



vitesse

**Time-of-Flight
ICP-MS**

Vitesse - Time-of-Flight ICP-MS

Speed, sensitivity and selectivity, simultaneously

- Fastest wide mass range data acquisition for applications such as laser ablation imaging and nanoparticle or single cell analysis.
- High sensitivity to probe micron sized trace element features in solid samples and determine the elemental composition of individual nanoparticles or cells.
- High analyte selectivity with a segmented reaction cell optimised for multi-element analysis.
- High physical resolving power Time-of-Flight (TOF) mass spectrometer to give interference free analysis.
- Optional full size quadrupole before reaction cell to further increase interference handling abilities.

By sampling from an ICP source as simultaneous packets of ions from all or part of the mass range, virtually no sample information is lost. A fast read out time as low as 80µs allows the full range of metallic and most of the non-metallic elements to be measured in individual nanoparticles and single cells. When using the latest laser ablation systems with millisecond sample washout times on single laser shots, it is possible

Key features:

Field proven ion extraction and focussing optics for high sensitivity

Novel segmented reaction cell with multiple gas controllers for interference removal

Patented physical ion beam attenuator to increase the working dynamic range of the ICP-MS

Variable frequency ion sampling, high resolution Time-of-Flight (TOF) mass spectrometer to optimise the sensitivity to the application

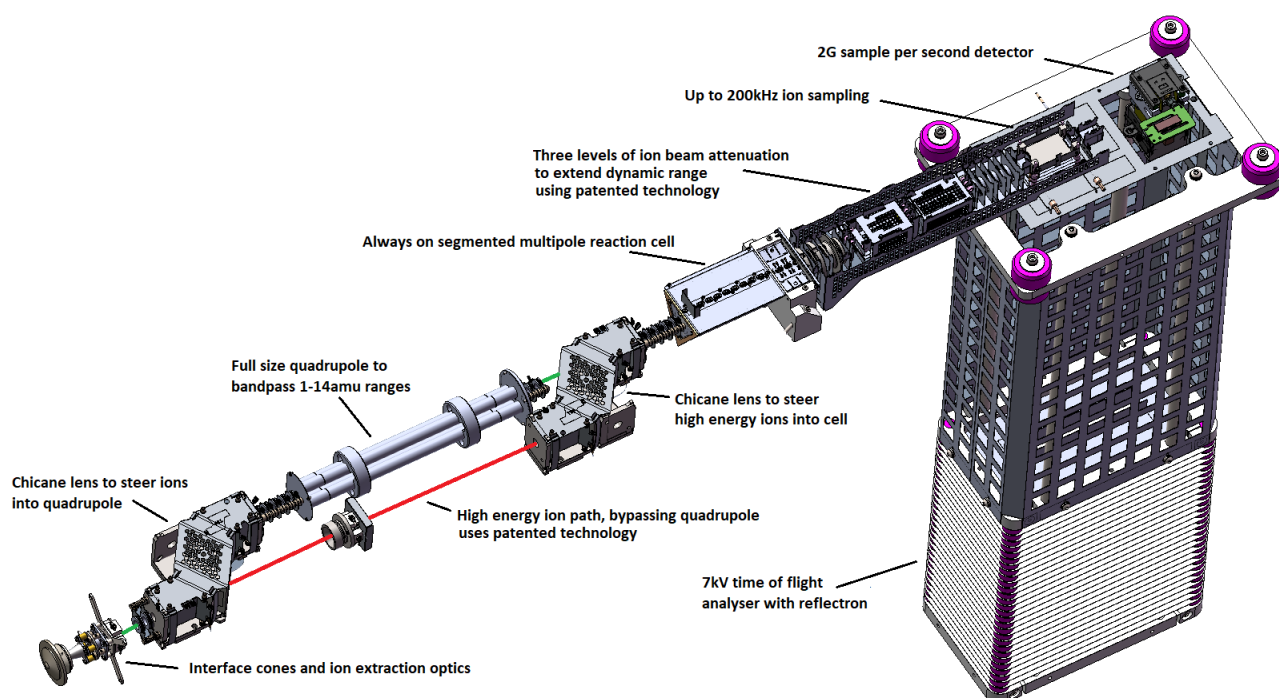
Bradbury-Nielson gate technology for mass range selection through the TOF

Robust MagneTOF detector with wide dynamic range and fast recovery from over-range signals

Fast data acquisition and processing electronics providing uninterrupted data at microsecond speeds for key applications

Optional full sized quadrupole with patented by-pass optics for full mass range coverage without mass bias effects

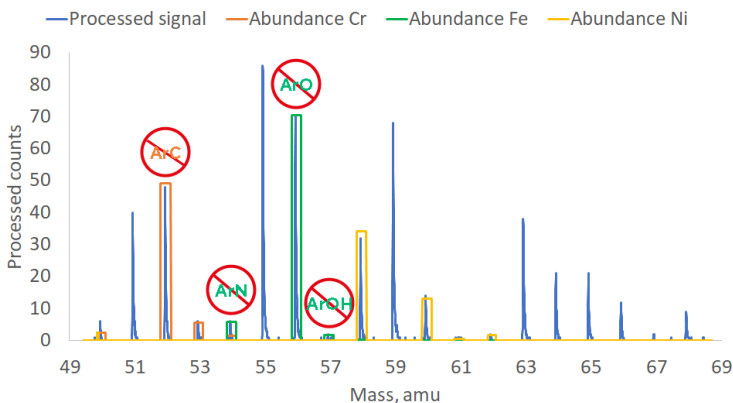
to get wide range elemental information from micron sized sample features or generate element images of several square millimetres in minutes. By combining spectra to get better statistics, it is possible to obtain highly precise elemental and isotopic compositions for solution samples.



Segmented Reaction Cell

Vitesse uses a segmented reaction cell which works effectively to remove most common interferences with the general removal of argon-based interferences using hydrogen and more specific removal of other matrix based interferences with more reactive gases. An axial electrical field is applied across the cell preventing loss of signal from scattered lighter mass ions that have been thermalised significantly before the cell exit.

Average of 10,000 acquisitions of 30µs showing no argon interferences in transition metal region of mass spectrum



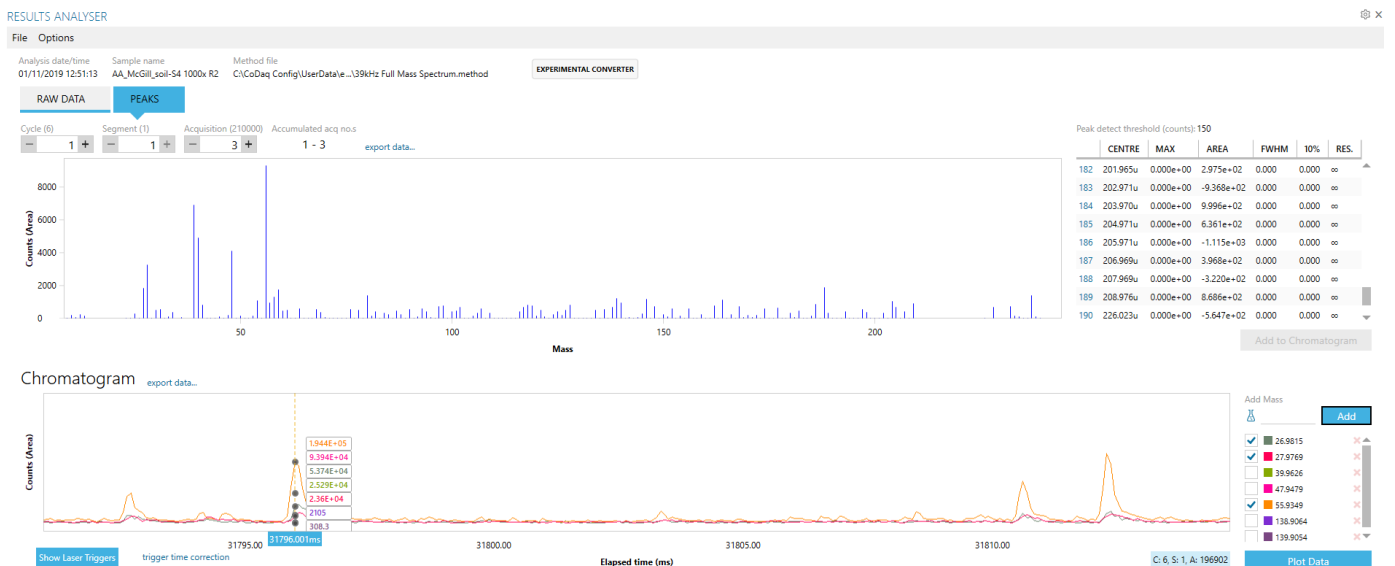
The signal from the passage of a nanoparticle or cell through the ICP lasts just a few hundred microseconds. Vitesse can continuously store data to disk at less than 80µs per spectra with no interruption. This makes the collection of data for hundreds of individual particles and cells a much faster process leading to more statistically relevant results.

Quadrupole, Cell, Time of Flight

The QCT option for the Vitesse adds a full size quadrupole in front of the segmented reaction cell so the ions entering the cell can be pre-selected to improve the selectivity of the reaction chemistry. Ranges from 1 to 14 amu can be chosen so all isotopes of a given element can be passed simultaneously. The QCT is complemented by use of the patented by-pass technology which allows the full ion beam to be directed to the segmented reaction cell giving wide mass range coverage without the mass bias effects introduced by a quadrupole even when used in RF only mode. The QCT option gives the ultimate in flexibility for interference removal whilst having the speed and simultaneous multi-element analysis of the time of flight mass spectrometer.

High speed Time-of-Flight analyser

Whether looking at the elemental composition of nanoparticles and single cells or high-speed elemental imaging with laser ablation, the ability to collect spectra continuously at speeds faster than the transient signal from the ion beam is critical to obtaining the most reliable information from the sample.

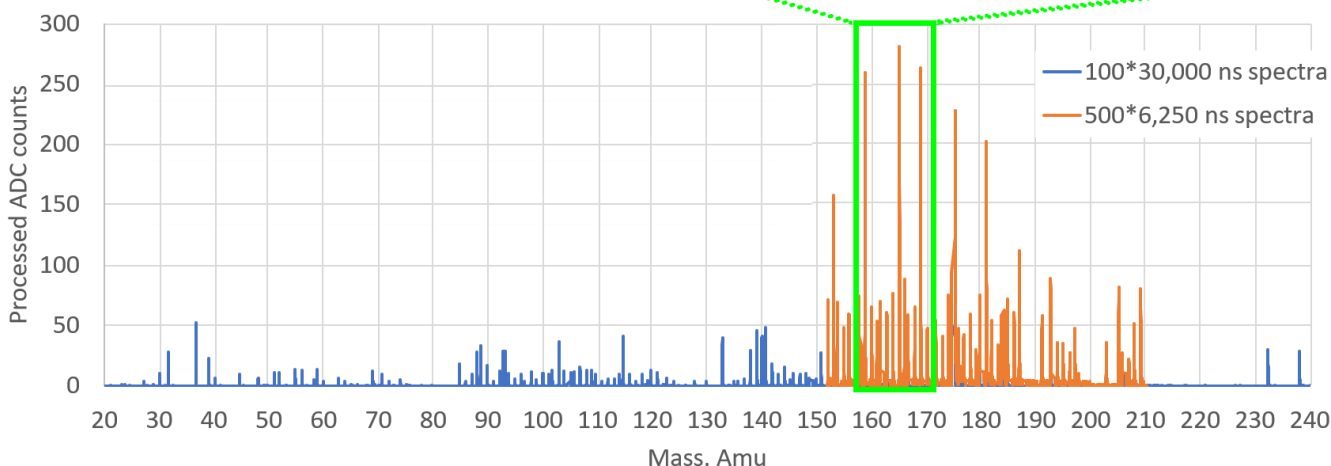
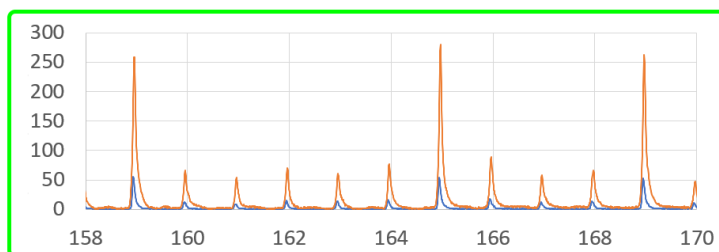


High sensitivity Time-of-Flight analyser

Vitesse extracts the ions created in the ICP and focuses them through to the entrance of the time-of-flight analyser using the same ion optical design as the highly sensitive Sapphire collision cell multi-collector ICP-MS from Nu. Packets of ions are then simultaneously ejected from the TOF entrance with a fixed energy before they are separated by the time each ion takes to fly through a drift region held at several kilovolts. The lighter ions have higher velocities arriving earlier than the heavier ions and so, for each packet of ions, a spectrum is generated. The time required for the heaviest ion to reach the detector is typically 30µs and therefore the normal frequency of data acquisition is approximately 33kHz.

When absolute sensitivity becomes more important than covering the widest possible range of elements, Vitesse is able to employ an over-pulsing technique. By using a Bradbury-Nielson gate immediately after the entrance to the time-of-flight analyser, the mass range being measured can be restricted and by increasing the ion sampling frequency, the sensitivity can be increased by up to a factor of five.

Comparison of 33kHz full mass range spectra with overpulsed 160kHz reduced mass range.



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Innovators in Mass Spectrometry. We deliver cutting-edge science and technology solutions, and offer our customers unparalleled support and maintenance service through the comprehensive **AMECARE** program.



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