-1400	-800	-800	0	-1180	-18.0	-150	-1050	040	000	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.846	11.8	-0.417	0.833	10.0	7820
-1400	-800	-800	0	-1180	-18.0	-150	-1050	040	000	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.846	11.8	1.28	1.87	10.0	10820
-1400	-800	-800	0	-1180	-18.0	-150	-1050	040	000	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.846	11.8	-0.208	-0.417	10.0	10000
-1400	-800	-800	0	-1180	-18.0	-150	-1050	040	000	-508	-34.0	0.105	-4.00	1200	1.08	10.0	0.846	11.8	1.04	-1.48	10.0	1275

Simple, Automated and Fast

Laser Ablation ICP-oTOFMS

The Laser Ablation Sampling

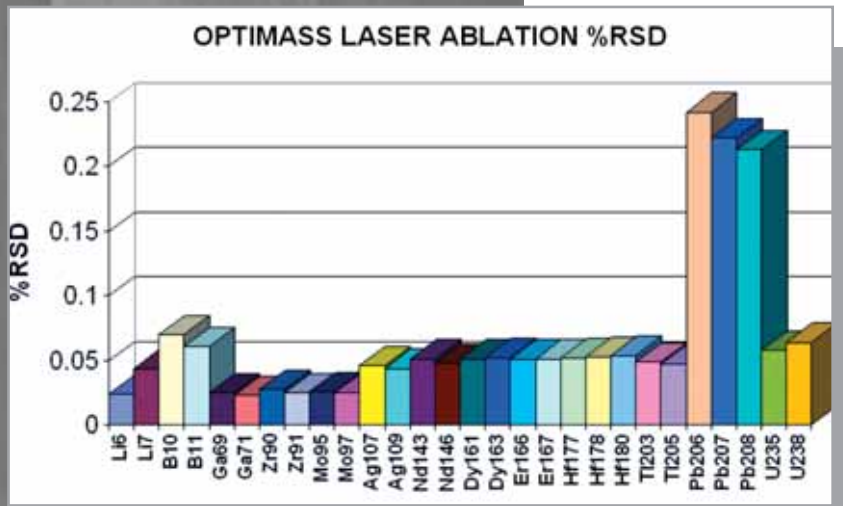
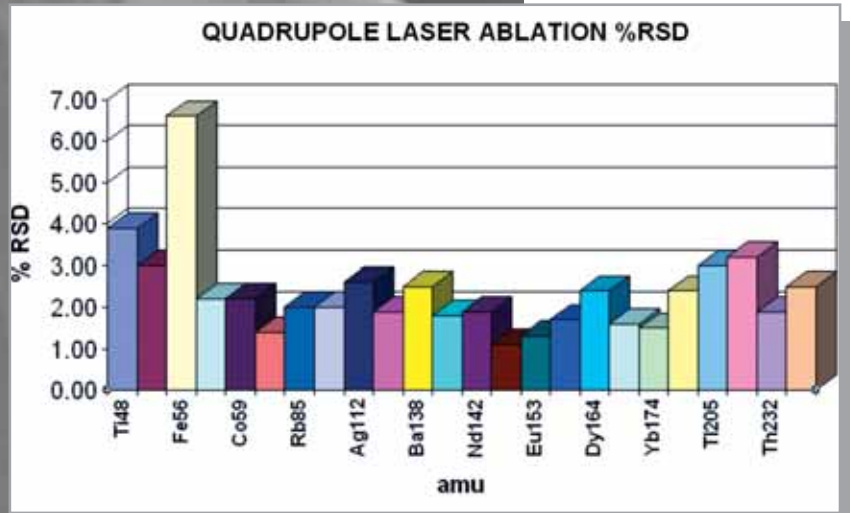
GBC now offers a packaged Laser Ablation-ICP-MS system. The integrated Dual Screen software control system facilitates easy viewing and control of both the Laser Ablation and OptiMass 9500 software.

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

The OptiMass 9500 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 9500 offers 6 times greater stability than a standard Quadrupole.



Dual screens for easy viewing

Transient Analysis

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 nm 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 Kleenvac 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 9500 is typically 2000 or greater for U238 or 0.4 amu.

Parts per Trillion Detection Limits

GBC OptiMass 9500

Spares & Accessories



Precision glassware readily available

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.



The OptiMass 9500 three-cone interface

SDS 540 Autosampler

The new 40% faster GBC automated Sample Delivery System, SDS 540, offers automation when combined with your OptiMass 9500 ICP-oTOFMS. The SDS 540 is totally controlled by the OptiMass 9500 software, providing random access as well as micro sampling capability for small samples and transient analysis.

The SDS 540 allows various sampling procedures and automation for liquid samples. It is capable of handling up to 540 samples and six different rack types in various configurations. The OptiMass 9500 combined with the SDS 540 means laboratories can quickly perform trace analysis to ppt levels without time consuming and costly sample dilutions.

Such extensive, unattended operation leads to high cost effectiveness and is especially beneficial to environmental and quality control laboratories.



SDS 540 Autosampler

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 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.



The HG3000PII hydride generator

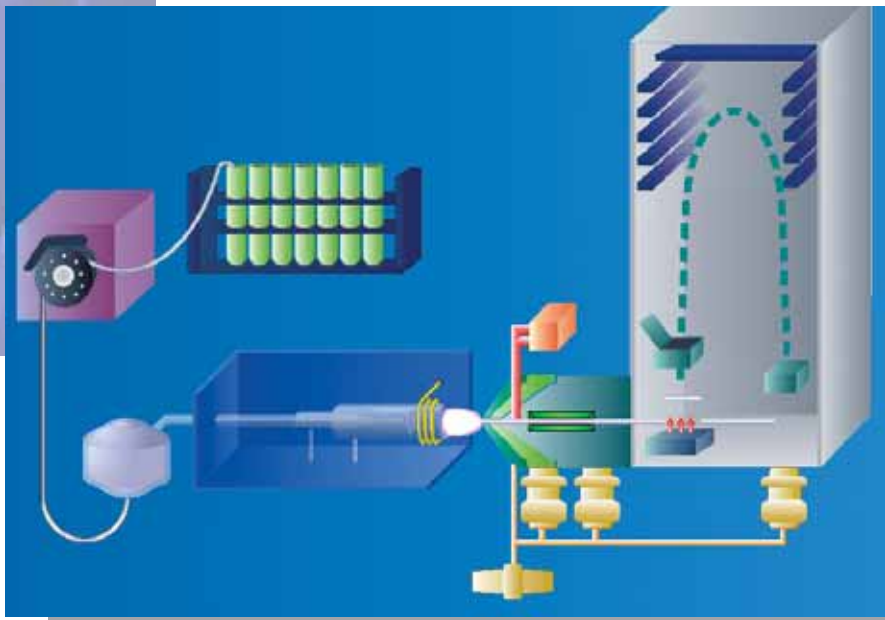
Precision Components

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.
- 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
- Auto-optimisation
- Semi-Quantitative analysis
- Retrospective Semi-Quantitative analysis
- Access data base
- Complete full spectrum results data saved for every replicate



Ease of Use

Customer Service

You can be assured that GBC will provide you the service that you require. With more than 100 agents 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 from the GBC global headquarters will travel to 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.



Rapid Service Response

OptiMass 9500 SPECIFICATIONS

OptiMass 9500 Dimensions

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

OptiMass 9500 Weights

Packed - 390 Kg

Unpacked - 270 Kg

Electrical Requirements

200-240 V AC, 7 kVA, 20A. 50/60 Hz

ORDERING INFORMATION

GBC OptiMass 9500 ICP orthogonal

Time-Of-Flight Mass Spectrometer

Part No. 99-2155-01

Designed and manufactured by
GBC Scientific Equipment Pty Ltd
A.C.N. 005 472 686

GBC reserves the right to
change specifications without
prior notice.

GBC publication number

01-0875-03

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GBC SCIENTIFIC EQUIPMENT

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